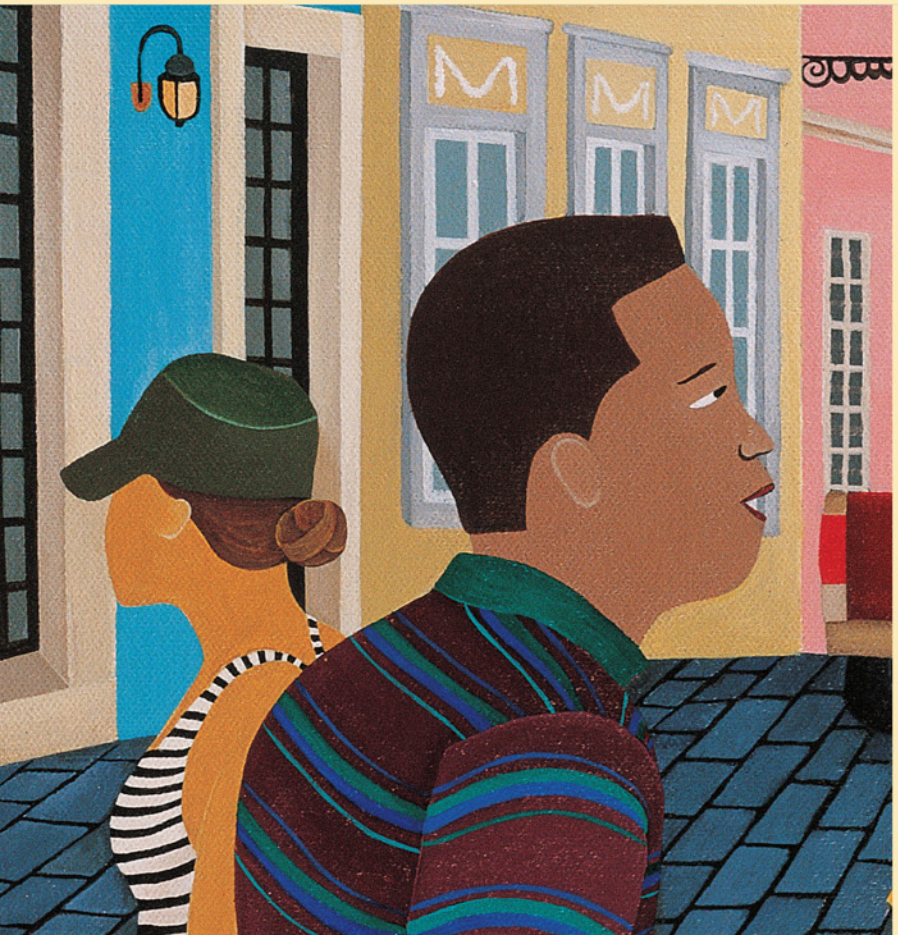
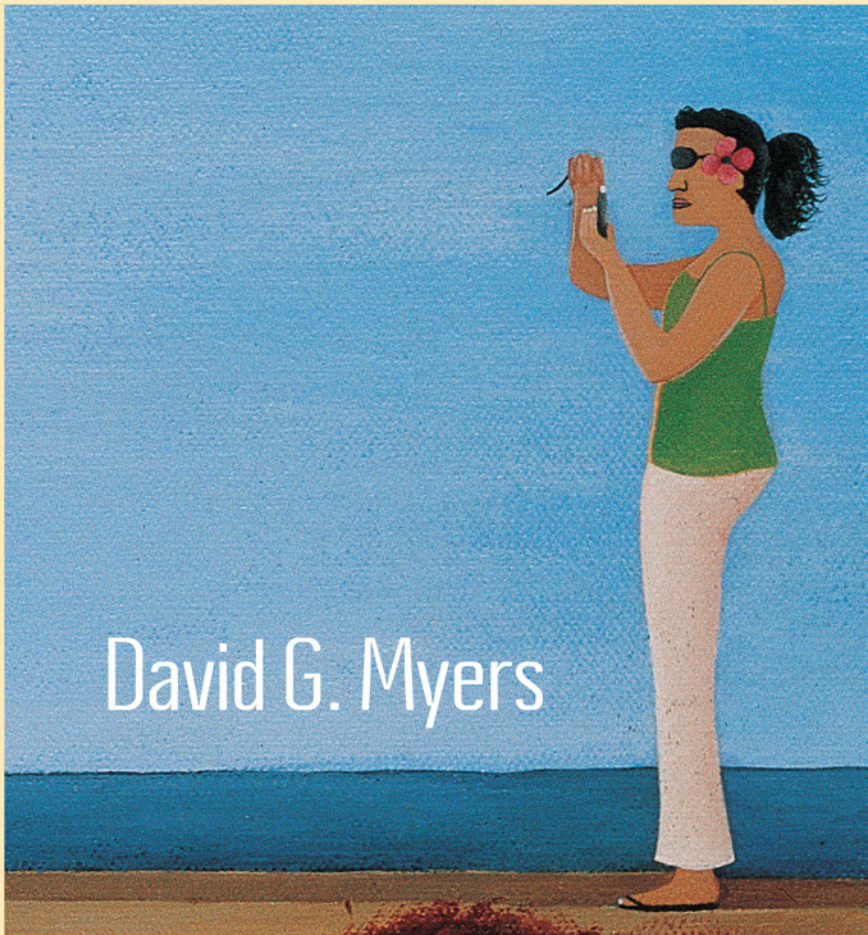
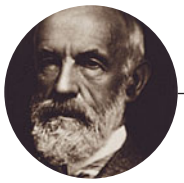
EXPLORING PSYCHOLOGY

EIGHTH EDITION IN MODULES





David G. Myers



1869 Francis Galton, Charles Darwin's cousin, publishes *Hereditary Genius*, in which he claims that intelligence is inherited. In **1876** he coins the expression "nature and nurture" to correspond with "heredity and environment."

1874 Carl Wernicke, a German neurologist and psychiatrist, shows that damage to a specific area in the left temporal lobe (now called Wernicke's area) disrupts ability to comprehend or produce spoken or written language.

1878 G. Stanley Hall receives from Harvard University's Department of Philosophy the first U.S. Ph.D. degree based on psychological research.

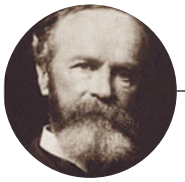
1879 Wilhelm Wundt establishes at the University of Leipzig, Germany, the first psychology laboratory, which becomes a Mecca for psychology students from all over the world.

1883 G. Stanley Hall, student of Wilhelm Wundt, establishes the first formal U.S. psychology laboratory at Johns Hopkins University.

1885 Hermann Ebbinghaus publishes *On Memory*, summarizing his extensive research on learning and memory, including the "forgetting curve."

1886 Joseph Jastrow receives from Johns Hopkins University the first Ph.D. degree in psychology awarded by a Department of Psychology in the United States.

1889 Alfred Binet and Henri Beaunis establish the first psychology laboratory in France at the Sorbonne, and the first International Congress of Psychology meets in Paris.



1890 William James, Harvard University philosopher and psychologist, publishes *The Principles of Psychology*, describing psychology as "the science of mental life."

1891 James Mark Baldwin establishes the first psychology laboratory in the British Commonwealth at the University of Toronto.

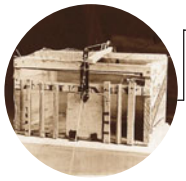
1892 G. Stanley Hall spearheads the founding of the American Psychological Association (APA) and becomes its first president.

1893 Mary Whiton Calkins (pictured) and Christine Ladd-Franklin are the first women elected to membership in the APA.

1894 Margaret Floy Washburn is the first woman to receive a Ph.D. degree in psychology (Cornell University).

Harvard University denies Mary Whiton Calkins admission to doctoral candidacy because of her gender, despite Hugo Münsterberg's claim that she was the best student he had ever had there.

1896 John Dewey publishes "The Reflex Arc Concept in Psychology," helping to formalize the school of psychology called functionalism.



1898 In "Animal Intelligence," Edward L. Thorndike, Columbia University, describes his learning experiments with cats in "puzzle boxes." In **1905,** he proposes the "law of effect."

1900 Sigmund Freud publishes *The Interpretation of Dreams*, his major theoretical work on psychoanalysis.

1933 Inez Beverly Prosser becomes the first African-American woman to receive a doctoral degree in psychology from a U.S. institution (Ph.D., University of Cincinnati).

1935 Christiana Morgan and Henry Murray introduce the Thematic Apperception Test to elicit fantasies from people undergoing psychoanalysis.

1936 Egas Moniz, Portuguese physician, publishes work on the first frontal lobotomies performed on humans.

1938 B. F. Skinner publishes *The Behavior of Organisms*, which describes operant conditioning of animals.

In *Primary Mental Abilities*, Louis L. Thurstone proposes seven such abilities.

Ugo Cerletti and Lucino Bini use electroshock treatment with a human patient.

1939 David Wechsler publishes the Wechsler-Bellevue intelligence test, forerunner of the Wechsler Intelligence Scale for Children (WISC) and the Wechsler Adult Intelligence Scale (WAIS).

Mamie Phipps Clark (pictured) receives a master's degree from Howard University. In collaboration with Kenneth B. Clark, she later extends her thesis, "The Development of Consciousness of Self in Negro Preschool Children," providing joint research cited in the U.S. Supreme Court's **1954** decision to end racial segregation in public schools.

Edward Alexander Bott helps found the Canadian Psychological Association. He becomes its first president in **1940.**

World War II provides many opportunities for psychologists to enhance the popularity and influence of psychology, especially in applied areas.

1943 Psychologist Starke Hathaway and physician J. Charnley McKinley publish the Minnesota Multiphasic Personality Inventory (MMPI).

1945 Karen Horney, who criticized Freud's theory of female sexual development, publishes *Our Inner Conflicts*.

1946 Benjamin Spock's first edition of *The Commonsense Book of Baby and Child Care* appears; the book will influence child-rearing in North America for several decades.

1948 Alfred Kinsey and his colleagues publish *Sexual Behavior in the Human Male*, and they publish *Sexual Behavior in the Human Female* in **1953.**

B. F. Skinner's novel, *Walden Two*, describes a Utopian community based on positive reinforcement, which becomes a clarion call for applying psychological principles in everyday living, especially communal living.

Ernest R. Hilgard publishes *Theories of Learning*, which was required reading for several generations of psychology students in North America.

1949 Raymond B. Cattell publishes the Sixteen Personality Factor Questionnaire (16PF).

Continued on inside back cover

EXPLORING PSYCHOLOGY
EIGHTH EDITION IN MODULES

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Laura James, *Posing in Old San Juan*, acrylic on canvas, 2008
Collection of Warren Stein

Laura James is a self-taught painter living and working in Brooklyn, New York. *Posing in Old San Juan* is typical of her style—incorporating bright colors, intricate patterns, and sometimes surreal objects to display her unique vision. Ms. James is a member of the Jamaica Artist Alliance, the Bridgeman Art Library in London, and the National Conference of Black Artists. Her paintings are widely exhibited and have reached as far as Japan, Africa, Canada, and the Caribbean.

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For Kate Nurre,
with gratitude for her energetic, effective, and enduring support

ABOUT THE AUTHOR

DAVID MYERS received his psychology Ph.D. from the University of Iowa. He has spent his career at Hope College, Michigan, where he has taught dozens of introductory psychology sections. Hope College students have invited him to be their commencement speaker and voted him "outstanding professor."

Myers' scientific articles have, with support from National Science Foundation grants, appeared in three dozen scientific periodicals, including *Science, American Scientist, Psychological Science*, and the *American Psychologist.* In addition to his scholarly writing and his textbooks for introductory and social psychology, he also digests psychological science for the general public. His writings have appeared in four dozen magazines, from *Today's Education* to *Scientific American*. He also has authored five general audience books, including *The Pursuit of Happiness* and *Intuition: Its Powers and Perils*.

David Myers has chaired his city's Human Relations Commission, helped found a thriving assistance center for families in poverty, and spoken to hundreds of college and community groups. Drawing on his experience, he also has written articles and a book *(A Quiet World)* about hearing loss, and he is advocating a transformation in American assistive listening technology (see www.hearingloop.org).

He bikes to work year-round and plays daily pick-up basketball. David and Carol Myers have raised two sons and a daughter. For more information visit www.davidmyers.org.

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BRIEF CONTENTS

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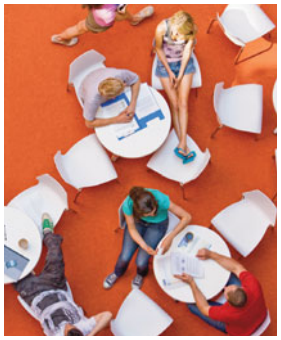

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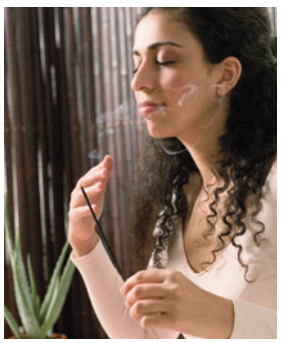

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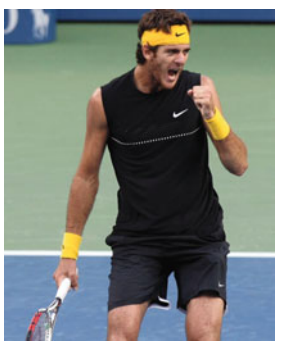

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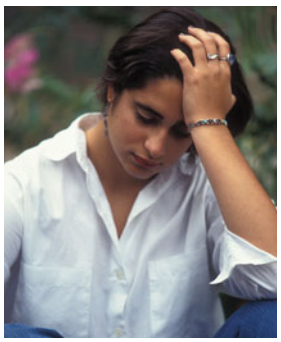

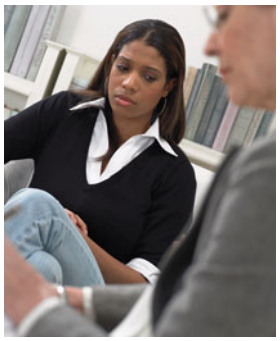

EXPLORING PSYCHOLOGY
EIGHTH EDITION IN MODULES

David G. Myers

Hope College
Holland, Michigan USA

WORTH PUBLISHERS

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PREFACE

With each new edition, I've found myself traveling a familiar path. When it is first published, I am relieved after many months of intense effort, and I am thrilled—sure that it is my best effort yet. Shortly thereafter, as new research comes out elaborating on concepts that the current edition teaches, and as thoughtful instructors and students begin writing with suggestions for improvement, and then when commissioned reviews and survey results start coming in, I have second thoughts about the current edition's seeming perfection. As my module-by-module storage cubbies begin fattening with new material, my eagerness for the next edition grows. By the time the new edition is ready to come out, I grimace when reminded of people using the old edition, which once seemed so perfect!

This new *Exploring Psychology, Eighth Edition in Modules* is no exception. This is now my best effort ever, much improved over the previous work! Among the many changes I am delighted to offer are

- hundreds of ***new research citations*** representing the most exciting and important new discoveries in our field.
- ***organizational changes*** based on changes in the field. For example, the heavily revised consciousness modules now follow the neuroscience modules and are titled Consciousness and the Two-Track Mind to reflect the dual-processing and cognitive neuroscience themes.
- ***fine-tuned writing*** with countless small and large improvements in the way concepts are presented, supported by the input and creative ideas of hundreds of contributing instructors, students, and friends.
- a sharp ***new art program*** that teaches more effectively.
- continually improving coverage of ***cultural and gender diversity issues.***

I find myself fascinated by today's psychology, with its studies of the neuroscience of our moods and memories, the reach of our adaptive unconscious, and the shaping power of the social and cultural context. Psychological science is increasingly attuned to the relative effects of nature and nurture, to gender and cultural diversity, to our conscious and unconscious information processing, and to the biology underlying our behavior. (See **TABLES 1** and **2** on the next page.) I am grateful for the privilege of assisting with the teaching of this mind-expanding discipline to so many students. To be entrusted with discerning and communicating psychology's insights is both an exciting honor and a great responsibility.

The thousands of instructors and millions of students who have worked with this book have contributed immensely to its development. Much of this has occurred spontaneously, through correspondence and conversations. For this edition, we also formally involved over 300 researchers and teaching psychologists, along with many students, in our efforts to gather accurate and up-to-date information about the field of psychology and the content, pedagogy, and supplements needs of instructors and students in the introductory course. We look forward to continuing feedback as we strive, over future editions, to create an ever-better book and supplements package.

Why a Modular Book?

This 39-module text has been a longtime wish come true for me. It breaks out of the box by restructuring the material into a buffet of (a) *short, digestible chapters* (called modules) that (b) *can be selected from and assigned in any order.*

TABLE 1 Evolutionary Psychology and Behavior Genetics

*In addition to the coverage found in Modules 8–9, the **evolutionary perspective** is covered on the following pages:*

*In addition to the coverage found in Modules 8–9, **behavior genetics** is covered on the following pages:*

TABLE 2 Neuroscience

*In addition to the coverage found in Modules 3–4, **neuroscience** can be found on the following pages:*

Have we not all heard the familiar student complaint: "The chapters are too long!" A text's typical 30- to 50-page chapter cannot be read in a single sitting before the eyes grow weary and the mind wanders. So why not parse the material into readable units? Ask your students whether they would prefer a 600-page book to be organized as fifteen 39-page chapters or as thirty-nine 15-page chapters. You may be surprised at their overwhelming support for shorter chapters. Indeed, students digest material better when they process in smaller chunks—as spaced rather than massed practice.

I have equally often heard from instructors bemoaning the fact that they "just can't get to everything" in the book. Sometimes instructors want to cover certain sections but not others in a traditional, long chapter. For example, in the typical States of Consciousness chapter, someone may want to cover Sleep and Hypnosis but not Drugs. In *Exploring Psychology, Eighth Edition in Modules,* instructors can easily choose to cover Module 5, Dual Processing, Sleep, and Dreams, and Module 6, Hypnosis, but not Module 7, Drugs.

How Is This Book Different from *Exploring Psychology*, Eighth Edition?

The primary differences between this book and my *Exploring Psychology,* Eighth Edition, text are the organization and the independence of the modules.

Organization

This book really IS *Exploring Psychology,* Eighth Edition—just in a different format. So this modular version contains all the updated research and innovative new coverage from *Exploring Psychology,* Eighth Edition. A very few sections have moved around to accommodate the modular structure. For example, "Rates of Psychological Disorders" is a separate section at the end of the Psychological Disorders chapter in *Exploring Psychology,* Eighth Edition, but it is covered in the first of the Psychological Disorders modules in this modular version.

The Modules Are Independent

Each module in this book is stand-alone rather than dependent upon the others for understanding. Cross-references to other parts of the book have been replaced with brief explanations. In some cases, illustrations or key terms are repeated to avoid possible confusion. No assumptions are made about what students have read prior to each module. This independence gives instructors ultimate flexibility in deciding which modules to use and in what order. Connections among psychology's subfields and findings are still made—they are just made in a way that does not assume knowledge of other parts of the book.

What Continues from *Exploring Psychology, Seventh Edition in Modules?*

Throughout its eight editions, my vision for this text has not wavered: *to merge rigorous science with a broad human perspective in a book that engages both mind and heart.* My aim has been to create a state-of-the-art introduction to psychology, written with sensitivity to students' needs and interests. I aspire to help students understand and appreciate the wonder of important phenomena of their lives. I also want to convey the inquisitive spirit with which psychologists *do* psychology. The study of psychology, I believe, enhances our abilities to restrain intuition with critical thinking, judgmentalism with compassion, and illusion with understanding.

Believing with Henry David Thoreau that "Anything living is easily and naturally expressed in popular language," I seek to communicate psychology's scholarship

with crisp narrative and vivid storytelling. Writing as a solo author, I hope to tell psychology's story in a way that is warmly personal as well as rigorously scientific. I love to reflect on connections between psychology and other realms, such as literature, philosophy, history, sports, religion, politics, and popular culture. And I love to provoke thought, to play with words, and to laugh.

Successful SQ3R Study Aids

1: This text's complete system of learning aids includes numbered Preview Questions, which appear in this format throughout the book.

Exploring Psychology, Eighth Edition in Modules has retained its popular system of study aids, integrated into an SQ3R structure that augments the narrative without disrupting it. Each module opens with an outline that enables students to quickly *survey* its major topics. Numbered Preview *Questions* at the start of new major topics define the learning objectives that will guide students as they *read*. *Rehearse* It! quizzes at the end of each module will stimulate students to rehearse what they have learned. These test items offer students an opportunity to review key ideas and to practice the multiple-choice test format. All **key terms** are defined in the margins for ready reference while students are being introduced to the new term in the narrative (see sample at left). Periodic Thinking Critically About and Close-Up boxes encourage development of critical thinking skills as well as application of the new concepts. The module-ending *Review* is structured as a set of answers to the numbered Preview Questions. Test for Success: Critical Thinking Exercises at the end of each module challenge students to think scientifically while reviewing the key concepts of the module. The Tips for Studying Psychology section at the end of Module 1 explains the SQ3R-based system of study aids, suggesting how students can *survey, question, read, rehearse,* and *review* the material for maximum retention.

key terms Look for complete definitions of important terms in the margin near their introduction in the narrative.

In the margins of this book, students will find interesting and informative review notes, and quotes from researchers and others that will encourage them to be active learners and apply what they are learning.

Goals for the Eighth Edition

Although supplemented by added storytelling, this new edition retains its predecessor's voice and much of its content and organization. It also retains the goals—the guiding principles—that have animated the previous seven editions:

1. ***To exemplify the process of inquiry*** I strive to show students not just the outcome of research, but how the research process works. Throughout, the book tries to excite the reader's curiosity. It invites readers to imagine themselves as participants in classic experiments. Several modules introduce research stories as mysteries that progressively unravel as one clue after another falls into place. (Module 4, for example, outlines the historical story of research on the brain's processing of language.)
2. ***To teach critical thinking*** By presenting research as intellectual detective work, I exemplify an inquiring, analytical mind-set. Whether students are studying development, cognition, or statistics, they will become involved in, and see the rewards of, critical reasoning. Moreover, they will discover how an empirical approach can help them evaluate competing ideas and claims for highly publicized phenomena—ranging from subliminal persuasion, ESP, and hypnosis to astrology, alternative therapies, and repressed and recovered memories.
3. ***To put facts in the service of concepts*** My intention is not to fill students' intellectual file drawers with facts, but to reveal psychology's major concepts—to teach students how to think, and to offer psychological ideas worth thinking about. In each module I place emphasis on those concepts I hope students will carry with them long after they complete the course. Always, I try to follow Albert Einstein's dictum that "everything should be made as simple as possible, but not simpler."
4. ***To be as up to date as possible*** Few things dampen students' interest as quickly as the sense that they are reading stale news. While retaining psychology's classic studies and concepts, I also present the discipline's most important recent developments. Nearly 482 references in this edition are dated 2007 or later.

5. ***To integrate principles and applications*** Throughout—by means of anecdotes, case histories, and the posing of hypothetical situations—I relate the findings of basic research to their applications and implications. Where psychology can illuminate pressing human issues—be they racism and sexism, health and happiness, or violence and war—I have not hesitated to shine its light.
6. ***To enhance comprehension by providing continuity*** Because this book has a single author, many significant issues—such as behavior genetics, cultural diversity, the bold thinking of intellectual pioneers, human rationality and irrationality, empathy for and understanding of troubled lives—weave throughout many modules, and students hear a consistent voice. "The uniformity of a work," observed Edward Gibbon, "denotes the hand of a single artist."
7. ***To reinforce learning at every step*** Everyday examples and rhetorical questions encourage students to process the material actively. Concepts are presented and then frequently applied to reinforce learning. The SQ3R system of pedagogical aids augments learning without interrupting the text narrative. A marginal glossary helps students master important terminology. Major sections begin with numbered Preview Questions, and modules end with Rehearse It! sections for self-testing on key concepts. End-of-module reviews repeat the Preview Questions and answer them. And the end-of-module Test for Success: Critical Thinking Exercises invite students to review and apply key concepts in thought-provoking ways.
8. ***To convey respect for human unity and diversity*** Especially in Module 8, Behavior Genetics and Evolutionary Psychology, and Module 9, Environmental Influences on Behavior, but also throughout the book, readers will see evidence of our human kinship—our shared biological heritage, our common mechanisms of seeing and learning, hungering and feeling, loving and hating. They will also better understand the dimensions of our diversity—our *individual* diversity in development and aptitudes, temperament and personality, and disorders and health; and our *cultural* diversity in attitudes and expressive styles, child-rearing and care for the elderly, and life priorities.

What's New?

Despite the overarching continuity, there is change and updating on every page. I have introduced the following major changes to *Exploring Psychology, Eighth Edition in Modules:*

Increased Coverage of Cultural and Gender Diversity

This edition presents an even more thoroughly cross-cultural perspective on psychology (**TABLE 3** on the next page)—reflected in research findings and in text and photo examples. Coverage of the psychology of women and men is thoroughly integrated (turn the page for **TABLE 4**). In addition, I am working to offer a world-based psychology for our worldwide student readership. Thus, I continually search the world for research findings and text and photo examples, conscious that readers may be in Melbourne, Sheffield, Vancouver, or Nairobi. North American and European examples come easily, given that I reside in the United States, maintain contact with friends and colleagues in Canada, subscribe to several European periodicals, and live periodically in the U.K. This edition, for example, offers many dozens of Canadian, British, and Australian and New Zealand examples. We are all citizens of a shrinking world, thanks to increased migration and the growing global economy. Thus, American students, too, benefit from information and examples that internationalize their world-consciousness. And if psychology seeks to explain *human* behavior (not just American or Canadian or Australian behavior), the broader the scope of studies presented, the more accurate is our picture of this world's people. My aim is to expose all students to the world beyond their own culture. Thus, I continue to welcome input and suggestions from all readers. The ***Nature, Nurture, and Human Diversity*** modules encourage students to appreciate cultural and gender differences and commonalities, and to consider the interplay of nature and nurture.

TABLE 3 Culture and Multicultural Experience

From Module 1 to Module 39, coverage of ***culture and multicultural experience*** *can be found on the following pages:*

Many new photos showcase the diversity of cultures within North America, as well as across the globe. In addition to significant cross-cultural examples and research presented within the narrative, these new photos and their informative captions freshen many modules and broaden students' perspectives in applying psychological science to their own world and to the worlds across the globe.

Emphasis on the Biological-Psychological-Social/Cultural Levels of Analysis Approach in Psychology

This edition systematically includes coverage of the biological, psychological, and social-cultural influences on our behavior. A significant section in Module 1 introduces the levels-of-analysis approach, setting the stage for future modules, and levels-of-analysis figures in many modules help students understand concepts in the biopsychosocial context.

TABLE 4 The Psychology of Men and Women

*Coverage of the **psychology of men and women** can be found on the following pages:*

Greater Sensitivity to the Clinical Perspective

With helpful guidance from clinical psychologist colleagues, I have become more mindful of the clinical angle on various concepts within psychology, which has sensitized and improved the Personality, Psychological Disorders, and Therapy modules, among others. For example, Module 29, Stress and Health, now covers problem-focused and emotion-focused coping strategies, and Module 24, Intelligence, describes some possible uses of intelligence-test results in clinical settings.

New Teaching and Learning Resources

Our supplements and media have been celebrated for their quality, abundance, and accuracy. The package available for *Exploring Psychology, Eighth Edition in Modules* raises the bar even higher with PsychPortal, which includes an interactive eBook, a suite of interactive components, the powerful Online Study Center, the Video Tool Kit, and the *Scientific American* News Feed. PsychPortal also enables instructors to monitor their students' engagement with its learning tools. See page xxii for details.

Enhanced Critical Thinking Coverage

I aim to introduce students to critical thinking in a natural way throughout the book, with even more in the narrative that encourages active learning of psychology's key concepts. The eighth edition includes the following opportunities for students to learn or practice their critical thinking skills.

- ***NEW Test for Success: Critical Thinking Exercises,*** contributed by Amy Himsel (El Camino College) and appearing at the end of each module, offer students an excellent opportunity to check their understanding of key concepts in the module, while learning and practicing critical thinking.
- ***Module 2 takes a unique, critical thinking approach to introducing students to psychology's research methods,*** emphasizing the fallacies of our everyday intuition and common sense and, thus, the need for psychological science. *Critical thinking* is introduced as a key term in this module.
- ***"Thinking Critically About . . ." boxes*** are found throughout the book, modeling for students a critical approach to some key issues in psychology. Module 22, for example, has an updated box, Thinking Critically About: The Fear Factor—Do We Fear the Right Things? (p. 310)
- ***Detective-style stories*** throughout the narrative get students thinking critically about psychology's key research questions. (See, for example, the story of language in the brain on pp. 56–58.)
- ***"Apply this"*** and ***"Think about it"***–style discussions keep students active in their study of each module. (Students can experience, for example, the sleep lab on pp. 73–75, or apply to their own life the therapeutic life-style change tips on p. 541.)
- ***Critical examinations of pop psychology*** spark interest and provide important lessons in thinking critically about everyday topics. (Consider, for example, the critical analysis of ESP on pp. 230–232.)
- **Appendix A: Statistical Reasoning in Everyday Life** encourages students to focus on thinking smarter by applying simple statistical principles to everyday reasoning.

See **TABLE 5** for a complete list of this text's coverage of critical thinking topics and Thinking Critically About boxes.

APA Guidelines for the Undergraduate Psychology Major

In March 2002, an American Psychological Association (APA) Task Force created a set of Learning Goals and Outcomes for students graduating with psychology majors from four-year schools (www.apa.org). Psychology departments in many schools have since used these goals and outcomes to help them establish their own benchmarks. Some instructors are eager to know whether a given text for the introductory course helps students get a good start at achieving these goals. *Exploring Psychology, Eighth Edition in Modules* will work nicely to help you begin to address these goals in your department. See www.worthpublishers.com/myers for a detailed guide to how *Exploring Psychology, Eighth Edition in Modules* corresponds to the APA Learning Goals and Outcomes.

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TABLE 5 Critical Thinking and Research Emphasis

Critical thinking coverage, *and in-depth stories of psychology's* ***scientific research*** *process, can be found on the following pages:*

Thinking Critically About . . . boxes:

The Fear Factor—Do We Fear the Right Things?, pp. 310–311
Lie Detection, p. 397
Complementary and Alternative Medicine, p. 426
How to Be a "Successful" Astrologer or Palm Reader, pp. 454–455
ADHD—Normal High Energy or Genuine Disorder?, p. 474
Insanity and Responsibility, p. 479

Critical Examinations of Pop Psychology:

How psychologists ask and answer questions, pp. 14–17
Perceiving order in random events, pp. 23–24
Do we use only 10 percent of our brains?, pp. 55–56
Can hypnosis enhance recall? Coerce action? Be therapeutic? Alleviate pain?, pp. 87–89
Has the concept of "addiction" been stretched too far?, p. 93
Near–death experiences, p. 100
Critiquing the evolutionary perspective, p. 120
How much credit (or blame) do parents deserve?, pp. 124–125
Is there extrasensory perception?, pp. 230–232
How valid is the Rorschach test?, pp. 444–445
Is repression a myth?, pp. 445–446
Is Freud credible?, pp. 445–447
Is psychotherapy effective?, pp. 523–526
Evaluating alternative therapies, pp. 526–527
Do video games teach or release violence?, p. 573

Thinking Critically With Psychological Science:

The limits of intuition and common sense, pp. 14–15
The scientific attitude, pp. 16–17
"Critical thinking" introduced as a key term, p. 17
The scientific method, pp. 17–27
Correlation and causation, pp. 22–23
Illusory correlation, p. 23
Exploring cause and effect, pp. 24–25
Random assignment, p. 25
Independent and dependent variables, pp. 26–27
Statistical reasoning, Appendix A, pp. A-1–A-8
Describing data, pp. A-1–A-6
Making inferences, pp. A-6–A-8

Scientific Detective Stories:

Is breast milk better than formula?, pp. 24–25
Our divided brains, pp. 59–62
Why do we sleep?, pp. 76–79
Why do we dream?, pp. 82–84
Is hypnosis an extension of normal consciousness or an altered state?, pp. 89–90
Twin and adoption studies, pp. 110–114
How a child's mind develops, pp. 151–158
Aging and intelligence, pp. 179–180
Parallel processing, pp. 198–199
How do we see in color?, pp. 199–200
How do we store memories in our brains?, pp. 280–285
How are memories constructed?, pp. 296–301
Do animals exhibit language?, pp. 325–326
Why do we feel hunger?, pp. 358–360
What determines sexual orientation?, pp. 380–385
The pursuit of happiness: Who is happy, and why?, pp. 410–416
Why—and in whom—does stress contribute to heart disease?, pp. 421–423
How and why is social support linked with health?, pp. 429–430
Self-esteem versus self-serving bias, pp. 467–469
What causes mood disorders?, pp. 482–489
Do prenatal viral infections increase risk of schizophrenia?, pp. 495–496
Is psychotherapy effective?, pp. 523–525
Why do people fail to help in emergencies?, pp. 581–583

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- **Scientific American *News Feed*** highlights current behavioral research.

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- The Online Study Center

- 60-Second Psych (*Scientific American* podcasts)
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- PsychSim 5.0 (on CD-ROM)
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Video Resources

- Instructor's Video Tool Kit
- Worth *Digital Media Archive*
- *Psychology: The Human Experience* Teaching Modules
- *The Many Faces of Psychology* Video
- *Scientific American Frontiers* Video Collection, Second Edition
- *The Mind* Video Teaching Modules, Second Edition
- *The Brain* Video Teaching Modules, Second Edition

Print Resources

- Instructor's Resources and Lecture Guides
- Instructor's Media Guide for Introductory Psychology
- Study Guide
- *Pursuing Human Strengths: A Positive Psychology Guide*
- *Critical Thinking Companion,* Second Edition

Scientific American Resources

- *Scientific American Mind*
- *Scientific American Reader to Accompany Myers*
- *Improving the Mind and Brain: A Scientific American Special Issue*
- *Scientific American Explores the Hidden Mind: A Collector's Edition*

In Appreciation

If it is true that "whoever walks with the wise becomes wise" then I am wiser for all the wisdom and advice received from expert colleagues. Aided by nearly a thousand consultants and reviewers over the last two decades, this has become a better, more accurate book than one author alone (this author, at least) could write. As my editors and I keep reminding ourselves, all of us together are smarter than any one of us.

My indebtedness continues to each of the teacher-scholars whose influence I acknowledged in the seven previous editions, and also to the innumerable researchers who have been so willing to share their time and talent to help me accurately report their research.

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At Worth Publishers a host of people played key roles in creating this eighth edition.

Although the information gathering is never-ending, the formal planning began as the author-publisher team gathered for a two-day retreat in June 2007. This happy and creative gathering included John Brink, Martin Bolt, Thomas Ludwig, Richard Straub, and me from the author team, along with my assistants Kathryn Brownson and Sara Neevel. We were joined by Worth Publishers executives Tom Scotty, Elizabeth Widdicombe, and Catherine Woods; editors Christine Brune, Kevin Feyen, Nancy Fleming, Tracey Kuehn, Betty Probert, and Peter Twickler; artistic director Babs Reingold; and sales and marketing colleagues Kate Nurre, Tom Kling, Guy Geraghty, Sandy Manly, Amy Shefferd, Rich Rosenlof, and Brendan Baruth. The input and brainstorming during this meeting of minds gave birth, among other things, to the thoroughly revised Module 5, Dual Processing, Sleep, and Dreams.

Christine Brune, chief editor, is a wonder worker. She offers just the right mix of encouragement, gentle admonition, attention to detail, and passion for excellence. An author could not ask for more.

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To achieve our goal of supporting the teaching of psychology, this teaching package not only must be authored, reviewed, edited, and produced, but also made available to teachers of psychology. For their exceptional success in doing that, our author team is grateful to Worth Publishers' professional sales and marketing team. We are especially grateful to Executive Marketing Manager Kate Nurre and National Psychology and Economics Consultant Tom Kling both for their tireless efforts to inform our teaching colleagues of our efforts to assist their teaching, and for the joy of working with them.

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After hearing countless dozens of people say that this book's supplements have taken their teaching to a new level, I reflect on how fortunate I am to be a part of a team in which everyone has produced work marked by the highest professional standards. For their remarkable talents, their long-term dedication, and their friendship, I thank my collaborators John Brink, Thomas Ludwig, and Richard Straub. Sadly, our friend and collaborator Martin Bolt died on Christmas Day 2009, after already completing the Instructor's Resources for this eighth edition.

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The day this book went to press was the day I started gathering information and ideas for the ninth edition. Your input will again influence how this book continues to evolve. So, please, do share your thoughts.

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Introduction to the History and Science of Psychology

Introduction to the History and Science of Psychology

Hoping to satisfy their curiosity about people and to remedy their own woes, millions turn to "psychology." They listen to talk-radio counseling, read articles on psychic powers, and attend stop-smoking hypnosis seminars. Searching for the meaning of dreams, the path to ecstatic love, and the roots of personal happiness, they consult self-help Web sites, popular books, magazines, and TV.

Others, intrigued by claims of psychological truth, wonder: Do mothers and infants bond in the first hours after birth? Should we trust childhood sexual abuse memories that get "recovered" in adulthood—and prosecute the alleged predators? Are first-born children more driven to achieve? Does psychotherapy heal?

For many people, psychologists are folks who analyze personality, offer counseling, and dispense child-rearing advice. Do they? Yes, and much more. Consider some of psychology's questions that from time to time you may wonder about:

- Have you ever found yourself reacting to something as one of your biological parents would—perhaps in a way you vowed you never would—and then wondered how much of your personality you inherited? *To what extent are person-to-person differences in personality predisposed by our genes? To what extent by our home and community environments?*
- Have you ever worried about how to act among people of a different culture, race, or gender? *In what ways are we alike as members of the human family? How do we differ?*
- Have you ever awakened from a nightmare and, with a wave of relief, wondered why you had such a crazy dream? *How often, and why, do we dream?*
- Have you ever played peekaboo with a 6-month-old and wondered why the baby finds the game so delightful? The infant reacts as though, when you momentarily move behind a door, you actually disappear—only to reappear later out of thin air. *What do babies actually perceive and think?*
- Have you ever wondered what leads to school and work success? Are some people just born smarter? *Does sheer intelligence explain why some people get richer, think more creatively, or relate more sensitively?*
- Have you ever become depressed or anxious, perhaps over a lost job during the recent economic crash, and wondered whether you'll ever feel "normal"? *What triggers our bad moods—and our good ones?*

Such questions provide grist for psychology's mill, because psychology is a science that seeks to answer all sorts of questions about us all—how and why we think, feel, and act as we do. In Module 1, we trace psychology's roots and survey the scope of this field. In Module 2, we consider psychology's methods and some ways we can all benefit by thinking critically.

"I have made a ceaseless effort not to ridicule, not to bewail, not to scorn human actions, but to understand them."

—Benedict Spinoza, *A Political Treatise*, 1677

John Lund/Sam Diephuis/Blend Images/Corbis

Megapress/Alamy

Ariadne Van Zandt/Lonely Planet Images

A smile is a smile the world around Throughout this book, you will see examples not only of our cultural and gender diversity but also of the similarities that define our shared human nature. People in different cultures vary in when and how often they smile, but a naturally happy smile *means* the same thing anywhere in the world.

MODULE 1

The History and Scope of Psychology

Psychology's Roots

1-1: What are some important milestones in the development of the science of psychology?[1]

Once upon a time, on a planet in this neighborhood of the universe, there came to be people. Soon thereafter, these creatures became intensely interested in themselves and in one another: "Who are we? What produces our thoughts? Our feelings? Our actions? And how are we to understand and manage those around us?"

Psychological Science Is Born

To be human is to be curious about ourselves and the world around us. Before 300 B.C.E., the Greek naturalist and philosopher Aristotle (384–322 B.C.E.) theorized about learning and memory, motivation and emotion, perception and personality. Today we chuckle at some of his guesses, like his suggestion that a meal makes us sleepy by causing gas and heat to collect around the source of our personality, the heart. But credit Aristotle with asking the right questions.

Philosophers' thinking about thinking continued until the birth of psychology as we know it, on a December day in 1879, in a small, third-floor room at Germany's University of Leipzig. There, two young men were helping an austere, middle-aged professor, Wilhelm Wundt, create an experimental apparatus. Their machine measured the time lag between people's hearing a ball hit a platform and their pressing a telegraph key (Hunt, 1993). Curiously, people responded in about one-tenth of a second when asked to press the key as soon as the sound occurred—and in about two-tenths of a second when asked to press the key as soon as they were consciously aware of perceiving the sound. (To be aware of one's awareness takes a little longer.) Wundt was seeking to measure "atoms of the mind"—the fastest and simplest mental processes. Thus began what many consider psychology's first experiment, launching the first psychological laboratory, staffed by Wundt and psychology's first graduate students.

This young science of psychology developed from the more established fields of philosophy and biology. Wundt was both a philosopher and a physiologist. Ivan Pavlov, who pioneered the study of learning, was a Russian physiologist. Sigmund Freud, who developed an influential theory of personality, was an Austrian physician. Jean Piaget, the last century's most influential observer of children, was a Swiss biologist. William James, author of an important 1890 textbook, was an American philosopher. This list of pioneering psychologists—"Magellans of the mind," as Morton Hunt (1993) has called them—illustrates psychology's origins in many disciplines and countries.

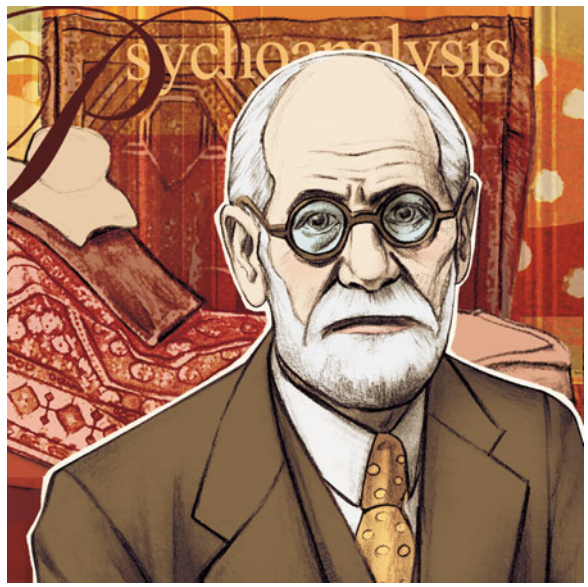
As these names illustrate, the early pioneers of most fields, including psychology, were predominantly men. When James' student Mary Calkins completed all the requirements for a Harvard Ph.D., outscoring all the male students on their exams, Harvard denied her the degree she had earned, offering her instead a degree from Radcliffe College, its undergraduate sister school for women. Although Calkins resisted the unequal treatment and refused the degree, she went on to become the American Psychological Association's (APA's) first female president in 1905. Margaret Floy Washburn became the first woman to receive a psychology Ph.D. and, in 1921, the second to be elected an APA president.

Information sources are cited in parentheses, with name and date. Every citation can be found in the end-of-book References, with complete documentation that follows American Psychological Association style.

[1] A Preview Question appears at the beginning of major sections. Search actively for the answer to the question as you read through the section. Later, you can check your understanding by reading the numbered Module Review and taking a Rehearse It! quiz at the end of the module.

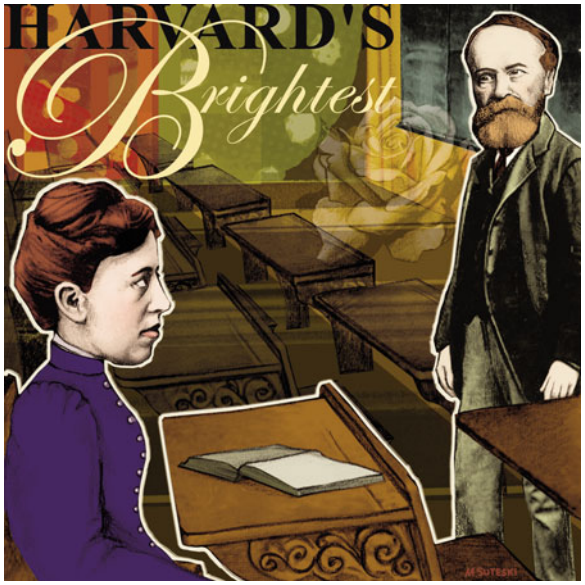
Monika Suteski

Wilhelm Wundt Wundt (far left) established the first psychology laboratory at the University of Leipzig, Germany.



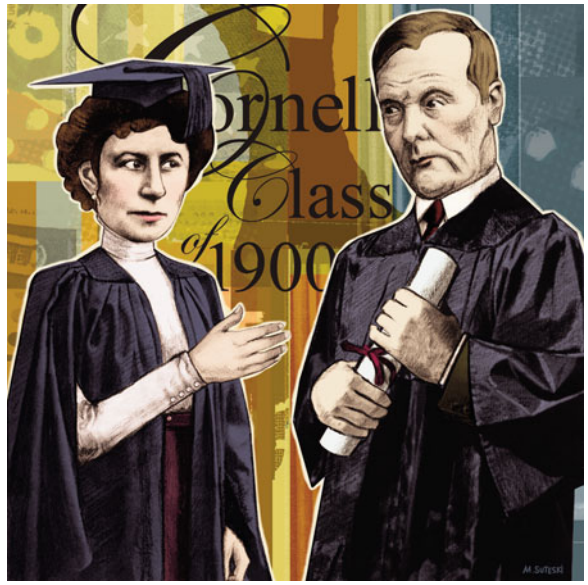
Monika Suteski

Sigmund Freud The controversial ideas of this famed personality theorist and therapist have influenced many people's self-understanding.



Monika Suteski

William James and Mary Whiton Calkins James, legendary teacher-writer, mentored Calkins, who became a pioneering memory researcher and the first woman to be president of the American Psychological Association.



Monika Suteski

Margaret Floy Washburn The first woman to receive a psychology Ph.D., Washburn synthesized animal behavior research in *The Animal Mind*.

The rest of the story of psychology—the subject of this book—develops at many levels. With activities ranging from the study of nerve cell activity to the study of international conflicts, *psychology* is not easily defined.

In psychology's early days, *introspection*—focusing on inner sensations, images, and feelings—was common. Wundt used this approach, as did James in his examination of the stream of consciousness and of emotion. Freud emphasized the ways emotional responses to childhood experiences and our unconscious thought processes affect our behavior. Thus, until the 1920s, *psychology* was defined as "the science of mental life."

From the 1920s into the 1960s, American psychologists, initially led by flamboyant and provocative John B. Watson and later by the equally provocative B. F. Skinner, dismissed introspection and redefined *psychology* as "the scientific study of observable behavior." After all, said these **behaviorists,** science is rooted in observation. You cannot observe a sensation, a feeling, or a thought, but you *can* observe and record people's *behavior* as they respond to different situations.

Humanistic psychology rebelled against both behaviorism and Freudian psychology. Pioneers Carl Rogers and Abraham Maslow found behaviorism's focus on learned behaviors too mechanistic. And rather than focusing on the meaning of early childhood memories, as a psychoanalyst might, the humanistic psychologists emphasized the importance of current environmental influences on our growth potential, and the importance of having our needs for love and acceptance satisfied.

In the 1960s, another movement emerged as psychology began to recapture its initial interest in mental processes. This *cognitive revolution* supported ideas developed by earlier psychologists, such as the importance of how our mind processes and retains information. Cognitive psychology and more recently **cognitive neuroscience** (the study of brain activity linked with mental activity) have also suggested new ways to understand and treat psychological disorders.

To encompass psychology's concern with observable behavior *and* with inner thoughts and feelings, today we define **psychology** as the *science of behavior and mental processes*.

Let's unpack this definition. *Behavior* is anything an organism *does*—any action we can observe and record. Yelling, smiling, blinking, sweating, talking, and questionnaire marking are all observable behaviors. *Mental processes* are subjective experiences: sensations, perceptions, dreams, thoughts, beliefs, and feelings.

The key word in psychology's definition is *science*. Psychology, as I will emphasize throughout this book, is less a set of findings than a way of asking and answering questions. My aim, then, is not merely to report results but also to show you how psychologists play their game. You will see how researchers evaluate conflicting opinions and ideas. And you will learn how all of us, whether scientists or simply curious people, can think smarter when describing and explaining the events of our lives.

Throughout the text, important concepts are **boldfaced.** *As you study, you can find these terms with their definitions in a nearby margin and in the Glossary at the end of the book.*

behaviorism the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2).

humanistic psychology historically significant perspective that emphasized the growth potential of healthy people and the individual's potential for personal growth.

cognitive neuroscience the interdisciplinary study of the brain activity linked with cognition (including perception, thinking, memory, and language).

psychology the science of behavior and mental processes.

John B. Watson and Rosalie Rayner Working with Rayner, Watson championed psychology as the science of behavior. Together, they demonstrated conditioned responses on a baby who became famous as "Little Albert."

Monika Suteski

B. F. Skinner A leading behaviorist, Skinner rejected introspection and studied how consequences shape behavior.

Monika Suteski

Contemporary Psychology

Like its pioneers, today's psychologists are citizens of many lands. The International Union of Psychological Science has 69 member nations, from Albania to Zimbabwe. Across the world, psychologists have wrestled with many issues, viewing behavior from the differing perspectives offered by the subfields in which they teach, work, and do research.

Global psychology Psychology is growing and it is globalizing. Today's psychologists are citizens of many lands—69 lands, according to the International Union of Psychological Science. Their number is mushrooming. In China, for example, 5 universities had psychology departments in 1985; by the last century's end, there were 40 (Zhang & Xu, 2006). And worldwide, ideas are working their way across borders now more than ever, as happened in 2007 at this international psychology conference in India. "We are moving rapidly toward a single world of psychological science," reported Robert Bjork (2000).

AP Photo/Ashwini Bhatia

Psychology's Biggest Question

1-2: What is psychology's historic big issue?

Psychology's biggest and most persistent issue has been the **nature-nurture issue**—*the controversy over the relative contributions of biology and experience to the development of our traits and behaviors:* Do our human traits develop through experience, or are we born with them?

nature-nurture issue the longstanding controversy over the relative contributions that genes and experience make to the development of psychological traits and behaviors. Today's science sees traits and behaviors arising from the interaction of nature and nurture.

The nature-nurture debate weaves a thread from the ancient Greeks' time to our own. Philosopher Plato (428–348 B.C.E.) assumed that character and intelligence are largely inherited and that certain ideas are inborn. Aristotle countered that there is nothing in the mind that does not first come in from the external world through the senses. Today's psychologists explore the issue by asking, for example:

- Are gender differences (the characteristics people associate with male and female) biologically predisposed or socially constructed?
- Is children's grammar mostly innate or formed by experience?
- How are differences in intelligence and personality influenced by heredity and by environment?
- Are sexual behaviors more "pushed" by inner biology or "pulled" by external incentives?
- Should we treat psychological disorders—depression, for example—as disorders of the brain, disorders of thought, or both?

A nature-made nature-nurture experiment Identical twins *(left)* share the same genes and, usually, the same environment. Fraternal twins *(right)* usually share the same environment but not the same genes. These differences make twins ideal participants in studies of hereditary and environmental influences on intelligence, personality, and other traits. Twin studies provide a rich array of findings—described throughout this book—that underscore the importance of both nature and nurture.

Mitch Diamond/Alamy

Gary Parker/Photo Researchers Inc.

Such debates continue. Yet over and over again we will see that in contemporary science the nature-nurture tension dissolves: *Nurture works on what nature endows.* Our species is biologically endowed with an enormous capacity to learn and adapt. Moreover, every psychological event (every thought, every emotion) is simultaneously a biological event. Thus, depression can be both a brain disorder and a thought disorder.

For more of the important developments in psychology's history, see the Timeline inside the front and back covers.

Psychology's Three Main Levels of Analysis

1-3: What are psychology's levels of analysis and related perspectives?

Each of us is a complex system that is part of a larger social system. But each of us is also composed of smaller systems, such as our nervous system and body organs, which are composed of still smaller systems—cells, molecules, and atoms.

These tiered systems suggest different **levels of analysis,** which offer complementary outlooks. It's like explaining why grizzly bears hibernate. Is it because hibernation helped their ancestors to survive and reproduce? Because their inner physiology drives them to do so? Because cold environments hinder food gathering during winter? Such perspectives are complementary because "everything is related to everything else" (Brewer, 1996). Together, different levels of analysis form an integrated **biopsychosocial approach,** which considers the influences of biological, psychological, and social-cultural factors (FIGURE 1.1).

levels of analysis the differing complementary views, from biological to psychological to social-cultural, for analyzing any given phenomenon.

biopsychosocial approach an integrated approach that incorporates biological, psychological, and social-cultural levels of analysis.

David Madison/Corbis

Views of anger How would each of psychology's perspectives explain what's going on here?

Each level provides a valuable vantage point for looking at behavior, yet each by itself is incomplete. Like different academic disciplines, psychology's varied perspectives ask different questions and have their own limits. One perspective may stress the biological, psychological, or social-cultural level more than another, but the different perspectives described in TABLE 1.1 on the next page complement one another. Consider, for example, how they shed light on anger.

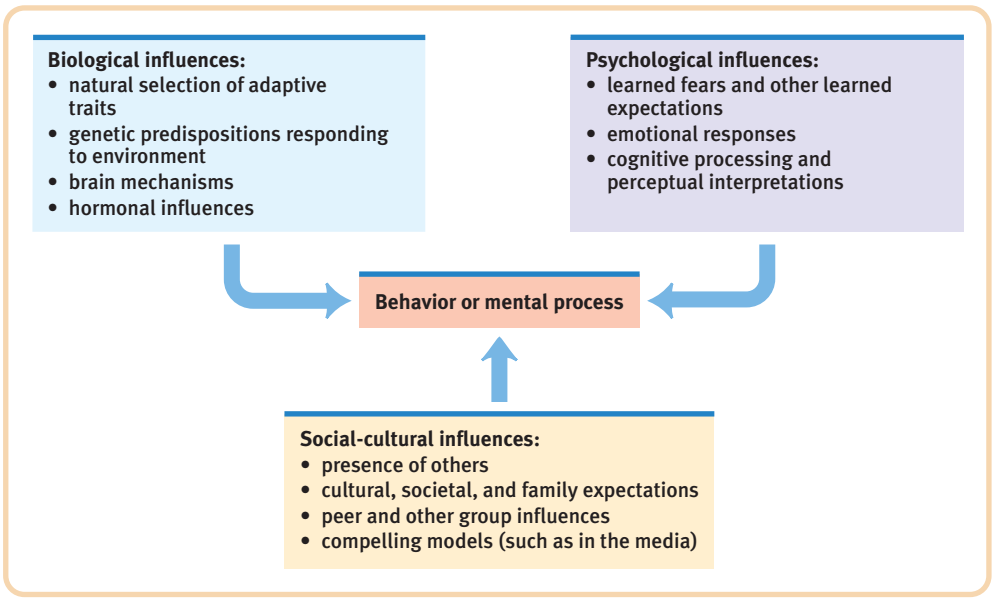


FIGURE 1.1 Biopsychosocial approach This integrated viewpoint incorporates various levels of analysis and offers a more complete picture of any given behavior or mental process.

TABLE 1.1 Psychology's Current Perspectives

Perspective	Focus	Sample Questions
Neuroscience	How the body and brain enable emotions, memories, and sensory experiences	How are messages transmitted within the body? How is blood chemistry linked with moods and motives?
Evolutionary	How the natural selection of traits promoted the survival of genes	How does evolution influence behavior tendencies?
Behavior genetics	How much our genes and our environment influence our individual differences	To what extent are psychological traits such as intelligence, personality, sexual orientation, and vulnerability to depression attributable to our genes? To our environment?
Psychodynamic	How behavior springs from unconscious drives and conflicts	How can someone's personality traits and disorders be explained in terms of sexual and aggressive drives or as the disguised effects of unfulfilled wishes and childhood traumas?
Behavioral	How we learn observable responses	How do we learn to fear particular objects or situations? What is the most effective way to alter our behavior, say, to lose weight or stop smoking?
Cognitive	How we encode, process, store, and retrieve information	How do we use information in remembering? Reasoning? Solving problems?
Social-cultural	How behavior and thinking vary across situations and cultures	How are we humans alike as members of one human family? As products of different environmental contexts, how do we differ?

- Someone working from a *neuroscience perspective* might study brain circuits that cause us to be "red in the face" and "hot under the collar."
- Someone working from the *evolutionary perspective* might analyze how anger facilitated the survival of our ancestors' genes.
- Someone working from the *behavior genetics perspective* might study how heredity and experience influence our individual differences in temperament.
- Someone working from the *psychodynamic perspective* might view an outburst as an outlet for unconscious hostility.
- Someone working from the *behavioral perspective* might attempt to determine which external stimuli trigger angry responses or aggressive acts.
- Someone working from the *cognitive perspective* might study how our interpretation of a situation affects our anger and how our anger affects our thinking.
- Someone working from the *social-cultural perspective* might explore how expressions of anger vary across cultural contexts.

The point to remember: Like two-dimensional views of a three-dimensional object, each of psychology's perspectives is helpful. But each by itself fails to reveal the whole picture.

So bear in mind psychology's limits. Don't expect it to answer the ultimate questions, such as those posed by Russian novelist Leo Tolstoy (1904): "Why should I live? Why should I do anything? Is there in life any purpose which the inevitable death that awaits me does not undo and destroy?" Instead, expect that psychology will help you understand why people think, feel, and act as they do. Then you should find the study of psychology fascinating and useful.

"I'm a social scientist, Michael. That means I can't explain electricity or anything like that, but if you ever want to know about people I'm your man."

Psychology's Subfields

1-4: What are some of psychology's subfields?

Picturing a chemist at work, you probably envision a white-coated scientist surrounded by glassware and high-tech equipment. Picture a psychologist at work, and you would be right to envision

- a white-coated scientist probing a rat's brain.
- an intelligence researcher measuring how quickly an infant shows boredom by looking away from a familiar picture.
- an executive evaluating a new "healthy life-styles" training program for employees.

- someone at a computer keyboard analyzing data on whether adopted teens' temperaments more closely resemble those of their adoptive parents or their biological parents.
- a therapist listening carefully to a client's depressed thoughts.
- a traveler visiting another culture and collecting data on variations in human values and behaviors.
- a teacher or writer sharing the joy of psychology with others.

The cluster of subfields we call psychology is a meeting ground for different disciplines. Thus, it's a perfect home for those with wide-ranging interests. In their diverse activities, from biological experimentation to cultural comparisons, the tribe of psychology is united by a common quest: describing and explaining behavior and the mind underlying it.

Some psychologists conduct **basic research** that builds psychology's knowledge base. In the pages that follow we will meet a wide variety of such researchers, including *biological psychologists* exploring the links between brain and mind; *developmental psychologists* studying our changing abilities from womb to tomb; *cognitive psychologists* experimenting with how we perceive, think, and solve problems; and *social psychologists* exploring how we view and affect one another.

These and other psychologists also may conduct **applied research** that tackles practical problems. *Industrial-organizational psychologists,* for example, use psychology's concepts and methods in the workplace to help organizations and companies select and train employees, boost morale and productivity, design products, and implement systems.

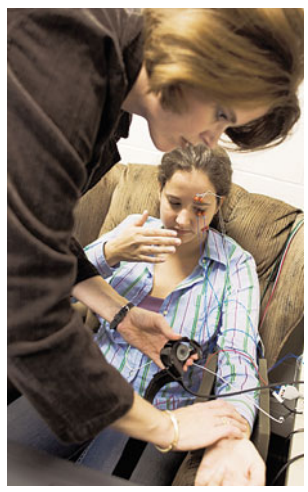
Although most psychology textbooks focus on psychological science, psychology is also a helping profession devoted to such practical issues as how to have a happy marriage, how to overcome anxiety or depression, and how to raise thriving children. As a science, psychology at its best bases such interventions on *evidence of effectiveness*. **Counseling psychologists** help people to cope with challenges and crises (including academic, vocational, and marital issues) and to improve their

Laura Dwight

I see you! A biological psychologist might view this child's delighted response as evidence of brain maturation. A cognitive psychologist might see it as a demonstration of the baby's growing knowledge of his surroundings. For a cross-cultural psychologist, the role of grandparents in different societies might be the issue of interest. As you will see throughout this book, these and other perspectives offer complementary views of behavior.

Michael Newman/Photo Edit

Scott J. Ferrell/Congressional Quarterly/Getty Images



©2007 John Kish IV

Psychology: A science and a profession Psychologists experiment with, observe, test, and treat behavior. Here we see psychologists testing a child, measuring emotion-related physiology, and doing face-to-face therapy.

basic research pure science that aims to increase the scientific knowledge base.

applied research scientific study that aims to solve practical problems.

counseling psychology a branch of psychology that assists people with problems in living (often related to school, work, or marriage) and in achieving greater well-being.

personal and social functioning. **Clinical psychologists** assess and treat mental, emotional, and behavior disorders (APA, 2003). Both counseling and clinical psychologists administer and interpret tests, provide counseling and therapy, and sometimes conduct basic and applied research. By contrast, **psychiatrists,** who also often provide psychotherapy, are medical doctors licensed to prescribe drugs and otherwise treat physical causes of psychological disorders. (Some clinical psychologists have lobbied for a similar right to prescribe mental-health–related drugs, and in 2002 and 2004 New Mexico and Louisiana became the first states to grant that right to specially trained and licensed psychologists.)

Want to learn more? See Appendix C, Careers in Psychology, at the end of this book for more information about psychology's subfields and to learn about the many interesting options available to those with bachelor's, master's, and doctoral degrees in psychology.

With perspectives ranging from the biological to the social, and with settings from the laboratory to the clinic, psychologists teach in medical schools, law schools, and theological seminaries, and they work in hospitals, factories, and corporate offices. They engage in interdisciplinary studies, such as psychohistory (the psychological analysis of historical characters), psycholinguistics (the study of language and thinking), and psychoceramics (the study of crackpots).[2]

Psychology also influences modern culture. Knowledge transforms us. Learning about the solar system and the germ theory of disease alters the way people think and act. Learning psychology's findings also changes people: They less often judge psychological disorders as moral failings, treatable by punishment and ostracism. They less often regard and treat women as men's mental inferiors. They less often view and rear children as ignorant, willful beasts in need of taming. "In each case," noted Morton Hunt (1990, p. 206), "knowledge has modified attitudes, and, through them, behavior." Once aware of psychology's well-researched ideas—about how body and mind connect, how a child's mind grows, how we construct our perceptions, how we remember (and misremember) our experiences, how people across the world differ (and are alike)—your mind may never again be quite the same.

"Once expanded to the dimensions of a larger idea, [the mind] never returns to its original size."
—Oliver Wendell Holmes, 1809–1894

Tips for Studying Psychology

1-5: How can psychological principles help you as a student?

The investment you are making in studying psychology should enrich your life and enlarge your vision. Although many of life's significant questions are beyond psychology, some very important ones are illuminated by even a first psychology course. Through painstaking research, psychologists have gained insights into brain and mind, dreams and memories, depression and joy. Even the unanswered questions can enrich us, by renewing our sense of mystery about "things too wonderful" for us yet to understand. Your study of psychology can also help teach you *how to ask and answer important questions*—how to think critically as you evaluate competing ideas and claims.

Having your life enriched and your vision enlarged (and getting a decent grade) requires effective study. To master information, you must *actively process it*. Your mind is not like your stomach, something to be filled passively; it is more like a muscle that grows stronger with exercise. Countless experiments reveal that people learn and remember best when they put material in their own words, rehearse it, and then review and rehearse it again.

The **SQ3R** study method incorporates these principles (Robinson, 1970). SQ3R is an acronym for its five steps: *S*urvey, *Q*uestion, *R*ead, *R*ehearse, *R*eview.

- To study a module, first *survey*, taking a bird's-eye view. Scan its headings, and notice how the module is organized.
- As you prepare to read each section, use its heading or numbered Preview Question to form your own *question* to answer as you read. For this section, you might have asked, "How can I most effectively and efficiently master the information in this book?"

[2] Confession: I wrote the last part of this sentence on April Fools' Day.

- Then *read,* actively searching for the answer to your question. At each sitting, read only as much as you can absorb without tiring. Usually a single module will do. Read actively and critically. Ask questions. Take notes. Consider implications: How does what you've read relate to your own life? Does it support or challenge your assumptions? How convincing is the evidence?
- Having read a section, *rehearse* in your own words what you have read. Test yourself by trying to answer your question, rehearsing what you can recall, then glancing back over what you can't recall.
- Finally, *review:* Read over any notes you have taken, again with an eye on the module's organization, and quickly review the whole module.

Survey, question, read, rehearse, review. I have organized this book to facilitate your use of the SQ3R study system. Each module begins with an outline that aids your *survey*. Headings and numbered *Preview Questions* suggest issues and concepts you should consider as you *read*. The material is organized into sections of readable length. At the end of each module, there are *Rehearse It!* questions and *Test for Success* exercises that help you test and *rehearse* what you've learned before moving on. The answers to these questions help you *review* the module's essentials, and the list of key terms helps you check your mastery of important concepts. Survey, question, read . . .

Five additional study tips may further boost your learning:

Distribute your study time. One of psychology's oldest findings is that *spaced practice*—perhaps one hour a day, six days a week—promotes better retention than *massed practice*—cramming it into one long study blitz. For example, rather than trying to read several modules in a single sitting, read just one and then turn to something else.

Spacing your study sessions requires a disciplined approach to managing your time. (Richard O. Straub explains time management in the helpful *Study Guide* that accompanies this text.)

Learn to think critically. Whether you are reading or in class, note people's *assumptions* and *values*. What perspective or bias underlies an argument? *Evaluate evidence*. Is it anecdotal or based on scientific experiment? *Assess conclusions*. Are there alternative explanations? (Use the Test for Success: Critical Thinking Exercises at the end of each module to build your critical thinking skills as you check your understanding of the module's main concepts.)

In class, listen actively. Listen for the main ideas and subideas of a lecture. *Write them down.* Ask questions during and after class. In class, as in your private study, process the information actively and you will understand and retain it better. As psychologist William James urged a century ago, *"No reception without reaction, no impression without . . . expression."*

Overlearn. We are prone to overestimating how much we know. You may understand a module as you read it, but by devoting extra study time to testing yourself and reviewing what you think you know, you will retain your new knowledge long into the future.

Be a smart test-taker. If a test contains both multiple-choice questions and an essay question, turn first to the essay. Read the question carefully, noting exactly what the instructor is asking. On the back of a page, pencil in a list of points you'd like to make and then organize them. Before writing, put aside the essay and work through the multiple-choice questions. (As you do so, your mind may continue to mull over the essay question. Sometimes the objective questions will bring pertinent thoughts to mind.) Then reread the essay question, rethink your answer, and start writing. When you finish, proofread your answer to eliminate spelling and grammatical errors that make you look less competent than you are. When reading multiple-choice questions, don't confuse yourself by trying to imagine how each choice might be the right one. Instead, try to answer each question as if it were a fill-in-the-blank question. First cover the answers and form a sentence in your mind, recalling what you know to complete the sentence. Then read the answers on the test and find the alternative that best matches your own answer.

clinical psychology a branch of psychology that studies, assesses, and treats people with psychological disorders.

psychiatry a branch of medicine dealing with psychological disorders; practiced by physicians who sometimes provide medical (for example, drug) treatments as well as psychological therapy.

SQ3R a study method incorporating five steps: *S*urvey, *Q*uestion, *R*ead, *R*ehearse, *R*eview.

While exploring psychology, you will learn much more than effective study techniques. Psychology deepens our appreciation for how we humans perceive, think, feel, and act. By so doing it can indeed enrich our lives and enlarge our vision. Through this book I hope to help guide you toward that end. As educator Charles Eliot said a century ago: "Books are the quietest and most constant of friends, and the most patient of teachers."

REVIEWING

The History and Scope of Psychology

Module Review

1-1: What are some important milestones in the development of the science of psychology? Psychological science's first laboratory appeared in 1879, launched by Wilhelm Wundt and his students. The field's early scholars came from several disciplines and many countries.

Psychology began as a "science of mental life." In the 1920s, under the influence of the *behaviorists*, it evolved into the "scientific study of observable behavior." Since the cognitive revolution in the 1960s, psychology has been widely defined as the "science of behavior and mental processes."

1-2: What is psychology's historic big issue? Psychology's biggest and most enduring concern has been the *nature-nurture issue*, the controversy over the relative contributions of the influences of genes and experience. Today's science emphasizes the interaction of genes and experiences in specific environments.

1-3: What are psychology's levels of analysis and related perspectives? The *biopsychosocial approach* integrates information from the biological, psychological, and social-cultural *levels of analysis*. Psychologists study human behaviors and mental processes from many different perspectives (including the neuroscience, evolutionary, behavior genetics, psychodynamic, behavioral, cognitive, and social-cultural).

1-4: What are some of psychology's subfields? Some psychologists specialize in *basic research* (often in the subfields of biological, developmental, cognitive, personality, and social psychology). Others, for example, industrial-organizational psychologists, do *applied research*. *Counseling psychologists* and *clinical psychologists* practice psychology as a helping profession. Clinical psychologists study, assess, and treat (with psychotherapy) people with psychological disorders. *Psychiatrists* also study, assess, and treat people with disorders, but as medical doctors, they may prescribe drugs in addition to psychotherapy.

1-5: How can psychological principles help you as a student? Research has shown that learning and memory are enhanced by active study. The *SQ3R* study method—survey, question, read, rehearse, and review—applies the principles derived from this research.

Rehearse It!

You can use these Rehearse It! questions to gauge whether you are ready for the next module.

1. In 1879, in psychology's first experiment, _____ and his students measured the time lag between hearing a ball hit a platform and pressing a key.
   a. Jean Piaget
   b. William James
   c. Sigmund Freud
   d. Wilhelm Wundt

2. A prominent psychology text was published in 1890. Its author was
   a. Wilhelm Wundt.
   b. Mary Whiton Calkins.
   c. Carl Rogers.
   d. William James.

3. In the early twentieth century, _____ redefined *psychology* as "the science of observable behavior."
   a. John B. Watson
   b. Abraham Maslow
   c. William James
   d. Sigmund Freud

4. In the history of psychology, a major topic has been the relative influence of nature and nurture. Nature is to nurture as
   a. personality is to intelligence.
   b. biology is to experience.
   c. intelligence is to biology.
   d. psychological traits are to behaviors.

5. The perspective in psychology that focuses on how behavior and thought differ from situation to situation and from culture to culture is the _____ perspective.
   a. cognitive
   b. behavioral
   c. social-cultural
   d. neuroscience

6. A psychologist using the behavioral perspective would be most likely to study
   a. the effect of school uniforms on classroom behaviors.
   b. the hidden meaning in children's themes and drawings.
   c. the age at which children can learn algebra.
   d. whether certain mathematical abilities appear to be inherited.

7. A psychologist treating emotionally troubled adolescents at a local mental health agency is most likely to be a(n)
   a. research psychologist.
   b. psychiatrist.
   c. industrial-organizational psychologist.
   d. clinical psychologist.

8. A psychologist conducting basic research to expand psychology's knowledge base would be most likely to
   a. design a computer screen with limited glare and assess the effect on computer operators' eyes after a day's work.
   b. treat older people who are overcome by depression.
   c. observe 3- and 6-year-olds solving puzzles and analyze differences in their abilities.
   d. interview children with behavioral problems and suggest treatments.

Answers: 1. d, 2. d, 3. a, 4. b, 5. c, 6. a, 7. d, 8. c.

Terms and Concepts to Remember

behaviorism, p. 5
humanistic psychology, p. 5
cognitive neuroscience, p. 5
psychology, p. 5
nature-nurture issue, p. 6
levels of analysis, p. 7
biopsychosocial approach, p. 7
basic research, p. 9
applied research, p. 9
counseling psychology, p. 9
clinical psychology, p. 10
psychiatry, p. 10
SQ3R, p. 10

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. "Nurture works on what nature endows." Describe what this means, using your own words.

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

2

Research Strategies: How Psychologists Ask and Answer Questions

Although in some ways we outsmart the smartest computers, our intuition often goes awry. To err is human. Enter psychological science. With its procedures for gathering and sifting evidence, science restrains error. As we familiarize ourselves with its strategies and incorporate its underlying principles into our daily thinking, we can think smarter. Psychologists use the science of behavior and mental processes to better understand why people think, feel, and act as they do.

Thinking Critically With Psychological Science

What About Intuition and Common Sense?

2-1: Why are the answers that flow from the scientific approach more reliable than those based on intuition and common sense?

Some people suppose that psychology merely documents and dresses in jargon what people already know: "So what else is new—you get paid for using fancy methods to prove what my grandmother knew?"

Others place their faith in human intuition. Former President George W. Bush described the feeling to Bob Woodward (2002) in explaining his decision to launch the Iraq war: "I'm a gut player. I rely on my instincts." Today's psychological science does document a vast intuitive mind. As we will see throughout this text, our thinking, memory, and attitudes operate on two levels—conscious and unconscious—with the larger part operating automatically, off screen. Like jumbo jets, we fly mostly on autopilot. So, should we, like former President Bush, listen to the whispers of our inner wisdom and trust "the force within"? Or should we more often be subjecting our intuitive hunches to skeptical scrutiny?

This much seems certain. Intuition is important, but we often underestimate its perils. My geographical intuition tells me that Reno is east of Los Angeles, that Rome is south of New York, that Atlanta is east of Detroit. But I am wrong, wrong, and wrong. As Madeleine L'Engle observed, "The naked intellect is an extraordinarily inaccurate instrument" (1972). Two phenomena—*hindsight bias* and *judgmental overconfidence*—illustrate why we cannot rely solely on intuition and common sense.

Chris Ryan/Op Images/Getty Images

The limits of intuition Personnel interviewers tend to be overconfident of their gut feelings about job applicants. Their confidence stems partly from their recalling cases where their favorable impression proved right, and partly from their ignorance about rejected applicants who succeeded elsewhere.

"He who trusts in his own heart is a fool."

—Proverbs 28:26

"Life is lived forward, but understood backward."

—Philosopher Søren Kierkegaard, 1813–1855

"Anything seems commonplace, once explained."

—Dr. Watson to Sherlock Holmes

Did We Know It All Along? Hindsight Bias

How easy it is to seem astute when drawing the bull's eye after the arrow has struck. After the U.S. occupation of Iraq led to a bloody civil war rather than a peaceful democracy, commentators saw the result as inevitable. *Before* the invasion was launched, these results seemed anything but obvious: In voting to allow the Iraq invasion, most U.S. senators did not anticipate the chaos that would seem so predictable in hindsight. Finding that something has happened makes it seem inevitable, a tendency we call **hindsight bias** (also known as the *I-knew-it-all-along phenomenon*). Hindsight bias is widespread. Some 100 studies have observed it in various countries and among both children and adults (Balmut et al., 2007).

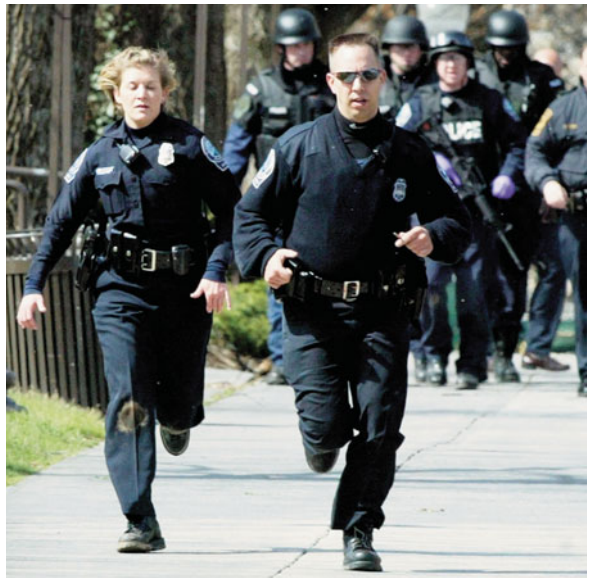
The phenomenon is easy to demonstrate: Give half the members of a group some purported psychological finding, and give the other half an opposite result. Tell the first group, "Psychologists have found that separation weakens romantic attraction. As the saying goes, 'Out of sight, out of mind.'" Ask them to imagine why this might be true. Most people can, and nearly all will then regard this true finding as unsurprising.

Tell the second group the opposite, "Psychologists have found that separation strengthens romantic attraction. As the saying goes, 'Absence makes the heart grow fonder.'" People given this untrue result can also easily imagine it, and they overwhelmingly see it as unsurprising common sense. Obviously, when both a supposed finding and its opposite seem like common sense, there is a problem.

Such errors in our recollections and explanations show why we need psychological research. Just asking people how and why they felt or acted as they did can sometimes be misleading—*not* because common sense is usually wrong, but because common sense more easily describes what *has* happened than what *will* happen. As physicist Neils Bohr reportedly said, "Prediction is very difficult, especially about the future."

Nevertheless, Grandma's intuition is often right. As Yogi Berra once said, "You can observe a lot by watching." (We have Berra to thank for other gems, such as "Nobody ever comes here—it's too crowded.") Because we're all behavior watchers, it would be surprising if many of psychology's findings had *not* been foreseen. Indeed, note Daniel Gilbert, Brett Pelham, and Douglas Krull (2003), "good ideas in psychology usually have an oddly familiar quality, and the moment we encounter them we feel certain that we once came close to thinking the same thing ourselves and simply failed to write it down." Good ideas are like good inventions; once created, they seem obvious. (Why did it take so long for someone to invent suitcases on wheels and Post-it Notes?)

But sometimes Grandma's intuition, informed by countless casual observations, has it wrong. In later modules we will see how research has overturned popular ideas—that familiarity breeds contempt, that dreams predict the future, and that most of us use only 10 percent of our brain. We will also see how research has surprised us with discoveries about how the brain's chemical messengers control our moods and memories, about other animals' abilities, and about the effects of stress on our capacity to fight disease.



AP Photo/*The Roanoke Times*, Matt Gentry

Hindsight bias *After* the 2007 Virginia Tech massacre of 32 people, it seemed obvious that school officials should have locked down the school (despite its having the population of a small city) after the first two people were murdered. With 20/20 hindsight, everything seems obvious.

hindsight bias the tendency to believe, after learning an outcome, that we would have foreseen it. (Also known as the *I-knew-it-all-along phenomenon.*)

Overconfidence

We humans tend to think we know more than we do. Asked how sure we are of our answers to factual questions (Is Boston north or south of Paris?), we tend to be more confident than correct.[3] Or consider these three anagrams, which Richard Goranson (1978) asked people to unscramble:

WREAT → WATER
ETRYN → ENTRY
GRABE → BARGE

About how many seconds do you think it would have taken you to unscramble each of these? Did hindsight influence you? Knowing the answers tends to make us overconfident—surely the solution would take only 10 seconds or so. In reality, the average problem solver spends 3 minutes, as you also might, given a similar anagram without a solution: OCHSA. (See the solution at right.)

Fun anagram solutions from Wordsmith.org:
Elvis = lives
Dormitory = dirty room
Slot machines = cash lost in 'em

"We don't like their sound. Groups of guitars are on their way out."

—Decca Records, in turning down a recording contract with the Beatles in 1962

Solution to OCHSA anagram: CHAOS.

"They couldn't hit an elephant at this distance."

—General John Sedgwick just before being killed during a U.S. Civil War battle, 1864

Are we any better at predicting our social behavior? To find out, Robert Vallone and his associates (1990) had students predict at the beginning of the school year whether they would drop a course, vote in an upcoming election, call their parents more than twice a month, and so forth. On average, the students felt 84 percent confident in making these self-predictions. Later quizzes about their actual behavior showed their predictions were only 71 percent correct. Even when students were 100 percent sure of themselves, their self-predictions erred 15 percent of the time.

The point to remember: Hindsight bias and overconfidence often lead us to overestimate our intuition. But scientific inquiry can help us sift reality from illusion.

[3] Boston is south of Paris.

The Scientific Attitude

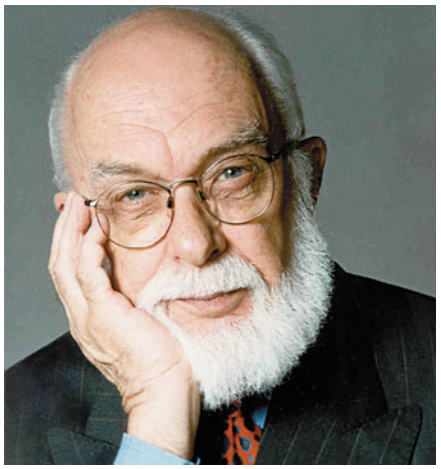
2-2: What attitudes characterize scientific inquiry, and what does it mean to think critically?

"The scientist . . . must be free to ask any question, to doubt any assertion, to seek for any evidence, to correct any errors."

—Physicist J. Robert Oppenheimer, *Life,* October 10, 1949

Underlying all science is, first, a hard-headed *curiosity,* a passion to explore and understand without misleading or being misled. Some questions *(Is there life after death?)* are beyond science. To answer them in any way requires a leap of faith. With many other ideas *(Can some people demonstrate ESP?),* the proof is in the pudding. No matter how sensible or crazy an idea sounds, scientists ask, "*Does it work?*" When put to the test, can its predictions be confirmed?

This scientific approach has a long history. As ancient a figure as Moses used such an approach. How do you evaluate a self-proclaimed prophet? His answer: Put the prophet to the test. If the predicted event "does not take place or prove true," then so much the worse for the prophet (Deuteronomy 18:22). By letting the facts speak for themselves, Moses was using what we now call an *empirical approach.* Magician James Randi uses this approach when testing those claiming to see auras around people's bodies:



Courtesy of the James Randi Education Foundation

The Amazing Randi The magician James Randi exemplifies skepticism. He has tested and debunked a variety of psychic phenomena.

> ***Randi:*** *Do you see an aura around my head?*
> ***Aura-seer:*** *Yes, indeed.*
> ***Randi:*** *Can you still see the aura if I put this magazine in front of my face?*
> ***Aura-seer:*** *Of course.*
> ***Randi:*** *Then if I were to step behind a wall barely taller than I am, you could determine my location from the aura visible above my head, right?*

Randi once told me that no aura-seer he asked would agree to take this simple test.

When subjected to such scrutiny, crazy-sounding ideas sometimes find support. More often, science becomes society's garbage disposal by sending crazy-sounding ideas to the waste heap, atop previous claims of perpetual motion machines, miracle cancer cures, and out-of-body travels into centuries past. Today's presumed "truths" sometimes become tomorrow's fallacies. To sift reality from fantasy, sense from nonsense, therefore requires a scientific attitude: being skeptical but not cynical, open but not gullible.

"A skeptic is one who is willing to question any truth claim, asking for clarity in definition, consistency in logic, and adequacy of evidence."

—Philosopher Paul Kurtz, *The Skeptical Inquirer,* 1994

"To believe with certainty," says a Polish proverb, "we must begin by doubting." As scientists, psychologists approach the world of behavior with a *curious skepticism,* persistently asking two questions: *What do you mean? How do you know?*

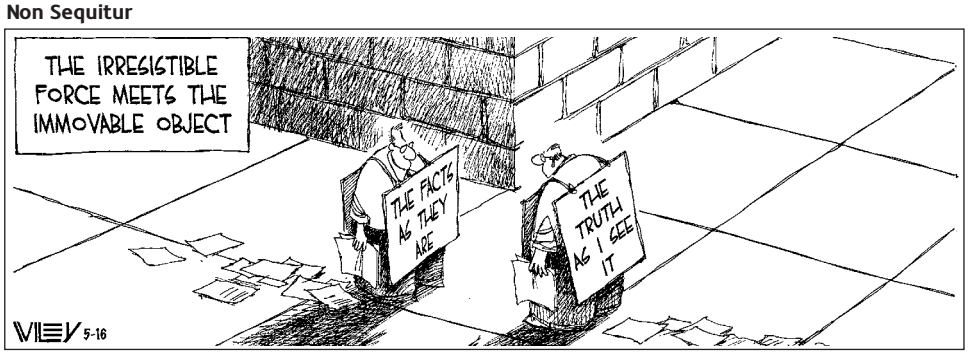
Putting a scientific attitude into practice requires not only curiosity and skepticism but also *humility*—an awareness of our own vulnerability to error and an openness to surprises and new perspectives. In the last analysis, what matters is not my opinion or yours, but the truths nature reveals in response to our questioning. If people or other animals don't behave as our ideas predict, then so much the worse for our ideas. This humble attitude was expressed in one of psychology's early mottos: "The rat is always right."

"My deeply held belief is that if a god anything like the traditional sort exists, our curiosity and intelligence are provided by such a god. We would be unappreciative of those gifts . . . if we suppressed our passion to explore the universe and ourselves."

—Carl Sagan, *Broca's Brain,* 1979

Historians of science tell us that these three attitudes—curiosity, skepticism, and humility—helped make modern science possible. Many of its founders, including Copernicus and Newton, were people whose religious convictions made them humble before nature and skeptical of mere human authority (Hooykaas, 1972; Merton, 1938). Some deeply religious people today may view science, including psychological science, as a threat. Yet, notes sociologist Rodney Stark (2003a,b), the scientific revolution was led mostly by deeply religious people acting on the idea that "in order to love and honor God, it is necessary to fully appreciate the wonders of his handiwork."

Non Sequitur



Of course, scientists, like anyone else, can have big egos and may cling to their preconceptions. We all view nature through the spectacles of our preconceived ideas. Nevertheless, the ideal that unifies psychologists with all scientists is the curious, skeptical, humble scrutiny of competing ideas. As a community, scientists check and recheck one another's findings and conclusions.

"The real purpose of the scientific method is to make sure Nature hasn't misled you into thinking you know something you don't actually know."

—Robert M. Pirsig, *Zen and the Art of Motorcycle Maintenance,* 1974

Critical Thinking

The scientific attitude prepares us to think smarter. Smart thinking, called **critical thinking,** examines assumptions, discerns hidden values, evaluates evidence, and assesses conclusions. Whether reading a news report or listening to a conversation, critical thinkers ask questions. They wonder, How do they know that? What is this person's agenda? Is the conclusion based on anecdote and gut feelings, or on evidence? Does the evidence justify a cause-effect conclusion? What alternative explanations are possible?

Has psychology's critical inquiry been open to surprising findings? The answer, as ensuing modules illustrate, is plainly *yes.* Believe it or not . . .

- massive losses of brain tissue early in life may have minimal long-term effects.
- within days, newborns can recognize their mother's odor and voice.
- brain damage can leave a person able to learn new skills yet unaware of such learning.
- electroconvulsive therapy (delivering an electric shock to the brain) is often a very effective treatment for severe depression.

And has critical inquiry convincingly debunked popular presumptions? The answer, as ensuing modules also illustrate, is again *yes.* The evidence indicates that . . .

- sleepwalkers are *not* acting out their dreams.
- our past experiences are *not* all recorded verbatim in our brains.
- most people do *not* suffer from unrealistically low self-esteem, and high self-esteem is not all good.
- opposites do *not* generally attract.

In each of these instances and more, what has been learned is not what is widely believed.

The Scientific Method

Psychologists arm their scientific attitude with the scientific method. In its attempt to describe and explain human nature, psychological science welcomes competing ideas and plausible-sounding theories. And it puts them to the test, with careful observation and rigorous analysis. If a theory works—if the data support its predictions—so much the better for that theory. If the predictions fail, the theory will be revised or rejected.

critical thinking thinking that does not blindly accept arguments and conclusions. Rather, it examines assumptions, discerns hidden values, evaluates evidence, and assesses conclusions.

theory an explanation using an integrated set of principles that organizes observations and predicts behaviors or events.

hypothesis a testable prediction, often implied by a theory.

operational definition a statement of the procedures (operations) used to define research variables. For example, *human intelligence* may be operationally defined as "what an intelligence test measures."

replication repeating the essence of a research study, usually with different participants in different situations, to see whether the basic finding extends to other participants and circumstances.

case study an observation technique in which one person is studied in depth in the hope of revealing universal principles.

Constructing Theories

2-3: How do psychologists use the scientific method to construct theories?

In everyday conversation, we often use *theory* to mean "mere hunch." In science, however, *theory* is linked with *observation*. A scientific **theory** *explains* through an integrated set of principles that *organizes* observations and *predicts* behaviors or events. By organizing isolated facts, a theory simplifies. There are too many facts about behavior to remember them all. By linking facts and bridging them to deeper principles, a theory offers a useful summary. As we connect the observed dots, a coherent picture emerges.

A good theory of depression, for example, helps us organize countless depression-related observations into a short list of principles. Imagine that we observe over and over that people with depression describe their past, present, and future in gloomy terms. We might therefore theorize that at the heart of depression lies low self-esteem. So far so good: Our self-esteem principle neatly summarizes a long list of facts about people with depression.

Yet no matter how reasonable a theory may sound—and low self-esteem seems a reasonable explanation of depression—we must put it to the test. A good theory produces testable predictions, called **hypotheses.** By enabling us to test and to reject or revise the theory, such predictions give direction to research. They specify what results would support the theory and what results would disconfirm it. To test our self-esteem theory of depression, we might assess people's self-esteem by having them respond to statements such as "I have good ideas" and "I am fun to be with." Then we could see whether, as we hypothesized, people who report poorer self-images also score higher on a depression scale (**FIGURE 2.1**).

In testing our theory, we should be aware that it can bias our observations: We may see what we expect. Having theorized that depression springs from low self-esteem, we may perceive depressed people's neutral comments as self-disparaging. The urge to see what we expect is an ever-present temptation, in the laboratory and outside of it. According to the bipartisan U.S. Senate Select Committee on Intelligence (2004), preconceived expectations that Iraq had weapons of mass destruction led intelligence analysts to wrongly interpret ambiguous observations as confirming that theory, and this theory-driven conclusion then led to the preemptive U.S. invasion of Iraq.

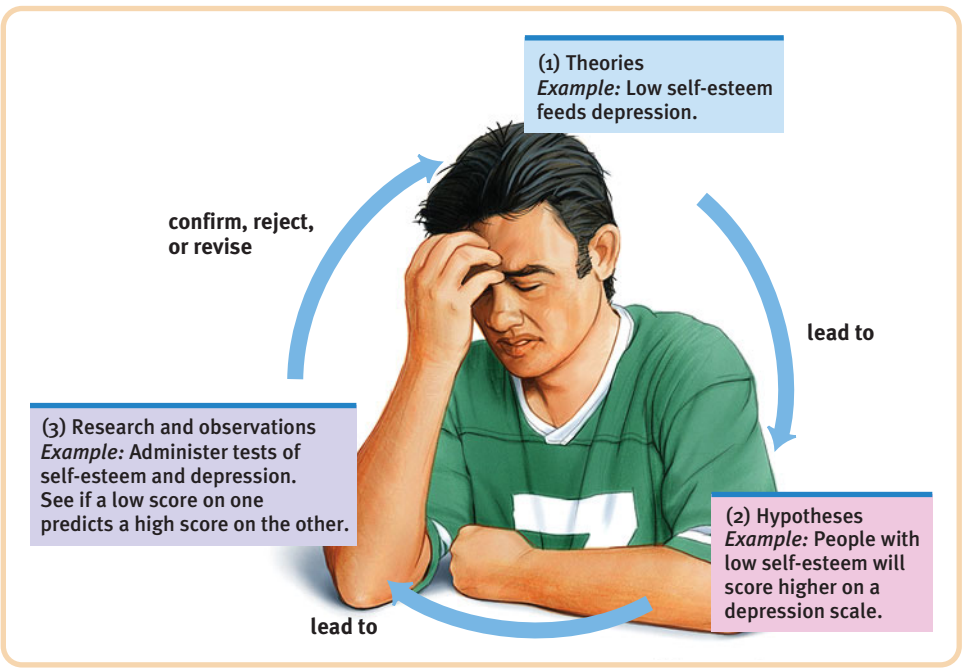


FIGURE 2.1 The scientific method A self-correcting process for asking questions and observing nature's answers.

As a check on their biases, psychologists report their research with precise **operational definitions** of procedures and concepts. *Hunger*, for example, might be defined as "hours without eating," *generosity* as "money contributed." Using these carefully worded statements, other researchers can **replicate** (repeat) the original observations with different participants, materials, and circumstances. If they get similar results, confidence in the finding's reliability grows. The first study of hindsight bias aroused psychologists' curiosity. Now, after many successful replications with differing people and questions, we feel sure of the phenomenon's power.

In the end, our theory will be useful if it (1) effectively *organizes* a range of self-reports and observations, and (2) implies clear *predictions* that anyone can use to check the theory or to derive practical applications. (If we boost people's self-esteem, will their depression lift?) Eventually, our research will probably lead to a revised theory that better organizes and predicts what we know about depression.

Good theories explain by
1. *organizing and linking observed facts.*
2. *implying hypotheses that offer testable predictions and, sometimes, practical applications.*

As we will see next, we can test our hypotheses and refine our theories using *descriptive* methods (which describe behaviors, often using case studies, surveys, or naturalistic observations), *correlational* methods (which associate different factors), and *experimental* methods (which manipulate factors to discover their effects). To think critically about popular psychology claims, we need to recognize these methods and know what conclusions they allow.

Description

2-4: How do psychologists observe and describe behavior?

The starting point of any science is description. In everyday life, all of us observe and describe people, often drawing conclusions about why they behave as they do. Professional psychologists do much the same, though more objectively and systematically.

The Case Study

Among the oldest research methods, the **case study** examines one individual in depth in the hope of revealing things true of us all. Much of our early knowledge about the brain, for example, came from case studies of individuals who suffered a particular impairment after damage to a certain brain region. Intensive case studies can be very revealing. They show us what *can* happen, and they often suggest directions for further study.

But sometimes individual cases may mislead us. If the individual being studied is atypical, the unrepresentative information can lead to mistaken judgments and false conclusions. Indeed, anytime a researcher mentions a finding ("Smokers die younger: 95 percent of men over 85 are nonsmokers") someone is sure to offer a contradictory anecdote ("Well, I have an uncle who smoked two packs a day and lived to be 89"). Dramatic stories and personal experiences (even psychological

"Given a thimbleful of [dramatic] facts we rush to make generalizations as large as a tub."

—Psychologist Gordon Allport, *The Nature of Prejudice,* 1954

Susan Kuklin/Photo Researchers

The case of the conversational chimpanzee In case studies of chimpanzees, psychologists have asked whether language is uniquely human. Here Nim Chimpsky signs *hug* as his trainer, psychologist Herbert Terrace, shows him the puppet Ernie. But is Nim really using language? Animal language researchers continue to debate that issue.

survey a technique for ascertaining the self-reported attitudes or behaviors of a particular group, usually by questioning a representative, random sample of the group.

population all the cases in a group being studied, from which samples may be drawn. (*Note:* Except for national studies, this does *not* refer to a country's whole population.)

random sample a sample that fairly represents a population because each member has an equal chance of inclusion.

naturalistic observation observing and recording behavior in naturally occurring situations without trying to manipulate and control the situation.

case examples) command our attention, and they are easily remembered. Which of the following do you find more memorable? (1) "In one study of 1300 dream reports concerning a kidnapped child, only 5 percent correctly envisioned the child as dead (Murray & Wheeler, 1937)." (2) "My friend dreamed his sister was in a car accident, and two days later she died in a head-on collision!" Numbers can be numbing, but the plural of *anecdote* is not *evidence*.

The point to remember: Individual cases can suggest fruitful ideas. What's true of all of us can be glimpsed in any one of us. But to discern the general truths that cover individual cases, we must answer questions with other research methods.

The Survey

The **survey** method looks at many cases in less depth. A survey asks people to report their behavior or opinions. Questions about everything from sexual practices to political opinions are put to the public. Harris and Gallup polls have revealed that 89 percent of Americans favor equal job opportunities for homosexual people, that 96 percent would like to change something about their appearance, and in late 2008, that 80 percent said the faltering economy was a significant source of stress. In Britain, seven in ten 18- to 29-year-olds support gay marriage; among those over 50, about the same percentage oppose it (a generation gap found in many Western countries). But asking questions is tricky, and the answers often depend on the ways questions are worded and respondents are chosen.

"How would you like me to answer that question? As a member of my ethnic group, educational class, income group, or religious category?"

WORDING EFFECTS Even subtle changes in the order or wording of questions can have major effects. Should cigarette ads or pornography be allowed on television? People are much more likely to approve "not allowing" such things than "forbidding" or "censoring" them. In one national survey, only 27 percent of Americans approved of "government censorship" of media sex and violence, though 66 percent approved of "more restrictions on what is shown on television" (Lacayo, 1995). People are similarly much more approving of "affirmative action" than of "preferential treatment," and of "revenue enhancers" than of "taxes." Because wording is such a delicate matter, critical thinkers will reflect on how the phrasing of a question might affect people's expressed opinions.

RANDOM SAMPLING In everyday thinking, the temptation to generalize from a few memorable anecdotes or unrepresentative personal experiences is nearly irresistible. Given (a) a statistical summary of a professor's student evaluations and (b) the vivid comments of two irate students, an administrator's impression of the professor may be influenced as much by the two unhappy students as by the many favorable evaluations in the statistical summary.

The point to remember: For an accurate picture of a whole population's attitudes and experience, there's only one game in town—a *representative sample*.

But it's not always possible to survey everyone in a group. So how do you obtain a representative sample—say, of the students at your college or university? How could you choose a smaller group that would represent the total student **population,** the whole group you want to study and describe? Usually, you would choose a **random sample,** in which every person in the entire group has an equal chance of participating. You might number the names in the general student listing and then use a random number generator to pick the participants for your survey. Large representative samples are better than small ones, but a small representative sample of 100 is better than an unrepresentative sample of 500.

With very large samples, estimates become quite reliable. E *is estimated to represent 12.7 percent of the letters in written English.* E, *in fact, is 12.3 percent of the 925,141 letters in Melville's* Moby Dick, *12.4 percent of the 586,747 letters in Dickens'* A Tale of Two Cities, *and 12.1 percent of the 3,901,021 letters in 12 of Mark Twain's works* (Chance News, *1997*).

Political pollsters sample voters in national election surveys just this way. Using only 1500 randomly sampled people, drawn from all areas of a country, they can provide a remarkably accurate snapshot of the nation's opinions. Without random sampling, large samples—including call-in phone samples and TV or Web site polls—often merely give misleading results.

The point to remember: Before accepting survey findings, think critically: Consider the sample. You cannot compensate for an unrepresentative sample by simply adding more people.

Naturalistic Observation

A third descriptive method records behavior in natural environments. These **naturalistic observations** range from watching chimpanzee societies in the jungle, to unobtrusively videotaping (and later systematically analyzing) parent-child interactions in different cultures, to recording racial differences in self-seating patterns in a student lunchroom.

Like case studies and surveys, naturalistic observation does not *explain* behavior. It *describes* it. Nevertheless, descriptions can be revealing. We once thought, for example, that only humans use tools. Then naturalistic observation revealed that chimpanzees sometimes insert a stick in a termite mound and withdraw it, eating the stick's load of termites. Such unobtrusive naturalistic observations paved the way for later studies of animal thinking, language, and emotion, which further expanded our understanding of our fellow animals. "Observations, made in the natural habitat, helped to show that the societies and behavior of animals are far more complex than previously supposed," noted chimpanzee observer Jane Goodall (1998). For example, chimpanzees and baboons have been observed using deception. Psychologists Andrew Whiten and Richard Byrne (1988) repeatedly saw one young baboon pretending to have been attacked by another as a tactic to get its mother to drive the other baboon away from its food. The more developed a primate species' brain, the more likely it is that the animals will display deceptive behaviors (Byrne & Corp, 2004).

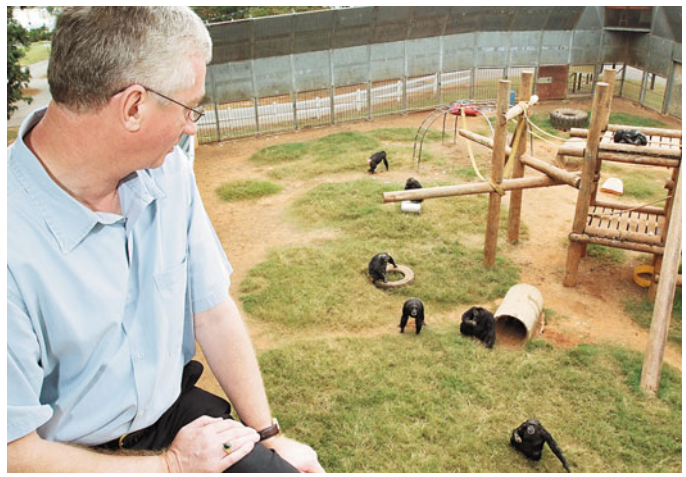


Photo by Jack Kearse, Emory University for Yerkes National Primate Research Center

A natural observer Chimpanzee researcher Frans de Waal (2005) reports that "I am a born observer. . . . When picking a seat in a restaurant I want to face as many tables as possible. I enjoy following the social dynamics—love, tension, boredom, antipathy—around me based on body language, which I consider more informative than the spoken word. Since keeping track of others is something I do automatically, becoming a fly on the wall of an ape colony came naturally to me."

Naturalistic observations also illuminate human behavior. Here are three you might enjoy.

- *A funny finding.* We humans laugh 30 times more often in social situations than in solitary situations. (Have you noticed how seldom you laugh when alone?) As we laugh, 17 muscles contort our mouth and squeeze our eyes, and we emit a series of 75-millisecond vowel-like sounds that are spaced about one-fifth of a second apart (Provine, 2001).
- *Sounding out students.* What, really, are introductory psychology students saying and doing during their everyday lives? To find out, Matthias Mehl and James Pennebaker (2003) equipped 52 such students from the University of Texas with belt-worn Electronically Activated Recorders (EARs). For up to four days, the EARs captured 30 seconds of the students' waking hours every 12.5 minutes, thus enabling the researchers to eavesdrop on more than 10,000 half-minute life slices by the end of the study. On what percentage of the slices do you suppose they found the students talking with someone? What percentage captured the students at a computer keyboard? The answers: 28 and 9 percent. (What percentage of *your* waking hours are spent in these activities?)
- *Culture, climate, and the pace of life.* Naturalistic observation also enabled Robert Levine and Ara Norenzayan (1999) to compare the *pace of life* in 31 countries. (Their operational definition of pace of life included walking speed, the speed with which postal clerks completed a simple request, and the accuracy of public clocks.) Their conclusion: Life is fastest paced in Japan and Western Europe, and slower paced in economically less-developed countries. People in colder climates also tend to live at a faster pace (and are more prone to die from heart disease).

Naturalistic observation offers interesting snapshots of everyday life, but it does so without controlling for all the factors that may influence behavior. It's one thing to observe the pace of life in various places, but another to explain why some people walk faster than others. Yet naturalistic observation, like surveys, can provide data for correlational research.

Courtesy of Matthias Mehl

An EAR for natural observation Psychologists Matthias Mehl and James Pennebaker have used Electronically Activated Recorders (EARs) to sample naturally occurring slices of daily life.

correlation the extent to which two factors vary together, and thus of how well either factor predicts the other. The *correlation coefficient* is the mathematical expression of the relationship, ranging from −1 to +1.

illusory correlation the perception of a relationship where none exists.

Correlation

2-5: What are positive and negative correlations, and why do they enable prediction but not cause-effect explanation?

Describing behavior is a first step toward predicting it. Surveys and naturalistic observations often show us that one trait or behavior is related to another. In such cases, we say the two **correlate.** A statistical measure (the *correlation coefficient*) helps us figure how closely two things vary together, and thus how well either one *predicts* the other. Knowing how much aptitude test scores *correlate* with school success tells us how well the scores *predict* school success.

A *positive correlation* (between 0 and +1.00) indicates a *direct* relationship, meaning that two things increase together or decrease together.

A *negative correlation* (between 0 and −1.00) indicates an *inverse* relationship: As one thing increases, the other decreases. Our earlier findings on self-esteem and depression illustrate a negative correlation: People who score *low* on self-esteem tend to score *high* on depression. Negative correlations could go as low as −1.00, which means that, like people on the opposite ends of a teeter-totter, one set of scores goes down precisely as the other goes up.

Here are four news reports of correlational research, some derived from surveys or naturalistic observations. Can you spot which are reporting positive correlations, which negative? (See the answers at left.)

1. The more young children watch TV, the less they read (Kaiser, 2003).
2. The more sexual content teens see on TV, the more likely they are to have sex (Collins et al., 2004).
3. The longer children are breast-fed, the greater their later academic achievement (Horwood & Fergusson, 1998).
4. The more often adolescents eat breakfast, the lower their body mass index (Timlin et al., 2008).

Answers to correlation questions: 1. negative, 2. positive, 3. positive, 4. negative.

Though informative, psychology's correlations usually leave most of the variation among individuals unpredicted. There is, for example, a positive correlation between parents' abusiveness and their children's later abusiveness when they become parents. But this does not mean that most abused children become abusive. The correlation simply indicates a statistical relationship: Most abused children do not grow into abusers, but nonabused children are even less likely to become abusive.

The point to remember: A correlation coefficient helps us see the world more clearly by revealing the extent to which two things relate.

Correlation need not mean causation
Length of marriage correlates positively with hair loss in men. Does this mean that marriage causes men to lose their hair (or that balding men make better husbands)? In this case, as in many others, a third factor obviously explains the correlation: Golden anniversaries and baldness both accompany aging.

Big Cheese Photo LLC/Alamy

CORRELATION AND CAUSATION Correlations point us toward predictions, but usually imperfect ones. Low self-esteem correlates with (and therefore predicts) depression. (This correlation might be indicated by a correlation coefficient, or just by a finding that people who score on the lower half of a self-esteem scale have an elevated depression rate.) So, does low self-esteem *cause* depression? If, based on the correlational evidence, you assume that it does, you have much company. A nearly irresistible thinking error is assuming that an association proves causation. But no matter how strong the relationship, it does not *prove* anything!

As options 2 and 3 in **FIGURE 2.2** show, we'd get the same negative correlation between low self-esteem and depression if depression caused people to be down on themselves, or if some third factor—such as heredity or brain chemistry—caused both low self-esteem and depression.

This point is so important—so basic to thinking smarter with psychology—that it merits one more example. A survey of over 12,000 adolescents found that the more teens feel loved by their parents, the less likely they are to behave in unhealthy ways—having early sex, smoking, abusing alcohol and drugs, exhibiting violence (Resnick et al., 1997). "Adults have a powerful effect on their children's behavior right through the high school years," gushed an Associated Press (AP) story reporting the finding. But this correlation comes with no built-in cause-effect arrow. Said differently (turn the volume up here), *association does not prove*

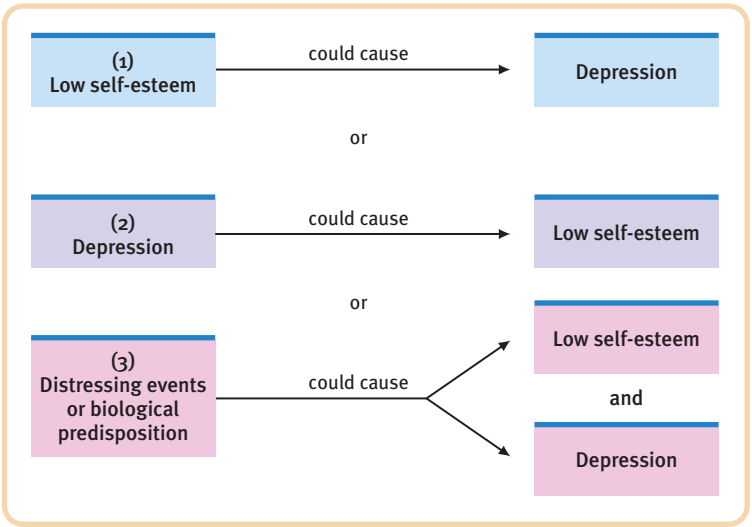


FIGURE 2.2 Three possible cause-effect relationships People low in self-esteem are more likely to report depression than are those high in self-esteem. One possible explanation of this negative correlation is that a bad self-image causes depressed feelings. But, as the diagram indicates, other cause-effect relationships are possible.

causation. Thus, the AP could as well have reported, "Well-behaved teens feel their parents' love and approval; out-of-bounds teens more often think their parents are disapproving jerks."

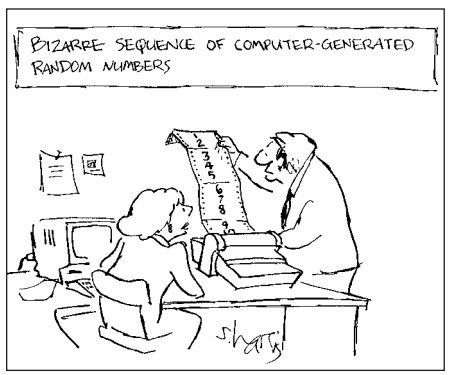
The point to remember: Correlation indicates the *possibility* of a cause-effect relationship, *but it does not prove causation.* Knowing that two events are associated need not tell us anything about causation. Remember this principle and you will be wiser as you read and hear news of scientific studies.

A New York Times *writer reported a massive survey showing that "adolescents whose parents smoked were 50 percent more likely than children of nonsmokers to report having had sex." He concluded (would you agree?) that the survey indicated a causal effect—that "to reduce the chances that their children will become sexually active at an early age" parents might "quit smoking" (O'Neil, 2002).*

ILLUSORY CORRELATIONS Correlation coefficients make visible the relationships we might otherwise miss. They also restrain our "seeing" relationships that actually do not exist. A perceived but nonexistent correlation is an **illusory correlation.** When we *believe* there is a relationship between two things, we are likely to *notice* and *recall* instances that confirm our belief (Trolier & Hamilton, 1986). We are especially likely to notice and remember the occurrence of two dramatic or unusual events in sequence—say, a premonition of an unlikely phone call followed by the call. When the call does not follow the premonition, we are less likely to note and remember the nonevent.

Illusory correlations help explain many superstitious beliefs, such as the presumption that infertile couples who adopt become more likely to conceive (Gilovich, 1991). Illusory thinking also helps explain why so many people believe that sugar makes children hyperactive, that getting chilled and wet causes us to catch a cold, and that changes in the weather trigger arthritis pain. We are, it seems, prone to perceiving patterns, whether they're there or not.

The point to remember: When we notice random coincidences, we may forget that they are random and instead see them as correlated. Thus, we can easily deceive ourselves by seeing what is not there.

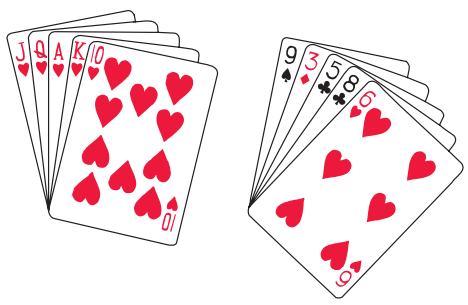


Bizarre-looking, perhaps. But actually no more unlikely than any other number sequence.

PERCEIVING ORDER IN RANDOM EVENTS In our natural eagerness to make sense of our world—what poet Wallace Stevens called our "rage for order"—we look for order even in random data. And we usually find it, because—here's a curious fact of life—*random sequences often don't look random.* Consider a random coin flip: If someone flipped a coin six times, which of the following sequences of heads (H) and tails (T) would be most likely: HHHTTT or HTTHTH or HHHHHH?

Daniel Kahneman and Amos Tversky (1972) found that most people believe HTTHTH would be the most likely random sequence. Actually, all three are equally likely (or, you might say, equally unlikely). A bridge or poker hand of 10 through ace, all of hearts, would seem extraordinary; actually, it would be no more or less likely than any other specific hand of cards (**FIGURE 2.3**).

FIGURE 2.3 Two random sequences Your chances of being dealt either of these hands are precisely the same: 1 in 2,598,960.



In actual random sequences, patterns and streaks (such as repeating digits) occur more often than people expect. To demonstrate this phenomenon for myself (as you can do), I flipped a coin 51 times, with these results:

1. H	10. T	19. H	28. T	37. T	46. H
2. T	11. T	20. H	29. H	38. T	47. H
3. T	12. H	21. T	30. T	39. H	48. T
4. T	13. H	22. T	31. T	40. T	49. T
5. H	14. T	23. H	32. T	41. H	50. T
6. H	15. T	24. T	33. T	42. H	51. T
7. H	16. H	25. T	34. T	43. H	
8. T	17. T	26. T	35. T	44. H	
9. T	18. T	27. H	36. H	45. T	

Looking over the sequence, patterns jump out: Tosses 10 to 22 provided an almost perfect pattern of pairs of tails followed by pairs of heads. On tosses 30 to 38 I had a "cold hand," with only one head in eight tosses. But my fortunes immediately reversed with a "hot hand"—seven heads out of the next nine tosses. Similar patterns and streaks happen in basketball shooting, baseball hitting, and mutual fund stock pickers' selections (Gilovich et al., 1985; Malkiel, 1989, 1995; Myers, 2002). These sequences often don't look random and so are overinterpreted ("When you're hot, you're hot!").

Given enough random events, something weird will happen
Angelo and Maria Gallina were the beneficiaries of one of those extraordinary chance events when they won two California lottery games on the same day.

Jerry Telfer/San Francisco Chronicle

On March 11, 1998, Utah's Ernie and Lynn Carey gained three new grandchildren when three of their daughters gave birth—on the same day (Los Angeles Times, *1998*).

What explains these streaky patterns? Was I exercising some sort of paranormal control over my coin? Did I snap out of my tails funk and get in a heads groove? No such explanations are needed, for these are the sorts of streaks found in any random data. Comparing each toss to the next, 24 of the 50 comparisons yielded a changed result—just the sort of near 50-50 result we expect from coin tossing. Despite seeming patterns, the outcome of one toss gives no clue to the outcome of the next.

However, some happenings seem so extraordinary that, mystified, we struggle to conceive an ordinary, chance-related explanation. Statisticians are less mystified. When Evelyn Marie Adams won the New Jersey lottery *twice*, newspapers reported the odds of her feat as 1 in 17 trillion. Bizarre? Actually, 1 in 17 trillion are indeed the odds that a given person who buys a single ticket for two New Jersey lotteries will win both times. And given the millions of people who buy U.S. state lottery tickets, reported statisticians Stephen Samuels and George McCabe (1989), it was "practically a sure thing" that someday, somewhere, someone would hit a state jackpot twice. Indeed, said fellow statisticians Persi Diaconis and Frederick Mosteller (1989), "with a large enough sample, any outrageous thing is likely to happen." An event that happens to but 1 in 1 billion people every day occurs about 6 times a day, 2000 times a year.

"The really unusual day would be one where nothing unusual happens."
—Statistician Persi Diaconis (2002)

Experimentation

2-6: How do experiments, powered by random assignment, clarify cause and effect?

Happy are they, remarked the Roman poet Virgil, "who have been able to perceive the causes of things." To isolate cause and effect, psychologists can eliminate (or screen out) the influence of other factors that may account for the results they observe. For example, researchers have found that breast-fed infants grow up with somewhat higher intelligence scores than do infants bottle-fed with cow's milk (Angelsen et al., 2001; Mortensen et al., 2002; Quinn et al., 2001). They have also found that breast-fed British babies have been more likely than their bottle-fed counterparts to eventually move into a higher social class (Martin et al., 2007). But the "breast is best" intelligence effect shrinks when researchers compare breast-fed and bottle-fed children from the same families (Der et al., 2006).

So, does this mean that smarter mothers (who in modern countries more often breast-feed) have smarter children? Or, as some researchers believe, do the nutrients of mother's milk contribute to brain development? To help answer this question, researchers have *controlled for* (statistically removed differences in) certain other factors, such as maternal age, education, and income. And they have found that in infant nutrition, mother's milk correlates modestly but positively with later intelligence.

Correlational research cannot control for all possible influences on a result. But researchers can isolate cause and effect with an **experiment.** Experiments enable a researcher to focus on the possible effects of one or more factors by (1) *manipulating the factors of interest* and (2) *holding constant (controlling) other factors.* With parental permission, a British research team randomly assigned 424 hospital preterm infants either to standard infant formula feedings or to donated breast-milk feedings (Lucas et al., 1992). On intelligence tests taken at age 8, the children nourished with breast milk had significantly higher intelligence scores than their formula-fed counterparts.

Random Assignment

No single experiment is conclusive, of course. But by **randomly assigning** infants to one feeding group or the other, researchers were able to hold constant all factors except nutrition. This eliminated alternative explanations and supported the conclusion that breast is indeed best for developing intelligence (at least for preterm infants). If a behavior (such as test performance) changes when we vary an experimental factor (such as infant nutrition), then we infer that the factor is having an effect.

The point to remember: Unlike correlational studies, which uncover naturally occurring relationships, an experiment manipulates a factor to determine its effect.

Consider, then, how we might use this method to assess a therapeutic intervention. Our tendency to seek new remedies when we are ill or emotionally down can produce misleading testimonies. If three days into a cold we start taking vitamin C tablets and find our cold symptoms lessening, we may credit the pills rather than the cold naturally subsiding. Similarly, in the 1700s, blood-letting *seemed* effective: People sometimes improved after the treatment. When they didn't, the practitioner inferred the disease was just too advanced to be reversed. (We, of course, now know that usually blood-letting is a *bad* treatment.) Whether a remedy is truly effective or not, enthusiastic users will probably endorse it. To find out whether it actually *is* effective, we must experiment.

And that is precisely how investigators evaluate new drug treatments and new methods of psychological therapy. Participants in these studies are randomly assigned to research groups. One group, the **experimental group,** receives a treatment (such as medication or other therapy). The other group, the **control group,** receives a pseudotreatment—an inert *placebo* (perhaps a pill with no drug in it).

Participants are often *blind* (uninformed) about what treatment, if any, they are receiving. If the study is using a **double-blind procedure,** neither the participants nor the research assistants collecting the data will know which group is receiving the treatment. Researchers take these measures because, to know how effective a therapy really is, they must control for a possible **placebo effect**—results created by the participants' belief in a treatment's healing powers or the staff's enthusiasm for its potential. The placebo effect is well documented in reducing pain, depression, and anxiety (Kirsch & Sapirstein, 1998). Just *thinking* you are getting a treatment can boost your spirits, relax your body, and relieve your symptoms. And the more expensive the placebo, the more "real" it seems: A fake pill that costs U.S.$2.50 works better than one costing 10 cents (Waber et al., 2008).

By randomly assigning people to the experimental and control conditions, researchers can be fairly certain the two groups are otherwise identical. Random assignment roughly equalizes the two groups in age, attitudes, and every other characteristic. With random assignment, as occurred with the infants in the breast-milk experiment, we also can conclude that any later differences between people in the experimental and control groups will usually be the result of the treatment.

experiment a research method in which an investigator manipulates one or more factors (independent variables) to observe the effect on some behavior or mental process (the dependent variable). By *random assignment* of participants, the experimenter aims to control other relevant factors.

random assignment assigning participants to experimental and control groups by chance, thus minimizing preexisting differences between those assigned to the different groups.

experimental group in an experiment, the group that is exposed to the treatment, that is, to one version of the independent variable.

control group in an experiment, the group that is *not* exposed to the treatment; contrasts with the experimental group and serves as a comparison for evaluating the effect of the treatment.

double-blind procedure an experimental procedure in which both the research participants and the research staff are ignorant (blind) about whether the research participants have received the treatment or a placebo. Commonly used in drug-evaluation studies.

placebo [pluh-SEE-bo; Latin for "I shall please"] **effect** experimental results caused by expectations alone; any effect on behavior caused by the administration of an inert substance or condition, which the recipient assumes is an active agent.

"If I don't think it's going to work, will it still work?"

Note the distinction between random sampling in surveys (discussed earlier) and random assignment in experiments (depicted in Figure 2.4 on the next page). Random sampling *helps us generalize to a larger population.* Random assignment *controls extraneous influences, which helps us infer cause and effect.*

independent variable the experimental factor that is manipulated; the variable whose effect is being studied.

dependent variable the outcome factor; the variable that may change in response to manipulations of the independent variable.

Independent and Dependent Variables

2-7: What are independent and dependent variables, and how do they differ?

Here is an even more potent example of a double-blind experiment: The drug Viagra was approved for use after 21 clinical trials. One trial was an experiment in which researchers randomly assigned 329 men with erectile dysfunction to either an experimental group (Viagra takers) or a control group (placebo takers). In this double-blind procedure, neither the men nor the person who gave them the pills knew which drug they were receiving. The result: At peak doses, 69 percent of Viagra-assisted attempts at intercourse were successful, compared with 22 percent for men receiving the placebo (Goldstein et al., 1998). Viagra worked.

This simple experiment manipulated just one factor: the drug dosage (none versus peak dose). We call this experimental factor the **independent variable** because we can vary it *independently* of other factors, such as the men's age, weight, and personality (which random assignment should control). Experiments examine the effect of one or more independent variables on some measurable behavior, called the **dependent variable** because it can vary *depending* on what takes place during the experiment. Both variables are given precise *operational definitions,* which specify the procedures that manipulate the independent variable (the precise drug dosage and timing in this study) or measure the dependent variable (the questions that assessed the men's responses). These definitions answer the "What do you mean?" question with a level of precision that enables others to repeat the study.

Let's pause to check your understanding using a simple psychology experiment: To test the effect of perceived ethnicity on the availability of a rental house, Adrian Carpusor and William Loges (2006) sent identically worded e-mail inquiries to 1115 Los Angeles-area landlords. The researchers varied the ethnic connotation of the sender's name and tracked the percentage of positive replies (invitations to view the apartment in person). "Patrick McDougall," "Said Al-Rahman," and "Tyrell Jackson" received, respectively, 89 percent, 66 percent, and 56 percent invitations.

In this experiment, what was the independent variable? The dependent variable? (See the answers in margin to the left.)

The independent variable, which the researchers manipulated, was the ethnicity-related names. The dependent variable, which they measured, was the positive response rate.

Experiments can also help us evaluate social programs. Do early childhood education programs boost impoverished children's chances for success? What are the effects of different anti-smoking campaigns? Do school sex-education programs reduce teen pregnancies? To answer such questions, we can experiment: If an intervention is welcomed but resources are scarce, we could use a lottery to randomly assign some people (or regions) to experience the new program and others to a control group. If later the two groups differ, the intervention's effect will be confirmed (Passell, 1993). Sometimes, however, experiments are not feasible or ethical. For example, we cannot randomly assign children to be raised by spanking or nonspanking parents. Instead, we correlate parental spanking amounts with children's behavior.

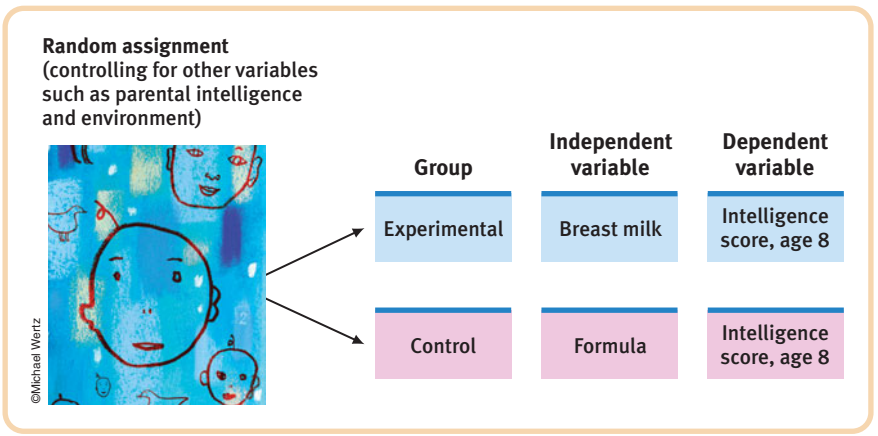


FIGURE 2.4 Experimentation To discern causation, psychologists may randomly assign some participants to an experimental group, others to a control group. Measuring the dependent variable (intelligence score in later childhood) will determine the effect of the independent variable (type of milk).

Let's recap. A *variable* is anything that can vary (infant nutrition, intelligence, TV exposure—anything within the bounds of what is feasible and ethical). Experiments aim to *manipulate* an *independent* variable, *measure changes* in the *dependent* variable, and *control* (minimize the possible effects of) all other variables. An experiment has at least two different groups: an *experimental group* and a *comparison* or *control group. Random assignment* works to equate the groups before any treatment effects. (**FIGURE 2.4** illustrates the breast-milk experiment's design.)

TABLE 2.1 Comparing Research Methods

Research Method	Basic Purpose	How Conducted	What Is Manipulated	Weaknesses
Descriptive	To observe and record behavior	Do case studies, surveys, or naturalistic observations	Nothing	No control of variables; single cases may be misleading
Correlational	To detect naturally occurring relationships; to assess how well one variable predicts another	Compute statistical association, sometimes among survey responses	Nothing	Does not specify cause and effect
Experimental	To explore cause and effect	Manipulate one or more factors; use random assignment	The independent variable(s)	Sometimes not feasible; results may not generalize to other contexts; not ethical to manipulate certain variables

In this way, an experiment tests the effect of at least one *independent variable* (what we manipulate) on at least one *dependent variable* (the outcome we measure). **TABLE 2.1** compares the features of psychology's research methods.

Frequently Asked Questions About Psychology

We have reflected on how a scientific approach can restrain biases. We have seen how case studies, surveys, and naturalistic observations help us describe behavior. We have also noted that correlational studies assess the association between two factors, which indicates how well one thing predicts another. We have examined the logic that underlies experiments, which use control conditions and random assignment of participants to isolate the effects of an independent variable on a dependent variable.

Yet, even knowing this much, you may still be approaching psychology with a mixture of curiosity and apprehension. So before we plunge in, let's entertain some frequently asked questions.

2-8: Can laboratory experiments illuminate everyday life?

When you see or hear about psychological research, do you ever wonder whether people's behavior in the lab will predict their behavior in real life? For example, does detecting the blink of a faint red light in a dark room have anything useful to say about flying a plane at night? After viewing a violent, sexually explicit film, does an aroused man's increased willingness to push buttons that he thinks will electrically shock a woman really say anything about whether violent pornography makes a man more likely to abuse a woman?

Before you answer, consider: The experimenter *intends* the laboratory environment to be a simplified reality—one that simulates and controls important features of everyday life. Just as a wind tunnel lets airplane designers re-create airflow forces under controlled conditions, a laboratory experiment lets psychologists re-create psychological forces under controlled conditions.

An experiment's purpose is not to re-create the exact behaviors of everyday life but to test *theoretical principles* (Mook, 1983). In aggression studies, deciding whether to push a button that delivers a shock may not be the same as slapping someone in the face, but the principle is the same. *It is the resulting principles—not the specific findings—that help explain everyday behaviors.*

When psychologists apply laboratory research on aggression to actual violence, they are applying theoretical principles of aggressive behavior, principles they have refined through many experiments. Similarly, it is the principles of the visual system, developed from experiments in artificial settings (such as looking at red lights in the dark), that we apply to more complex behaviors, such as night flying.

culture the enduring behaviors, ideas, attitudes, and traditions shared by a group of people and transmitted from one generation to the next.

And many investigations show that principles derived in the laboratory do typically generalize to the everyday world (Anderson et al., 1999).

The point to remember: Psychologists' concerns lie less with particular behaviors than with the general principles that help explain many behaviors.

2-9: Does behavior depend on one's culture and gender?

What can psychological studies done in one time and place, often with White Europeans or North Americans, really tell us about people in general? As we will see time and again, **culture**—shared ideas and behaviors that one generation passes on to the next—matters. Our culture shapes our behavior. It influences our standards of promptness and frankness, our attitudes toward premarital sex and varying body shapes, our tendency to be casual or formal, our willingness to make eye contact, our conversational distance, and much, much more. Being aware of such differences, we can restrain our assumptions that others will think and act as we do. Given the growing mixing and clashing of cultures, our need for such awareness is urgent.

It is also true, however, that our shared biological heritage unites us as a universal human family. The same underlying processes guide people everywhere:

- People diagnosed with dyslexia, a reading disorder, exhibit the same brain malfunction whether they are Italian, French, or British (Paulesu et al., 2001).
- Variation in languages may impede communication across cultures. Yet all languages share deep principles of grammar, and people from opposite hemispheres can communicate with a smile or a frown.
- People in different cultures vary in feelings of loneliness. But across cultures, loneliness is magnified by shyness, low self-esteem, and being unmarried (Jones et al., 1985; Rokach et al., 2002).

We are each in certain respects like all others, like some others, and like no other. Studying people of all races and cultures helps us discern our similarities and our differences, our human kinship and our diversity.

You will see throughout this book that *gender* matters, too. Researchers report gender differences in what we dream, in how we express and detect emotions, and in our risk for alcohol dependence, depression, and eating disorders. Gender differences fascinate us, and studying them is potentially beneficial. For example, many researchers believe that women carry on conversations more readily to build relationships, and that men talk more to give information and advice (Tannen, 1990). Knowing this difference can help us prevent conflicts and misunderstandings in everyday relationships.

But again, psychologically as well as biologically, women and men are overwhelmingly similar. Whether female or male, we learn to walk at about the same age. We experience the same sensations of light and sound. We feel the same pangs of hunger, desire, and fear. We exhibit similar overall intelligence and well-being.

The point to remember: Even when specific attitudes and behaviors vary by gender or across cultures, as they often do, the underlying processes are much the same.

"All people are the same; only their habits differ."
—Confucius, 551–479 B.C.E.

Ami Vitale/Getty Images

A cultured greeting Because culture shapes people's understanding of social behavior, actions that seem ordinary to us may seem quite odd to visitors from far away. Yet underlying these differences are powerful similarities. Supporters of newly elected leaders everywhere typically greet them with pleased deference, though not necessarily with bows and folded hands, as in India. Here influential and popular politician Sonia Gandhi greeted some of her constituents shortly after her election.

2-10: Why do psychologists study animals, and is it ethical to experiment on animals?

Many psychologists study animals because they find them fascinating. They want to understand how different species learn, think, and behave. Psychologists also study animals to learn about people, by doing experiments permissible only with animals. We humans are not *like* animals; we *are* animals and our physiology resembles that of many other species. Animal experiments have therefore led to treatments for human diseases—insulin for diabetes, vaccines to prevent polio and rabies, transplants to replace defective organs.

Humans are complex, but the same processes by which we learn are present in rats, monkeys, and even sea slugs. The simplicity of the sea slug's nervous system is precisely what makes it so revealing of the neural mechanisms of learning.

If we share important similarities with other animals, then should we not respect them? "We cannot defend our scientific work with animals on the basis of the similarities between them and ourselves and then defend it morally on the basis of differences," noted Roger Ulrich (1991). The animal protection movement protests the use of animals in psychological, biological, and medical research. But researchers remind us that the animals used worldwide each year in research are but a fraction of 1 percent of the billions of animals killed annually for food. And yearly, for every dog or cat used in an experiment and cared for under humane regulations, 50 others are killed in humane animal shelters (Goodwin & Morrison, 1999).

Some animal protection organizations want to replace experiments on animals with naturalistic observation. Many animal researchers respond that this is not a question of good versus evil but of compassion for animals versus compassion for people.

Out of this heated debate, two issues emerge. The basic one is whether it is right to place the well-being of humans above that of animals. In experiments on stress and cancer, is it right that mice get tumors in the hope that people might not? Should some monkeys be exposed to an HIV-like virus in the search for an AIDS vaccine? Is our use and consumption of other animals as natural as the behavior of carnivorous hawks, cats, and whales? The answers to such questions vary by culture. In Gallup surveys in Canada and the United States, about 60 percent of adults deem medical testing on animals "morally acceptable." In Britain, only 37 percent do (Mason, 2003).

If we give human life first priority, the second issue is, What safeguards should protect the well-being of animals in research? One survey of animal researchers gave an answer, with 98 percent or more in favor of government regulations protecting primates, dogs, and cats, and 74 percent in favor of regulations providing for the humane care of rats and mice (Plous & Herzog, 2000). Many professional associations and funding agencies already have such guidelines. For example, British Psychological Society guidelines call for housing animals under reasonably natural living conditions, with companions for social animals (Lea, 2000). American Psychological Association (2002) guidelines mandate ensuring the "comfort, health, and humane treatment" of animals and minimizing "infection, illness, and pain."

"Rats are very similar to humans except that they are not stupid enough to purchase lottery tickets."
—Dave Barry, July 2, 2002

"I believe that to prevent, cripple, or needlessly complicate the research that can relieve animal and human suffering is profoundly inhuman, cruel, and immoral."
—Psychologist Neal Miller, 1983

"Please do not forget those of us who suffer from incurable diseases or disabilities who hope for a cure through research that requires the use of animals."
—Psychologist Dennis Feeney (1987)

"The righteous know the needs of their animals."
—Proverbs 12:10

"The greatness of a nation can be judged by the way its animals are treated."
—Mahatma Gandhi, 1869–1948

Ami Vitale/Getty Images

Animal research benefiting animals
Thanks partly to research on the benefits of novelty, control, and stimulation, these gorillas are enjoying an improved quality of life in New York's Bronx Zoo. As they would in the wild, they now work for their supper (Stewart, 2002).

Humane care also leads to more effective science, because pain and stress would distort the animals' behavior during experiments.

Animals have themselves benefited from animal research. One famous example was Louis Pasteur's experiments with rabies, which caused some dogs to suffer but led to a vaccine that spared not only millions of people but also millions of dogs from an agonizing death. More recently, by measuring stress hormone levels in samples of millions of dogs brought each year to animal shelters, researchers devised handling and stroking methods that reduce stress and ease the dogs' transition to adoptive homes (Tuber et al., 1999). Other studies have helped improve care and management in animals' natural habitats. By revealing our behavioral kinship with animals and the remarkable intelligence of chimpanzees, gorillas, and other animals, experiments have also led to increased empathy and protection for them. At its best, a psychology concerned for humans and sensitive to animals serves the welfare of both.

2-11: Is it ethical to experiment on people?

If the image of researchers delivering supposed electric shocks troubles you, you may be relieved to know that in most psychological studies, especially those with human participants, blinking lights, flashing words, and pleasant social interactions are more common.

Occasionally, though, researchers do temporarily stress or deceive people, but only when they believe it is essential to a justifiable end, such as understanding and controlling violent behavior or studying mood swings. Such experiments wouldn't work if the participants knew all there was to know about the experiment beforehand. Wanting to be helpful, the participants might try to confirm the researcher's predictions.

The American Psychological Association (1992), the British Psychological Society (1993), and psychologists internationally (Pettifor, 2004) have developed ethical principles to guide investigators. They include (1) obtaining potential participants' informed consent, (2) protecting participants from harm and discomfort, (3) keeping information about individual participants confidential, and (4) fully explaining the research afterward. Moreover, most universities today screen research proposals through an ethics committee that safeguards the well-being of every participant.

The ideal is for a researcher to be sufficiently informative *and* considerate that participants will leave feeling at least as good about themselves as when they came in. Better yet, they should be repaid by having learned something. If treated respectfully, most participants enjoy or accept their engagement (Epley & Huff, 1998; Kimmel, 1998). Indeed, say psychology's defenders, professors provoke much greater anxiety by giving and returning course exams than do researchers in the typical experiment.

2-12: Is psychology free of value judgments?

Psychology is definitely not value-free. Values affect what we study, how we study it, and how we interpret results. Researchers' values influence their choice of topics. Should we study worker productivity or worker morale? Sex discrimination or gender differences? Conformity or independence? Values can also color "the facts." As we noted earlier, what we want or expect to see can bias our observations and interpretations (**FIGURE 2.5**).

"It is doubtless impossible to approach any human problem with a mind free from bias."

—Simone de Beauvoir, *The Second Sex,* 1953

Even the words we use to describe something can reflect our values. Are the sex acts we do not practice "perversions" or "sexual variations"? In psychology or in everyday speech, labels describe and labels evaluate. One person's *rigidity* is another's *consistency.* One person's *faith* is another's *fanaticism*. Our labeling someone as *firm* or *stubborn*, *careful* or *picky*, *discreet* or *secretive* reveals our feelings.

Popular applications of psychology also contain hidden values. If you defer to "professional" guidance about how to live—how to raise children, how to achieve

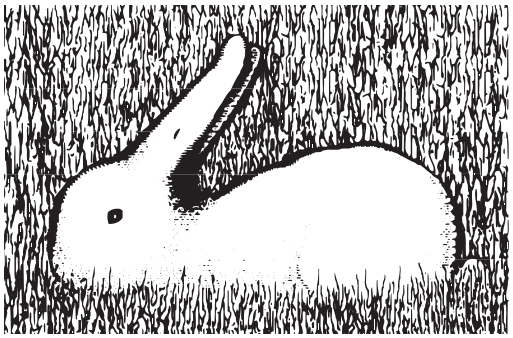


FIGURE 2.5 What do you see? People interpret ambiguous information to fit their preconceptions. Did you see a duck or a rabbit? Before showing some friends this image, ask them if they can see the duck lying on its back (or the bunny in the grass). (From Shepard, 1990.)

self-fulfillment, what to do with sexual feelings, how to get ahead at work—you are accepting value-laden advice. A science of behavior and mental processes can certainly help us reach our goals, but it cannot decide what those goals should be.

Psychology is value-laden. Is it also dangerously powerful, as some people worry? Is it an accident that astronomy is the oldest science and psychology the youngest? To some people, exploring the external universe seems far safer than exploring our own inner universe. Might psychology, they ask, be used to manipulate people?

Psychology speaks In making its historic 1954 school desegregation decision, the U.S. Supreme Court cited the expert testimony and research of psychologists Kenneth Clark and Mamie Phipps Clark (1947). The Clarks reported that, when given a choice between Black and White dolls, most African-American children chose the White doll, which seemingly indicated internalized anti-Black prejudice.

Knowledge, like all power, can be used for good or evil. Nuclear power has been used to light up cities—and to demolish them. Persuasive power has been used to educate people—and to deceive them. Although psychology does indeed have the power to deceive, its purpose is to enlighten. Every day, psychologists are exploring ways to enhance learning, creativity, and compassion. Psychology speaks to many of our world's great problems—war, overpopulation, prejudice, family crises, crime—all of which involve attitudes and behaviors. Psychology also speaks to our deepest longings—for nourishment, for love, for happiness. And as you will see, one of the newer developments in this field—*positive psychology*—has as its goal exploring and promoting human strengths. Psychology cannot address all of life's great questions, but it speaks to some mighty important ones.

Research Strategies: How Psychologists Ask and Answer Questions

Module Review

2-1: Why are the answers that flow from the scientific approach more reliable than those based on intuition and common sense? Common sense often serves us well, but we are prone to *hindsight bias* (the "I-knew-it-all-along phenomenon"), a tendency to believe, after learning an outcome, that we would have foreseen it. We also are routinely overconfident of our judgments, thanks partly to our bias to seek information that confirms them. Although limited by the testable questions it can address, scientific inquiry can help us sift reality from illusion and restrain the biases of our unaided intuition.

2-2: What attitudes characterize scientific inquiry, and what does it mean to think critically? The three components of the scientific attitude are (1) a curious eagerness to (2) skeptically scrutinize competing ideas and (3) an open-minded humility before nature. This attitude carries into everyday life as *critical thinking*, which examines assumptions, discerns hidden values, evaluates evidence, and assesses outcomes. Putting ideas, even crazy-sounding ideas, to the test helps us winnow sense from nonsense.

2-3: How do psychologists use the scientific method to construct theories? Psychological *theories* organize observations and imply predictive *hypotheses.* After constructing precise *operational definitions* of their procedures, researchers test their hypotheses, validate and refine the theory, and, sometimes, suggest practical applications. If other researchers obtain similar results by *replicating* the study with different participants and conditions, we can then place greater confidence in the conclusion.

2-4: How do psychologists observe and describe behavior? Psychologists observe and describe behavior using individual *case studies*, *surveys* among *random samples* of a *population*, and *naturalistic observations.* In generalizing from observations, representative samples are a better guide than vivid anecdotes.

2-5: What are positive and negative correlations, and why do they enable prediction but not cause-effect explanation? A positive *correlation* (ranging from 0 to +1.00) indicates a direct relationship: Two factors rise or decrease together. A negative correlation (ranging from 0 to −1.00) indicates an inverse relationship: As one item increases, the other decreases. An association (sometimes stated as a correlation coefficient) indicates the possibility of a cause-effect relationship, but it does not prove the direction of the influence, or whether an underlying third factor may explain the correlation. *Illusory correlations* are random events that we notice and falsely assume are related. Patterns or sequences occur naturally in sets of random data. Our tendency to interpret these patterns as meaningful connections may be an attempt to make sense of the world around us.

2-6: How do experiments, powered by random assignment, clarify cause and effect? To discover cause-effect relationships, psychologists conduct *experiments*, manipulating one or more factors of interest and controlling other factors. *Random assignment* minimizes preexisting differences between the *experimental group* (exposed to the treatment) and the *control group* (given a placebo or different version of the treatment). Studies may use a *double-blind procedure* to avoid a *placebo effect* and researchers' bias.

2-7: What are independent and dependent variables, and how do they differ? An *independent variable* is the factor you manipulate to study its effect. A *dependent variable* is the factor you measure to discover any changes that occur in response to these manipulations.

2-8: Can laboratory experiments illuminate everyday life? By intentionally creating a controlled, artificial environment in the lab, researchers aim to test theoretical principles. These general principles help explain everyday behaviors.

2-9: Does behavior depend on one's culture and gender? Attitudes and behaviors vary across *cultures*, but the underlying principles vary much less because of our human kinship. Although gender differences tend to capture attention, it is important to remember our greater gender similarities.

2-10: Why do psychologists study animals, and is it ethical to experiment on animals? Some psychologists are primarily interested in animal behavior. Others study animals to better understand the physiological and psychological processes shared by humans. Under ethical and legal guidelines, animals used in experiments rarely experience pain. Nevertheless, animal rights groups raise an important issue: Even if it leads to the relief of human suffering, is an animal's temporary suffering justified?

2-11: Is it ethical to experiment on people? Researchers may temporarily stress or deceive people in order to learn something important. Professional ethical standards provide guidelines concerning the treatment of both human and animal participants.

2-12: Is psychology free of value judgments? Psychologists' values influence their choice of research topics, their theories and observations, their labels for behavior, and their professional advice. Applications of psychology's principles have been used mainly in the service of humanity.

Rehearse It!

1. *Hindsight bias* refers to our tendency to
   a. perceive events as obvious or inevitable after the fact.
   b. be more confident than correct in estimating distances.
   c. overestimate our ability to predict the future.
   d. make judgments that fly in the face of common sense.
2. As scientists, psychologists view theories with curiosity, skepticism, and humility. This means that they
   a. approach research with a negative cynicism.
   b. assume that an article published in a reputable journal must be true.
   c. believe that every important human question can be studied scientifically.
   d. are willing to ask questions and to reject claims that cannot be verified by research.

3. A newspaper article describes how a "cure for cancer has been found." A critical thinker probably will

a. dismiss the article as untrue.
b. accept the information as a wonderful breakthrough.
c. question the article, evaluate the evidence, and assess the conclusions.
d. question the article but quickly accept it as true if the author has an excellent reputation.

4. The predictions implied by a theory are called

a. operational definitions.
b. correlations.
c. hypotheses.
d. replications.

5. Which of the following is NOT one of the techniques psychologists use to observe and describe behavior?

a. A case study
b. Naturalistic observation
c. Correlational research
d. A phone survey

6. You wish to take an accurate poll in a certain country by questioning people who truly represent the country's adult population. Therefore, you need to ensure that you question

a. at least 50 percent males and 50 percent females.
b. a small but intelligent sample of the population.
c. a very large sample of the population.
d. a random sample of the population.

7. A study finds that the more childbirth training classes women attend, the less pain medication they require during childbirth. This finding can be stated as a(n)

a. positive correlation.
b. negative correlation.
c. cause-effect relationship.
d. illusory correlation.

8. Knowing that two events are correlated provides

a. a basis for prediction.
b. an explanation of why the events are related.
c. proof that as one increases, the other also increases.
d. an indication that an underlying third factor is at work.

9. Some people wrongly perceive that their dreams predict future events. This is an example of a(n) _____ correlation.

a. negative
b. positive
c. illusory
d. naturalistic

10. Descriptive and correlational studies describe behavior, detect relationships, and predict behavior. But to explain behaviors, psychologists use

a. naturalistic observation.
b. experiments.
c. surveys.
d. case studies.

11. To test the effect of a new drug on depression, we randomly assign people to control and experimental groups. Those in the experimental group take a pink pill containing the new medication; those in the control group take a pink pill that contains no medication. Which statement is true?

a. The medication is the dependent variable.
b. Depression is the independent variable.
c. Participants in the control group take a placebo.
d. Participants in the experimental group take a placebo.

12. A double-blind procedure is often used to prevent researchers' biases from influencing the outcome of an experiment. In this procedure,

a. only the participants know whether they are in the control group or the experimental group.
b. experimental and control group members will be carefully matched for age, sex, income, and education level.
c. neither the participants nor the researchers know who is in the experimental group or control group.
d. someone separate from the researcher will ask people to volunteer for the experimental group or the control group.

13. A researcher wants to determine whether noise level affects the blood pressure of elderly people. In one group she varies the level of noise in the environment and records participants' blood pressure. In this experiment, the level of noise is the

a. control condition.
b. placebo.
c. dependent variable.
d. independent variable.

14. The laboratory environment is designed to

a. exactly re-create the events of everyday life.
b. re-create psychological forces under controlled conditions.
c. create opportunities for naturalistic observation.
d. minimize the use of animals and humans in psychological research.

15. Which of the following is true regarding gender differences and similarities?

a. Differences between the genders outweigh any similarities.
b. Despite some gender differences, the underlying processes of human behavior are the same.
c. Both similarities and differences between the genders depend more on biology than on environment.
d. Gender differences are so numerous, it is difficult to make meaningful comparisons.

16. In defending their experimental research with animals, psychologists have noted that

a. animals' physiology and behavior can tell us much about our own.
b. animal experimentation sometimes helps animals as well as humans.
c. advancing the well-being of humans justifies animal experimentation.
d. All of these statements are correct.

Answers: 1. a, 2. d, 3. c, 4. c, 5. d, 6. d, 7. b, 8. a, 9. c, 10. b, 11. c, 12. c, 13. d, 14. b, 15. b, 16. d.

Terms and Concepts to Remember

hindsight bias, p. 14
critical thinking, p. 17
theory, p. 18
hypothesis, p. 18
operational definition, p. 19
replication, p. 19
case study, p. 19
survey, p. 20
population, p. 20
random sample, p. 20
naturalistic observation, p. 21
correlation, p. 22
illusory correlation, p. 23
experiment, p. 25
random assignment, p. 25
experimental group, p. 25
control group, p. 25
double-blind procedure, p. 25
placebo effect, p. 25
independent variable, p. 26
dependent variable, p. 26
culture, p. 28

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. How can you use your knowledge of the scientific attitude to help you evaluate claims in the media, even if you're not a scientific expert on the issue?
2. Here are some recently reported correlations, with interpretations drawn by journalists. Further research, often including experiments, has clarified cause and effect in each case. Knowing just these correlations, can you come up with other possible explanations for each of these?
   a. Alcohol use is associated with violence. (One interpretation: Drinking triggers or unleashes aggressive behavior.)
   b. Educated people live longer, on average, than less-educated people. (One interpretation: Education lengthens life and enhances health.)
   c. Teens engaged in team sports are less likely to use drugs, smoke, have sex, carry weapons, and eat junk food than are teens who do not engage in team sports. (One interpretation: Team sports encourage healthy living.)
   d. Adolescents who frequently see smoking in movies are more likely to smoke. (One interpretation: Movie stars' behavior influences impressionable teens.)
3. As you watch an Orlando Magic basketball game with your friend, he says that Dwight Howard really has a hot hand right now and the other players should give him the ball as soon as possible. Based on your knowledge of our tendency toward illusory thinking, how should you respond?
4. Foot pads purported to draw toxins out of the body during sleep have become popular lately. Testimonials suggest that foot pads remove toxins from the body and also help alleviate a variety of health problems, including fatigue and backaches. How can we determine whether foot pads are actually effective?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

The Biology of Mind

The Biology of Mind

Imagine that just moments before your death, someone removed your brain from your body and kept it alive by floating it in a tank of fluid while feeding it enriched blood. Would you still be in there? Further imagine that your still-living brain has been transplanted into the body of a person whose own brain was severely damaged. To whose home should the recovered patient return?

If you answered that the patient should return to your home, you illustrated what most of us believe—that we reside in our head. An acquaintance of mine received a new heart donated by a woman who in turn had received a matching heart-lung transplant. When the two chanced to meet in their hospital ward, the donor introduced herself: "I think you have my heart." But only her heart; her self, she assumed, still resided in her skull.

In the next two modules, we explore the biology of the mind—the links between our brain and our behavior. No principle is more central to today's psychology, or to this book, than this: *Everything psychological—every idea, every mood, every urge—is simultaneously biological.* We may talk separately of biological and psychological influences, but to think, feel, or act without a body would be like running without legs.

In exploring the links between our biology and our behavior, we will start small and build from the bottom up. In Module 3, we take a close look at the nervous and endocrine systems. In Module 4, we focus on brain structures and their functions.

"You're certainly a lot less fun since the operation.

MODULE 3

Neural and Hormonal Systems

Neural Communication

The Nervous System

The Endocrine System

Throughout this book, you will find examples of how biology underlies our behavior and mental processes. By studying the links between biological activity and psychological events, **biological psychologists** are gaining a better understanding of such events.

Neural Communication

The human body is complexity built from simplicity. Part of this complexity is our amazing internal communication system, which makes the Internet look simple. Across the world, researchers are unlocking the mysteries of how our brain uses electrical and chemical processes to take in, organize, interpret, store, and use information. The story begins with the system's basic building block, the *neuron*, or nerve cell. We'll look first at its structure, and then at how neurons work together.

Neurons

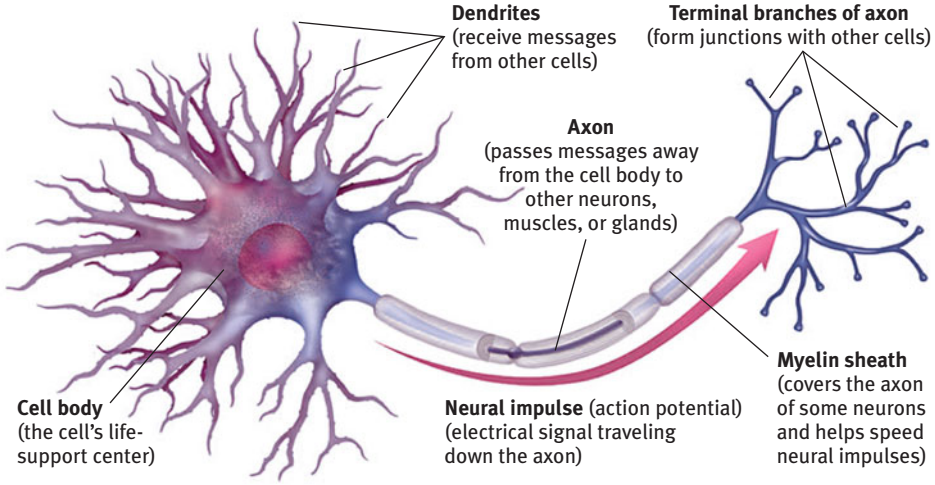
3-1: What are neurons, and how do they transmit information?

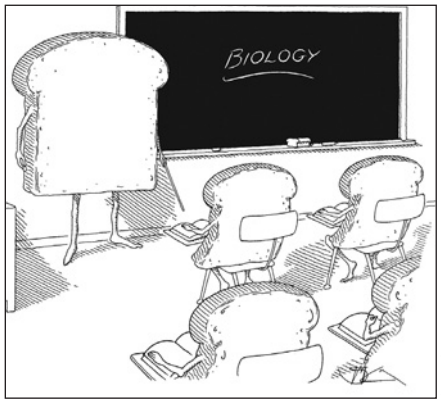
Neurons differ, but all are variations on the same theme. Each consists of a *cell body* and its branching fibers. The bushy **dendrite** fibers receive information and conduct it toward the cell body. From there, the cell's **axon** (sometimes covered with a *myelin sheath*) passes the message along to other neurons or to muscles or glands. Axons speak. Dendrites listen.

Unlike the short dendrites, axons can be very long, projecting several feet through the body. A neuron carrying orders to a leg muscle, for example, has a cell body and axon roughly on the scale of a basketball attached to a rope 4 miles long.

Neurons transmit messages when stimulated by signals from our senses or when triggered by chemical signals from neighboring neurons. At such times, a neuron fires an impulse, called the **action potential**—a brief electrical charge that travels down its axon (**FIGURE 3.1**).

Depending on the type of fiber, a neural impulse travels at speeds ranging from a sluggish 2 miles per hour to a breakneck 200 or more miles per hour. But even this top speed is 3 million times slower than that of electricity through a wire. We measure brain activity in milliseconds (thousandths of a second) and computer activity





© Tom Swick

"The body is made up of millions and millions of crumbs."

biological psychology the scientific study of the links between biological (genetic, neural, hormonal) and psychological processes. (Some biological psychologists call themselves *behavioral neuroscientists, neuropsychologists, behavior geneticists, physiological psychologists,* or *biopsychologists*.)

neuron a nerve cell; the basic building block of the nervous system.

dendrite the neuron's bushy, branching extensions that receive messages and conduct impulses toward the cell body.

axon the neuron's extension that passes messages through its branching terminal fibers that form junctions with other neurons, muscles, or glands.

action potential a neural impulse; a brief electrical charge that travels down an axon.

FIGURE 3.1 A motor neuron

in nanoseconds (billionths of a second). Thus, unlike the nearly instantaneous reactions of a high-speed computer, your reaction to a sudden event, such as a child darting in front of your car, may take a quarter-second or more. Your brain is vastly more complex than a computer, but slower at executing simple responses.

"What one neuron tells another neuron is simply how much it is excited."

—Francis Crick, *The Astonishing Hypothesis,* 1994

Each neuron is a miniature decision-making device performing complex calculations as it receives signals from hundreds, even thousands, of other neurons. Most of these signals are *excitatory,* somewhat like pushing a neuron's accelerator. Others are *inhibitory,* more like pushing its brake. If excitatory signals minus inhibitory signals exceed a minimum level of stimulation, or **threshold,** the combined signals trigger an action potential. (Think of it this way: If the excitatory party animals outvote the inhibitory party poopers, the party's on.) The action potential then travels down the axon, which branches into junctions with hundreds or thousands of other neurons and with the body's muscles and glands.

Increasing the level of stimulation above the threshold will not increase the neural impulse's intensity. The neuron's reaction is an *all-or-none response:* Like guns, neurons either fire or they don't. How, then, do we detect the intensity of a stimulus? How do we distinguish a gentle touch from a big hug? A strong stimulus—a slap rather than a tap—can trigger *more* neurons to fire, and to fire more often. But it does not affect the action potential's strength or speed. Squeezing a trigger harder won't make a bullet go faster.

How Neurons Communicate

3-2: How do nerve cells communicate with other nerve cells?

Neurons interweave so intricately that even with a microscope you would have trouble seeing where one neuron ends and another begins. Scientists once believed that the axon of one cell fused with the dendrites of another in an uninterrupted fabric. Then British physiologist Sir Charles Sherrington (1857–1952) noticed that neural impulses were taking an unexpectedly long time to travel a neural pathway. Inferring that there must be a brief interruption in the transmission, Sherrington called the meeting point between neurons a **synapse.**

"All information processing in the brain involves neurons 'talking to' each other at synapses."

—Neuroscientist Solomon H. Snyder (1984)

We now know that the axon terminal of one neuron is in fact separated from the receiving neuron by a *synaptic gap* (or *synaptic cleft*) less than a millionth of an inch wide. Spanish anatomist Santiago Ramon y Cajal (1852–1934) marveled at these near-unions of neurons, calling them "protoplasmic kisses." "Like elegant ladies air-kissing so as not to muss their makeup, dendrites and axons don't quite touch," notes poet Diane Ackerman (2004). How do the neurons execute this protoplasmic kiss, sending information across the tiny synaptic gap? The answer is one of the important scientific discoveries of our age.

When an action potential reaches the knoblike terminals at an axon's end, it triggers the release of chemical messengers called **neurotransmitters** (FIGURE 3.2). Within 1/10,000th of a second, the neurotransmitter molecules cross the synaptic gap and bind to receptor sites on the receiving neuron—as precisely as a key fits a lock. For an instant, the neurotransmitter unlocks tiny channels at the receiving site, and electrically charged atoms flow in, exciting or inhibiting the receiving neuron's readiness to fire. Then, in a process called *reuptake,* the sending neuron reabsorbs the excess neurotransmitters.

threshold the level of stimulation required to trigger a neural impulse.

synapse [SIN-aps] the junction between the axon tip of the sending neuron and the dendrite or cell body of the receiving neuron. The tiny gap at this junction is called the *synaptic gap* or *synaptic cleft.*

neurotransmitters chemical messengers that cross the synaptic gaps between neurons. When released by the sending neuron, neurotransmitters travel across the synapse and bind to receptor sites on the receiving neuron, thereby influencing whether that neuron will generate a neural impulse.

How Neurotransmitters Influence Us

3-3: How do neurotransmitters influence behavior?

In their quest to understand neural communication, researchers have discovered dozens of different neurotransmitters and raised new questions: Are certain neurotransmitters found only in specific places? How do they affect our moods, memories, and mental abilities? Can we boost or diminish these effects through drugs or diet?

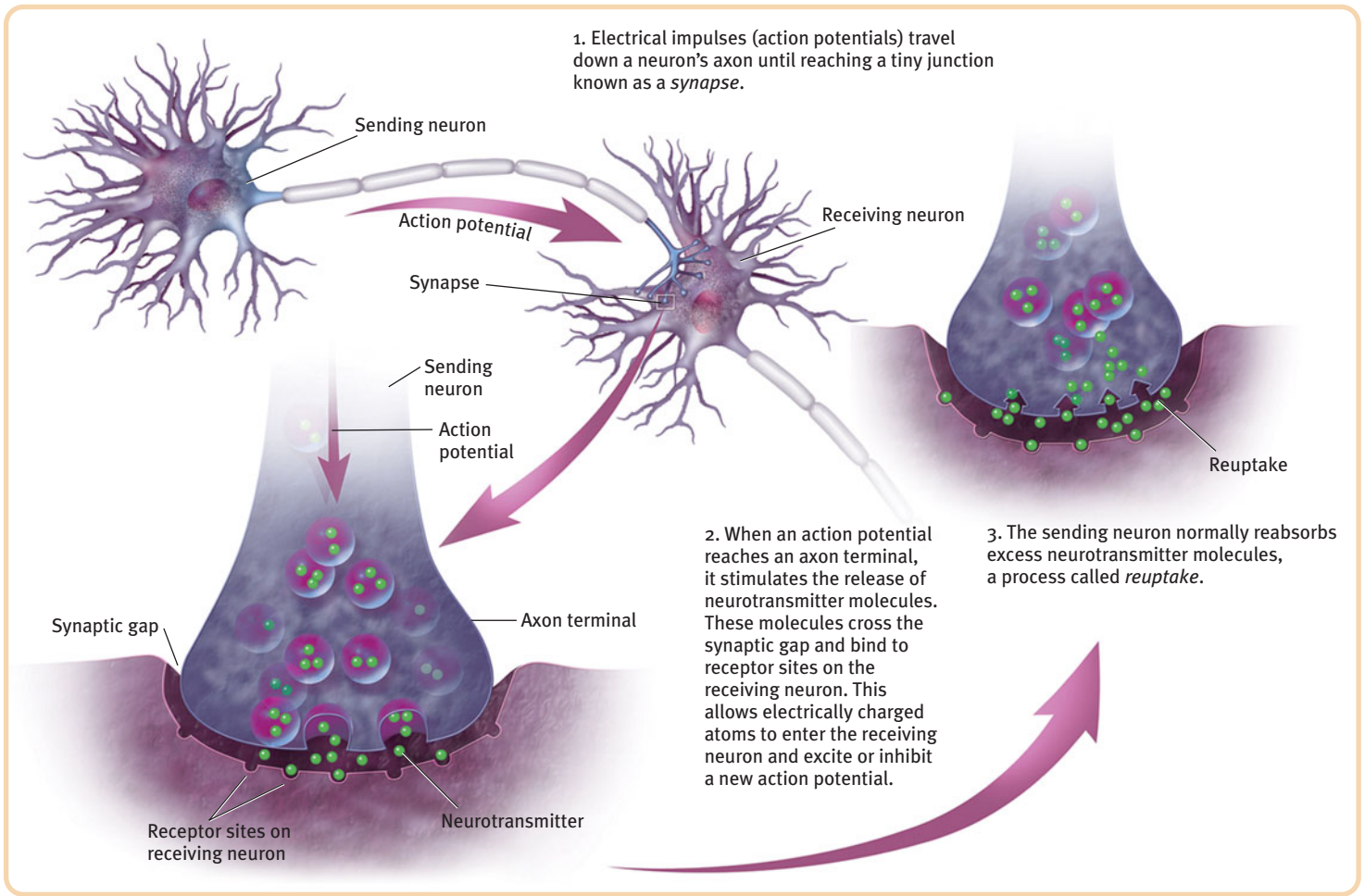
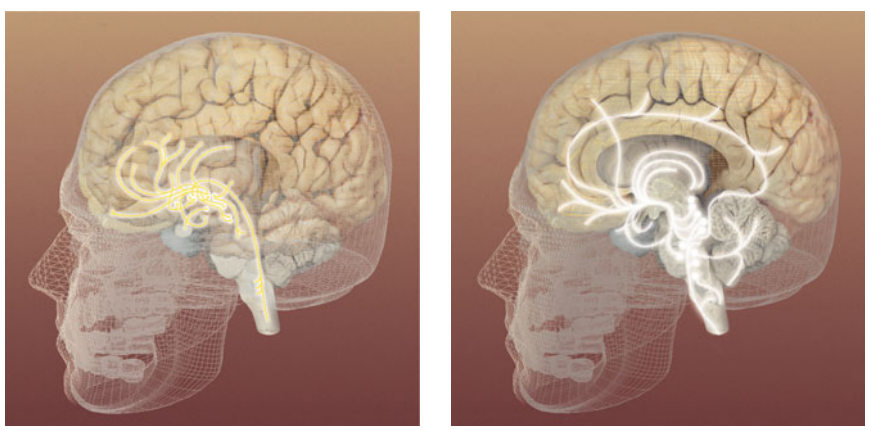


FIGURE 3.2 How neurons communicate

"When it comes to the brain, if you want to see the action, follow the neurotransmitters."

—Neuroscientist Floyd Bloom (1993)

Other modules explore neurotransmitter influences on hunger and thinking, depression and euphoria, addictions and therapy. For now, let's glimpse how neurotransmitters influence our motions and our emotions. A particular pathway in the brain may use only one or two neurotransmitters (**FIGURE 3.3**), and particular neurotransmitters may have particular effects on behavior and emotions (**TABLE 3.1** on the next page offers examples). Acetylcholine (ACh) is one of the best-understood neurotransmitters. In addition to its role in learning and memory, ACh is the messenger at every junction between a motor neuron (which carries information from the brain and spinal cord to the body's tissues) and skeletal muscles. When ACh is released to our muscle cell receptors, the muscle contracts. If ACh transmission is



Both photos from *Mapping the Mind*, Rita Carter, © 1989 University of California Press

Serotonin pathways

Dopamine pathways

FIGURE 3.3 Neurotransmitter pathways
Each of the brain's differing chemical messengers has designated pathways where it operates. Shown here are the pathways for serotonin and dopamine (Carter, 1998).

endorphins [en-DOR-fins] "morphine within"—natural, opiatelike neurotransmitters linked to pain control and to pleasure.

nervous system the body's speedy, electrochemical communication network, consisting of all the nerve cells of the peripheral and central nervous systems.

central nervous system (CNS) the brain and spinal cord.

peripheral nervous system (PNS) the sensory and motor neurons that connect the central nervous system (CNS) to the rest of the body.

nerves bundled axons that form neural "cables" connecting the central nervous system with muscles, glands, and sense organs.

sensory neurons neurons that carry incoming information from the sensory receptors to the brain and spinal cord.

motor neurons neurons that carry outgoing information from the brain and spinal cord to the muscles and glands.

interneurons neurons within the brain and spinal cord that communicate internally and intervene between the sensory inputs and motor outputs.

TABLE 3.1 Some Neurotransmitters and Their Functions

Neurotransmitter	Function	Examples of Malfunctions
Acetylcholine (ACh)	Enables muscle action, learning, and memory	With Alzheimer's disease, ACh-producing neurons deteriorate.
Dopamine	Influences movement, learning, attention, and emotion	Excess dopamine receptor activity is linked to schizophrenia. Starved of dopamine, the brain produces the tremors and decreased mobility of Parkinson's disease.
Serotonin	Affects mood, hunger, sleep, and arousal	Undersupply is linked to depression. Prozac and some other antidepressant drugs raise serotonin levels.
Norepinephrine	Helps control alertness and arousal	Undersupply can depress mood.
Endorphins	Lessen pain and boost mood	If flooded with artificial opiates, the brain may stop producing endorphins, causing intense discomfort.

blocked, as happens during some kinds of anesthesia, the muscles cannot contract and we are paralyzed.

Candace Pert and Solomon Snyder (1973) made an exciting discovery about neurotransmitters when they attached a radioactive tracer to morphine, showing where it was taken up in an animal's brain. The morphine, an opiate drug that elevates mood and eases pain, bound to receptors in areas linked with mood and pain sensations. But why would the brain have these "opiate receptors"? Why would it have a chemical lock, unless it also had a natural key to open it?

Researchers soon confirmed that the brain does indeed produce its own naturally occurring opiates. Our body releases several types of neurotransmitter molecules similar to morphine in response to pain and vigorous exercise. These **endorphins** (short for *end*ogenous [produced within] m*orphine*), as we now call them, help explain good feelings such as the "runner's high," the painkilling effects of acupuncture, and the indifference to pain in some severely injured people.

Drugs and other chemicals affect brain chemistry at synapses, often by either exciting or inhibiting neurons' firing. *Agonist* molecules may be similar enough to a neurotransmitter to bind to its receptor and mimic its effects. Some opiate drugs are agonists and produce a temporary "high" by amplifying normal sensations of arousal or pleasure. *Antagonists* also bind to receptors but their effect is instead to block a neurotransmitter's functioning. They may occupy sites on the receiving neuron and block the neurotransmitter's effects. Curare, a poison some South American Indians have applied to hunting-dart tips, occupies and blocks ACh receptor sites on muscles, producing paralysis in animals struck by the dart.

Physician Lewis Thomas, on the endorphins: "There it is, a biologically universal act of mercy. I cannot explain it, except to say that I would have put it in had I been around at the very beginning, sitting as a member of a planning committee."

***—The Youngest Science,* 1983**

The Nervous System

3-4: What are the functional divisions of the nervous system?

To live is to take in information from the world and the body's tissues, to make decisions, and to send back information and orders to the body's tissues. All this happens thanks to our body's **nervous system.** The brain and spinal cord form the **central nervous system (CNS),** the body's decision maker. The **peripheral nervous system (PNS)** is responsible for gathering information and for transmitting CNS decisions to other body parts. **Nerves,** electrical cables formed of bundles of axons, link the CNS with the body's sensory receptors, muscles, and glands.

The optic nerve, for example, bundles a million axons into a single cable carrying the messages each eye sends to the brain (Mason & Kandel, 1991).

Information travels in the nervous system through three types of neurons. **Sensory neurons** carry messages from the body's tissues and sensory receptors inward to the brain and spinal cord, for processing. The central nervous system then sends instructions out to the body's tissues via the **motor neurons.** In between the sensory input and motor output, **interneurons** process information within the CNS. Our complexity resides mostly in our interneuron systems. Our nervous system has a few million sensory neurons, a few million motor neurons, and billions and billions of interneurons.

The Peripheral Nervous System

Our peripheral nervous system has two components—somatic and autonomic. Our **somatic nervous system** enables voluntary control of our skeletal muscles. As you reach the bottom of this page, your somatic nervous system will report to your brain the current state of your skeletal muscles and carry instructions back, triggering your hand to turn the page.

Our **autonomic nervous system** controls our glands and the muscles of our internal organs, influencing such functions as glandular activity, heartbeat, and digestion. Like an automatic pilot, this system may be consciously overridden, but usually it operates on its own (autonomously). **FIGURE 3.4** outlines the nervous system.

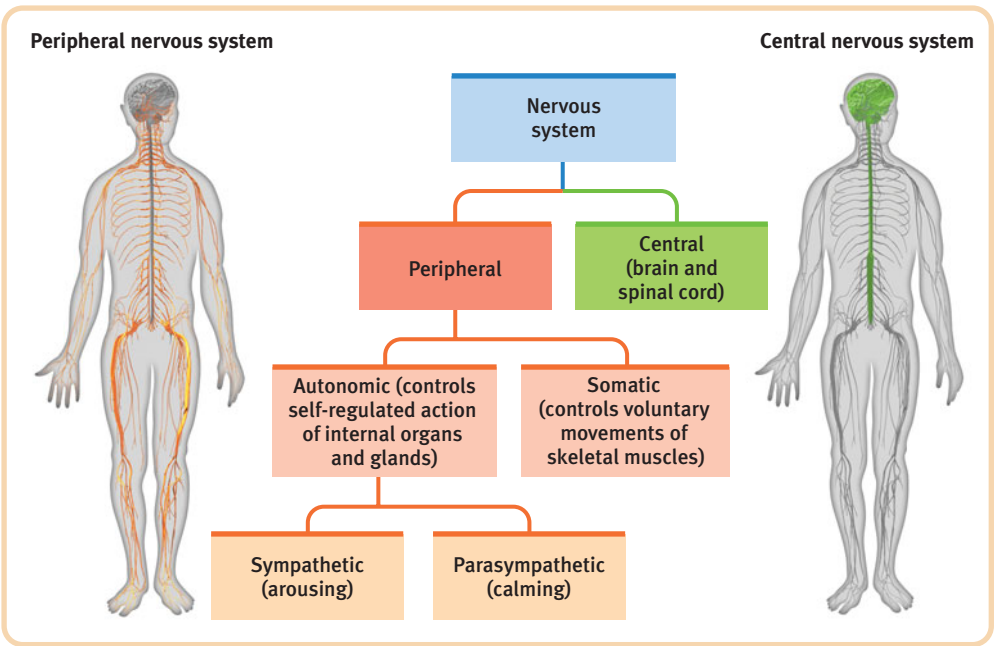


FIGURE 3.4 The functional divisions of the human nervous system

The autonomic nervous system serves two important, basic functions (**FIGURE 3.5** on the next page). The **sympathetic nervous system** arouses and expends energy. If something alarms, enrages, or challenges you, your sympathetic system will accelerate your heartbeat, raise your blood pressure, slow your digestion, raise your blood sugar, and cool you with perspiration, making you alert and ready for action. When the stress subsides, your **parasympathetic nervous system** produces opposite effects. It conserves energy as it calms you by decreasing your heartbeat, lowering your blood sugar, and so forth. In everyday situations, the sympathetic and parasympathetic nervous systems work together to keep you in a steady internal state.

somatic nervous system the division of the peripheral nervous system that controls the body's skeletal muscles. Also called the *skeletal nervous system.*

autonomic [aw-tuh-NAHM-ik] **nervous system** the part of the peripheral nervous system that controls the glands and the muscles of the internal organs (such as the heart). Its sympathetic division arouses; its parasympathetic division calms.

sympathetic nervous system the division of the autonomic nervous system that arouses the body, mobilizing its energy in stressful situations.

parasympathetic nervous system the division of the autonomic nervous system that calms the body, conserving its energy.

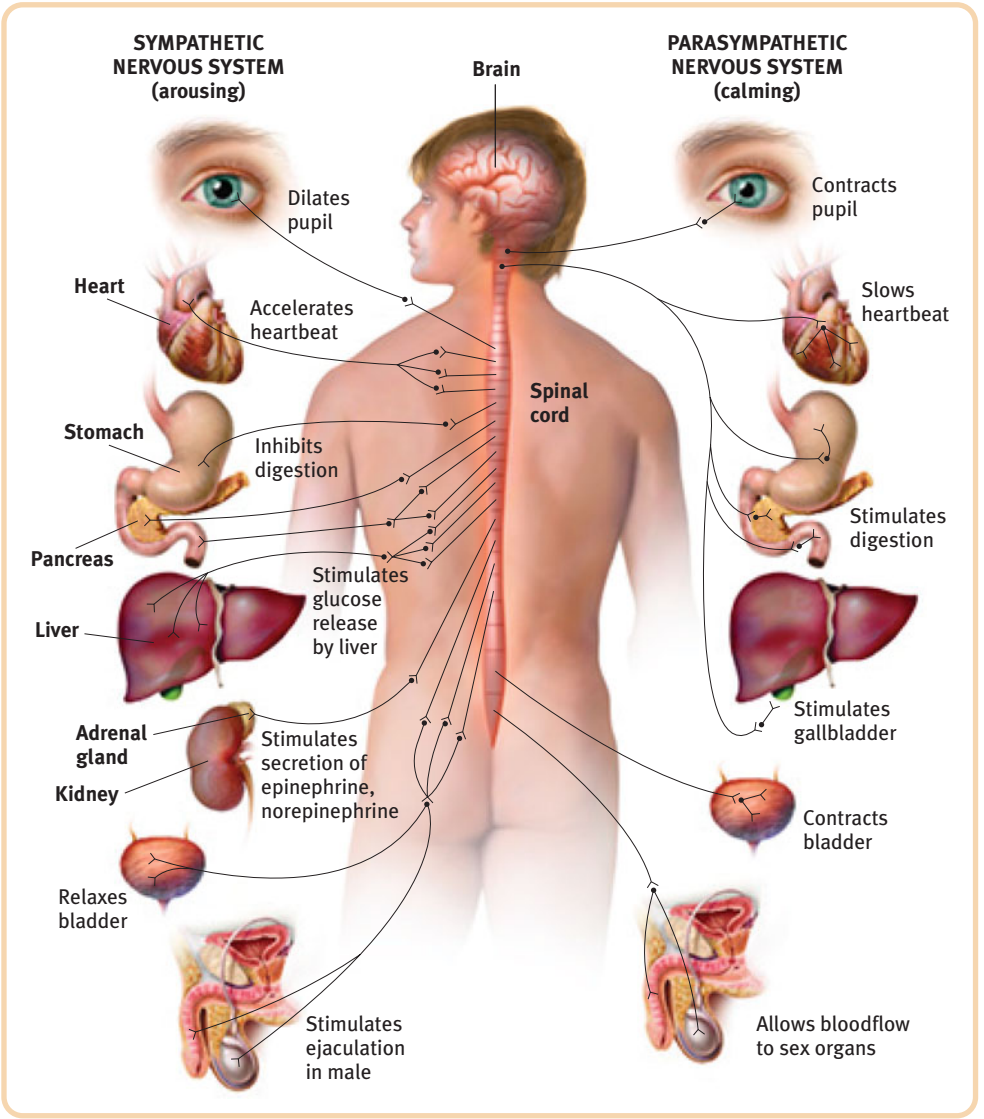


FIGURE 3.5 The dual functions of the autonomic nervous system The autonomic nervous system controls the more autonomous (or self-regulating) internal functions. Its *sympathetic division* arouses and expends energy. Its *parasympathetic division* calms and conserves energy, allowing routine maintenance activity. For example, sympathetic stimulation accelerates heartbeat, whereas parasympathetic stimulation slows it.

The Central Nervous System

From the simplicity of neurons "talking" to other neurons arises the complexity of the central nervous system's brain and spinal cord.

It is the brain that enables our humanity—our thinking, feeling, and acting. Tens of billions of neurons, each communicating with thousands of other neurons, yield an ever-changing wiring diagram that dwarfs a powerful computer. With some 40 billion neurons, each having roughly 10,000 contacts with other neurons, we end up with perhaps 400 trillion synapses—places where neurons meet and greet their neighbors (de Courten-Myers, 2005). A grain-of-sand–sized speck of your brain contains some 100,000 neurons and one billion "talking" synapses (Ramachandran & Blakeslee, 1998).

Stephen Colbert: "How does the brain work? Five words or less."
Steven Pinker: "Brain cells fire in patterns."
—*The Colbert Report,* February 8, 2007

The brain's neurons cluster into work groups called *neural networks.* To understand why, Stephen Kosslyn and Olivier Koenig (1992, p. 12) have invited us to "think about why cities exist; why don't people distribute themselves more evenly across the countryside?" Like people networking with people, neurons network with nearby neurons with which they can have short, fast connections.

The *spinal cord* is an information highway connecting the peripheral nervous system to the brain. Ascending neural fibers send up sensory information, and descending fibers send back motor-control information. The neural pathways governing our **reflexes,** our automatic responses to stimuli, illustrate the spinal cord's work. A simple

spinal reflex pathway is composed of a single sensory neuron and a single motor neuron. These often communicate through an interneuron. The knee-jerk response, for example, involves one such simple pathway. A headless warm body could do it.

Another such pathway enables the pain reflex illustrated in **FIGURE 3.6**. When your finger touches a flame, neural activity excited by the heat travels via sensory neurons to interneurons in your spinal cord. These interneurons respond by activating motor neurons leading to the muscles in your arm. Because the simple pain reflex pathway runs through the spinal cord and right back out, your hand jerks from the candle's flame *before* your brain receives and responds to the information that causes you to feel pain. That's why it feels as if your hand jerks away not by your choice, but on its own.

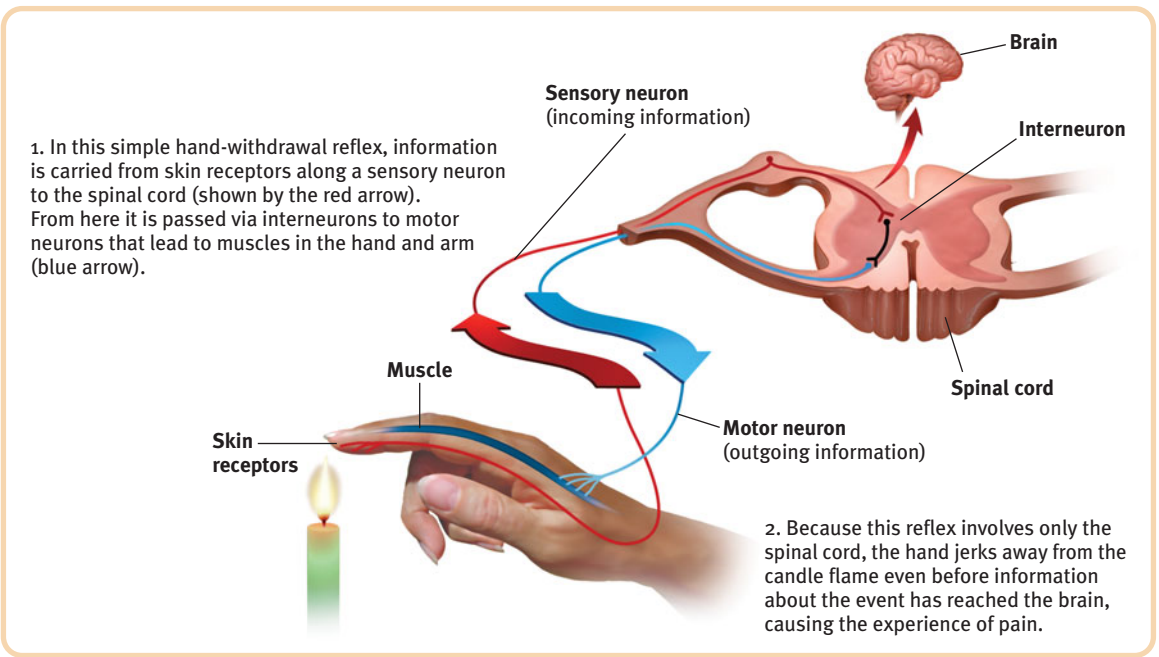


FIGURE 3.6 A simple reflex

Information travels to and from the brain by way of the spinal cord. Were the top of your spinal cord severed, you would not feel pain from your body below. Nor would you feel pleasure. With your brain literally out of touch with your body, you would lose all sensation and voluntary movement in body regions with sensory and motor connections to the spinal cord below its point of injury. You would exhibit the knee-jerk without feeling the tap. When the brain center keeping the brakes on erections is severed, men paralyzed below the waist may be capable of an erection (a simple reflex) if their genitals are stimulated (Goldstein, 2000). Women similarly paralyzed may respond with vaginal lubrication. But, depending on where and how completely the spinal cord is severed, they may be genitally unresponsive to erotic images and have no genital feeling (Kennedy & Over, 1990; Sipski & Alexander, 1999). To produce bodily pain or pleasure, the sensory information must reach the brain.

reflex a simple, automatic response to a sensory stimulus, such as the knee-jerk response.

The Endocrine System

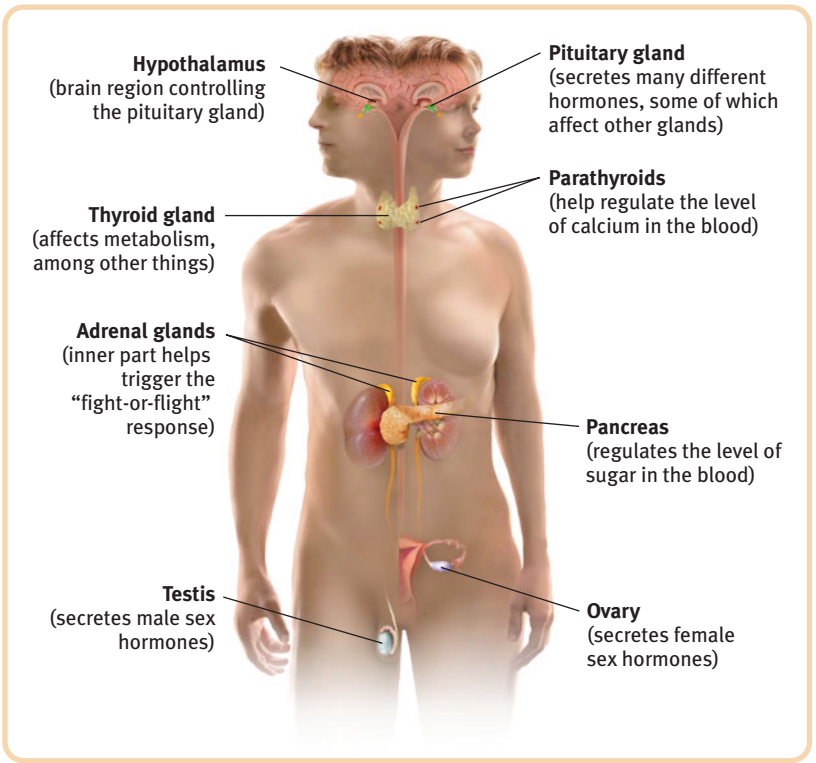
3-5: How does the endocrine system—the body's slower information system—transmit its messages?

So far we have focused on the body's speedy electrochemical information system. Interconnected with the nervous system is a second communication system, the **endocrine system.** The endocrine system's glands secrete another form of chemical messengers, **hormones,** which travel through the bloodstream and affect other tissues, including the brain. When they act on the brain, they influence our interest

endocrine [EN-duh-krin] **system** the body's "slow" chemical communication system; a set of glands that secrete hormones into the bloodstream.

hormones chemical messengers that are manufactured by the endocrine glands, travel through the bloodstream, and affect other tissues.

FIGURE 3.7 The endocrine system



in sex, food, and aggression. **FIGURE 3.7** illustrates the locations and functions of glands in the endocrine system.

Some hormones are chemically identical to neurotransmitters (those chemical messengers that diffuse across a synapse and excite or inhibit an adjacent neuron). The endocrine system and nervous system are therefore close relatives: Both produce molecules that act on receptors elsewhere. Like many relatives, they also differ. The speedy nervous system zips messages from eyes to brain to hand in a fraction of a second. Endocrine messages trudge along in the bloodstream, taking several seconds or more to travel from the gland to the target tissue. If the nervous system's communication delivers messages rather like e-mail, the endocrine system is the body's snail mail. But slow and steady sometimes wins the race. Endocrine messages tend to outlast the effects of neural messages. That helps explain why upset feelings may linger, sometimes beyond our thinking about what upset us. In a moment of danger, for example, the autonomic nervous system orders the **adrenal glands** on top of the kidneys to release *epinephrine* and *norepinephrine* (also called *adrenaline* and *noradrenaline*). These hormones increase heart rate, blood pressure, and blood sugar, providing us with a surge of energy. When the emergency passes, the hormones—and the feelings of excitement—linger a while. The endocrine system's hormones influence many aspects of our lives—growth, reproduction, metabolism, mood—and work with our nervous system to keep everything in balance while we respond to stress, exertion, and our own thoughts.

The most influential endocrine gland is the **pituitary gland,** a pea-sized structure located in the core of the brain, where it is controlled by an adjacent brain area, the *hypothalamus*. The pituitary releases hormones that influence growth. Its secretions also influence the release of hormones by other endocrine glands. The pituitary, then, is a sort of master gland (whose own master is the hypothalamus). For example, under the brain's influence, the pituitary triggers your sex glands to release sex hormones. These in turn influence your brain and behavior.

This feedback system (brain → pituitary → other glands → hormones → brain) reveals the intimate connection of the nervous and endocrine systems. The nervous system directs endocrine secretions, which then affect the nervous system. Conducting and coordinating this whole electrochemical orchestra is that maestro we call the brain.

adrenal [ah-DREEN-el] **glands** a pair of endocrine glands that sit just above the kidneys and secrete hormones (epinephrine and norepinephrine) that help arouse the body in times of stress.

pituitary gland the endocrine system's most influential gland. Under the influence of the hypothalamus, the pituitary regulates growth and controls other endocrine glands.

Neural and Hormonal Systems

Module Review

3-1: What are neurons, and how do they transmit information? *Neurons* are the elementary components of the nervous system, the body's speedy electrochemical information system. A neuron sends signals through its *axons,* and receives signals through its branching *dendrites.* If the combined signals are strong enough, the neuron fires, transmitting an electrical impulse (the *action potential*) down its axon by means of a chemistry-to-electricity process. The neuron's reaction is an all-or-none process.

3-2: How do nerve cells communicate with other nerve cells? When action potentials reach the end of an axon (the axon terminals), they stimulate the release of *neurotransmitters.* These chemical messengers carry a message from the sending neuron across a *synapse* to receptor sites on a receiving neuron. The sending neuron, in a process called reuptake, then normally reabsorbs the excess neurotransmitter molecules in the synaptic gap. The receiving neuron, if the signals from that neuron and others are strong enough, generates its own action potential and relays the message to other cells.

3-3: How do neurotransmitters influence behavior? Each neurotransmitter travels a designated path in the brain and has a particular effect on behavior and emotions. Acetylcholine affects muscle action, learning, and memory. *Endorphins* are natural opiates released in response to pain and exercise.

3-4: What are the functional divisions of the nervous system? The *nervous system* is divided into the *central nervous system* (*CNS*—the brain and spinal cord) and the *peripheral nervous system (PNS),* which connects the CNS to the rest of the body by means of *nerves.* The PNS has two main divisions. The *somatic nervous system* enables voluntary control of the skeletal muscles. The *autonomic nervous system,* through its *sympathetic* and *parasympathetic* divisions, controls involuntary muscles and glands. Neurons are the basic building blocks of the nervous system. *Sensory neurons* carry incoming information from sense receptors to the brain and spinal cord, and *motor neurons* carry information from the brain and spinal cord out to the muscles and glands. *Interneurons* communicate within the brain and spinal cord and between sensory and motor neurons. Neurons cluster into working neural networks.

3-5: How does the endocrine system—the body's slower information system—transmit its messages? The *endocrine system* is a set of glands that secrete *hormones* into the bloodstream, where they travel through the body and affect other tissues, including the brain. In an intricate feedback system, the brain's hypothalamus influences the *pituitary gland* (the endocrine system's master gland) which influences other glands (such as the *adrenals*) to release hormones, which in turn influence the brain.

Rehearse It!

1. The neuron fiber that carries messages to other neurons is the
   a. dendrite.
   b. axon.
   c. cell body.
   d. myelin.

2. The tiny space between the axon of a sending neuron and the dendrite or cell body of a receiving neuron is called the
   a. axon terminal.
   b. branching fiber.
   c. synaptic gap.
   d. threshold.

3. The neuron's response to stimulation is an all-or-none response, meaning that the intensity of the stimulus determines
   a. whether or not an impulse is generated.
   b. how fast an impulse is transmitted.
   c. how intense an impulse will be.
   d. whether the stimulus is excitatory or inhibitory.

4. When an action potential reaches the axon terminal of a neuron, it triggers the release of chemical messengers called
   a. dendrites.
   b. synapses.
   c. neural impulses.
   d. neurotransmitters.

5. Endorphins are released in the brain in response to
   a. morphine or heroin.
   b. pain or vigorous exercise.
   c. the all-or-none response.
   d. All of these answers are correct.

6. The autonomic nervous system controls internal functions, such as heart rate and glandular activity. The word *autonomic* means
   a. calming.
   b. voluntary.
   c. self-regulating.
   d. arousing.

7. The sympathetic nervous system arouses us for action and the parasympathetic nervous system calms us down. Together, the two systems make up the
   a. autonomic nervous system.
   b. somatic nervous system.
   c. central nervous system.
   d. peripheral nervous system.

8. The neurons of the spinal cord are part of the
   a. somatic nervous system.
   b. central nervous system.
   c. autonomic nervous system.
   d. peripheral nervous system.

9. The most influential endocrine gland, known as the master gland, is the
   a. pituitary.
   b. hypothalamus.
   c. kidney.
   d. adrenal.

10. _____ secrete(s) epinephrine and norepinephrine, helping to arouse the body during times of stress.
    a. Adrenal glands
    b. The pituitary gland
    c. The hypothalamus
    d. Neurotransmitters

Answers: 1. b, 2. c, 3. a, 4. d, 5. b, 6. c, 7. a, 8. b, 9. a, 10. a.

Terms and Concepts to Remember

biological psychology, p. 37
neuron, p. 37
dendrite, p. 37
axon, p. 37
action potential, p. 37
threshold, p. 38
synapse [SIN-aps], p. 38
neurotransmitters, p. 38
endorphins [en-DOR-fins], p. 40
nervous system, p. 40
central nervous system (CNS), p. 40
peripheral nervous system (PNS), p. 40
nerves, p. 40
sensory neurons, p. 41
motor neurons, p. 41
interneurons, p. 41
somatic nervous system, p. 41
autonomic [aw-tuh-NAHM-ik] nervous system, p. 41
sympathetic nervous system, p. 41
parasympathetic nervous system, p. 41
reflex, p. 42
endocrine [EN-duh-krin] system, p. 43
hormones, p. 43
adrenal [ah-DREEN-el] glands, p. 44
pituitary gland, p. 44

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. In *The Astonishing Hypothesis* (1994, p. 49), Sir Francis Crick noted, "What one neuron tells another neuron is simply how much it is excited." Using terms from this module, compare the neural communication when we are (a) tapped gently on the arm, and (b) slapped across the face.

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 4

The Brain

When you think *about* your brain, you're thinking *with* your brain—sending billions of neurotransmitter molecules across countless millions of synapses. Indeed, say neuroscientists, *the mind is what the brain does*.

Even in a motionless body, the brain—and mind—may, in some cases, be active. One 23-year-old woman showed no outward signs of conscious awareness after a traffic accident. Nevertheless, when researchers asked her to imagine playing tennis or moving around her home, brain scans revealed activity like that of healthy volunteers (Owen et al., 2006). As she imagined playing tennis, for example, an area of her brain controlling arm and leg movements became active.

A century ago, scientists had no tools high-powered yet gentle enough to reveal such activity in a living human brain. Clinical observations had unveiled some brain-mind connections. Physicians noted, for example, that damage to one side of the brain often caused numbness or paralysis on the body's opposite side, suggesting that the body's right side is wired to the brain's left side, and vice versa. Others noticed that damage to the back of the brain disrupted vision, and that damage to the left-front part of the brain produced speech difficulties. Gradually, these early explorers were mapping the brain.

Now, within a lifetime, the whole brain-mapping process has changed. The known universe's most amazing organ is being probed and mapped by a new generation of neural mapmakers. Their techniques for peering into the thinking, feeling brain are doing for psychology what the microscope did for biology and the telescope did for astronomy. Close-Up: The Tools of Discovery—Having Our Head Examined on the next page looks at some techniques that enable neuroscientists to study the working brain.

Tom Landers/*Boston Globe*

Banking brains Francine Benes, director of McLean Hospital's Brain Bank, sees the collection as a valuable database.

Older Brain Structures

4-1: What are the functions of important lower-level brain structures?

Indicators of an animal's capacities come from its brain structures. In primitive animals, such as sharks, a not-so-complex brain primarily regulates basic survival functions: breathing, resting, and feeding. In lower mammals, such as rodents, a more complex brain enables emotion and greater memory. In advanced mammals, such as humans, a brain that processes more information enables foresight as well.

This increasing complexity arises from new brain systems built on top of the old, much as the Earth's landscape covers the old with the new. Digging down, one discovers the fossil remnants of the past—brainstem components performing for us much as they did for our distant ancestors. Let's start with the brain's basement and work up to the newer systems.

The Brainstem

The brain's oldest and innermost region is the **brainstem.** It begins where the spinal cord swells slightly after entering the skull. This slight swelling is the **medulla.** Here lie the controls for your heartbeat and breathing. Just above the medulla sits the *pons,* which helps coordinate movements. If a cat's brainstem is severed from the rest of the brain above it, the animal will still breathe and live—and even run, climb, and groom (Klemm, 1990). But cut off from the brain's higher regions, it won't purposefully run or climb to get food.

The brainstem is a crossover point, where most nerves to and from each side of the brain connect with the body's opposite side. This peculiar cross-wiring is but one of the brain's many surprises.

brainstem the oldest part and central core of the brain, beginning where the spinal cord swells as it enters the skull; the brainstem is responsible for automatic survival functions.

medulla [muh-DUL-uh] the base of the brainstem; controls heartbeat and breathing.

Close-Up:

The Tools of Discovery—Having Our Head Examined

4-2: How do neuroscientists study the brain's connections to behavior and mind?

Whether in the interests of science or medicine, today's scientists can selectively **lesion** (destroy) tiny clusters of normal or defective brain cells, leaving the surrounding tissue unharmed. They can snoop on the messages of individual neurons, using modern microelectrodes with tips so small they can detect the electrical pulse in a single neuron. For example, we can now detect exactly where the information goes in a cat's brain when someone strokes its whisker. They can also electrically, chemically, or magnetically stimulate various parts of the brain and note the effects; eavesdrop on the chatter of billions of neurons; and see color representations of the brain's energy-consuming activity.

Right now, your mental activity is giving off telltale electrical, metabolic, and magnetic signals that neuroscientists could trap to observe your brain at work. For example, electrical activity in your brain's billions of neurons sweeps in regular waves across its surface. An **electroencephalogram (EEG)** will give an amplified read-out of such waves (**FIGURE 4.1**).

"You must look into people, as well as at them," advised Lord Chesterfield in a 1746 letter to his son. Newer windows into the brain give us that Supermanlike ability to see inside a living brain. One such tool, the **PET (positron emission tomography) scan** (**FIGURE 4.2**), depicts brain activity by showing each brain area's consumption of its chemical fuel, the sugar glucose. Active neurons are glucose hogs, and after a person receives temporarily radioactive glucose, the PET scan can track the gamma rays released by this "food for thought" as the person performs a given task. Rather like weather radar showing rain activity, PET scan "hot spots" show which brain areas are most active as the person does mathematical calculations, looks at images of faces, or daydreams.

MRI (magnetic resonance imaging) can also be used to scan the brain or other body parts. In MRI brain scans, the person's head is put in a strong magnetic field, which aligns the spinning atoms of brain molecules. Then a radio wave pulse momentarily disorients the atoms. When the atoms return to their normal spin, they release signals that provide a detailed picture of the brain's soft tissues. MRI scans have revealed a larger-than-average neural area in the left hemisphere of musicians who display perfect pitch (Schlaug et al., 1995). They have also revealed enlarged *ventricles*—fluid-filled brain areas (marked by the red arrows in **FIGURE 4.3**)—in some patients with schizophrenia, a disabling psychological disorder.

A special application of MRI—**fMRI (functional MRI)**—can reveal the brain's functioning as well as its structure. Where the brain is especially active, blood goes. By comparing MRI scans taken less than a second apart, researchers can watch the brain "light up" (with increased oxygen-laden bloodflow) as a person performs different mental functions. As the person looks at a scene, for example, the fMRI machine detects blood rushing to the back of the brain, which processes visual information (see Figure 4.14, in the discussion of cortex functions). Such snapshots of the brain's changing activity are providing new insights into how the brain divides its labor.

To be learning about the neurosciences now is like studying world geography while Magellan was exploring the seas. This truly is the golden age of brain science.

A.J. Photo/Photo Researchers, Inc.

FIGURE 4.1 An electroencephalograph providing amplified tracings of waves of electrical activity in the brain Here it is displaying the brain activity of this 4-year-old who has epilepsy.

Courtesy of Brookhaven National Laboratories

FIGURE 4.2 The PET scan To obtain a PET scan, researchers inject volunteers with a low and harmless dose of a short-lived radioactive sugar. Detectors around the person's head pick up the release of gamma rays from the sugar, which has concentrated in active brain areas. A computer then processes and translates these signals into a map of the brain at work.

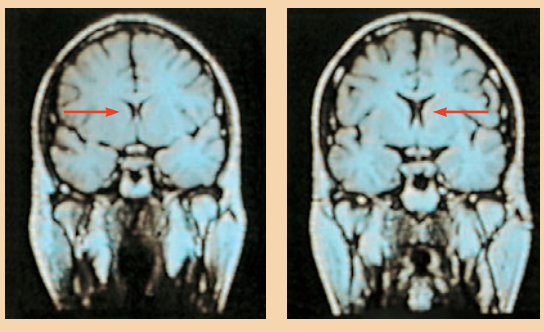
lesion [LEE-zhuhn] tissue destruction. A brain lesion is a naturally or experimentally caused destruction of brain tissue.

electroencephalogram (EEG) an amplified recording of the waves of electrical activity that sweep across the brain's surface. These waves are measured by electrodes placed on the scalp.

PET (positron emission tomography) scan a visual display of brain activity that detects where a radioactive form of glucose goes while the brain performs a given task.

MRI (magnetic resonance imaging) a technique that uses magnetic fields and radio waves to produce computer-generated images of soft tissue. MRI scans show brain anatomy.

fMRI (functional MRI) a technique for revealing bloodflow and, therefore, brain activity by comparing successive MRI scans. fMRI scans show brain function.



Both photos from Daniel Weinberger, M.D., CBDB,NIMH

FIGURE 4.3 MRI scan of a healthy individual (left) and a person with schizophrenia (right) Note the enlarged ventricle, the fluid-filled brain region at the tip of the arrow in the image on the right.

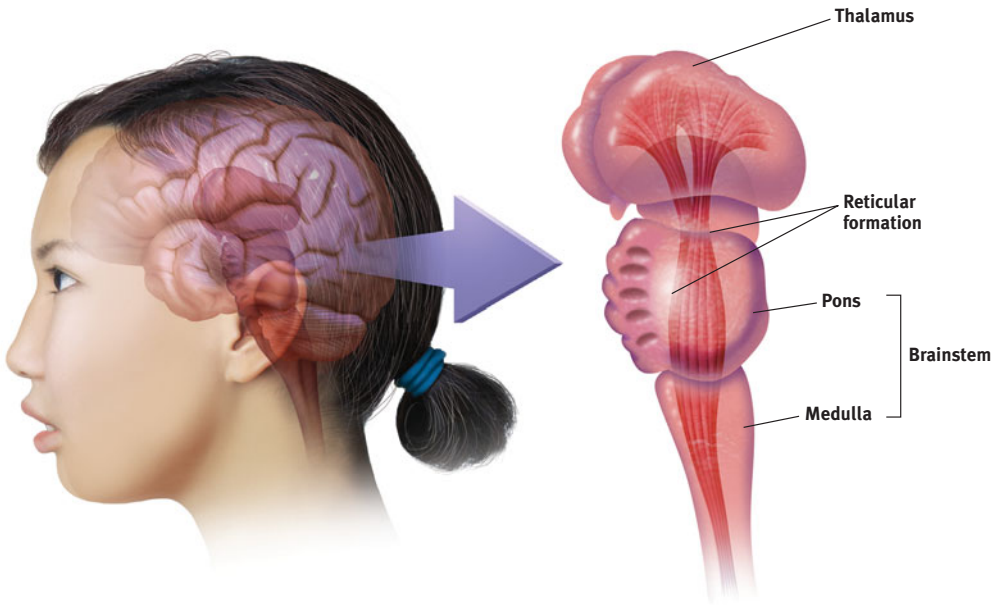


FIGURE 4.4 The brainstem and thalamus The brainstem, including the pons and medulla, is an extension of the spinal cord. The thalamus is attached to the top of the brainstem. The reticular formation passes through both structures.

The Thalamus

Sitting at the top of the brainstem is the **thalamus** (**FIGURE 4.4**). This joined pair of egg-shaped structures acts as the brain's sensory switchboard. It receives information from all the senses except smell and routes it to the higher brain regions that deal with seeing, hearing, tasting, and touching. Think of the thalamus as being to sensory input what London is to England's trains: a hub through which traffic passes en route to various destinations. The thalamus also receives some of the higher brain's replies, which it then directs to the medulla and to the cerebellum.

The Reticular Formation

Inside the brainstem, between your ears, lies the **reticular** ("netlike") **formation,** a finger-shaped network of neurons that extends from the spinal cord right up through the thalamus. As the spinal cord's sensory input travels up to the thalamus, some of it travels through the reticular formation, which filters incoming stimuli and relays important information to other areas of the brain.

In 1949, Giuseppe Moruzzi and Horace Magoun discovered that electrically stimulating the reticular formation of a sleeping cat almost instantly produced an awake, alert animal. When Magoun *severed* a cat's reticular formation from higher brain regions, without damaging the nearby sensory pathways, the effect was equally dramatic: The cat lapsed into a coma from which it never awakened. The reticular formation affects arousal.

The Cerebellum

Extending from the rear of the brainstem is the baseball-sized **cerebellum,** meaning "little brain," which is what its two wrinkled halves resemble (**FIGURE 4.5** on the next page). The cerebellum enables one type of nonverbal learning and memory. It helps us judge time, modulate our emotions, and discriminate sounds and textures (Bower & Parsons, 2003). It also coordinates voluntary movement. When soccer great David Beckham fires the ball into the net with a perfectly timed kick, give his cerebellum some credit. If you injured your cerebellum, you would have difficulty walking, keeping your balance, or shaking hands. Your movements would be jerky and exaggerated. Under alcohol's influence on the cerebellum, walking may lack coordination, as many a driver has learned after being pulled over and given a roadside test.

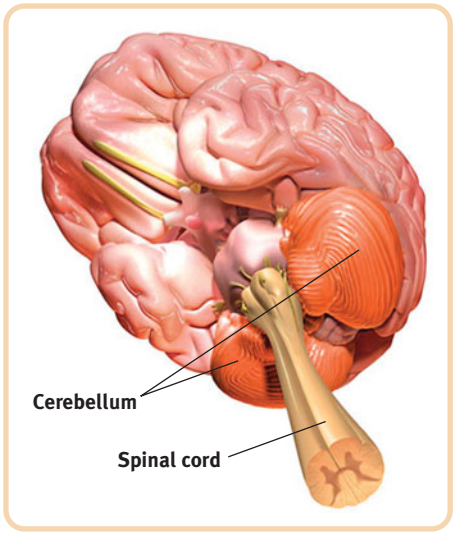
thalamus [THAL-uh-muss] the brain's sensory switchboard, located on top of the brainstem; it directs messages to the sensory receiving areas in the cortex and transmits replies to the cerebellum and medulla.

reticular formation a nerve network in the brainstem that plays an important role in controlling arousal.

cerebellum [sehr-uh-BELL-um] the "little brain" at the rear of the brainstem; functions include some nonverbal learning, processing sensory input, and coordinating movement output and balance.

FIGURE 4.5 The brain's organ of agility Hanging at the back of the brain, the cerebellum coordinates our voluntary movements, as when David Beckham directs the ball precisely.

Luis Gene/AFP/Getty Images

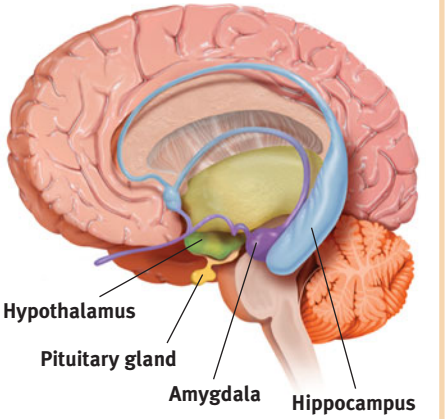


Note: These older brain functions all occur without any conscious effort. This illustrates another of our recurring themes: *Our brain processes most information outside of our awareness.* We are aware of the *results* of our brain's labor (say, our current visual experience) but not of *how* we construct the visual image. Likewise, whether we are asleep or awake, our brainstem manages its life-sustaining functions, freeing our newer brain regions to think, talk, dream, or savor a memory.

"Consciousness is a small part of what the brain does."

—Neuroscientist Joseph LeDoux, in "Mastery of Emotions," 2006

FIGURE 4.6 The limbic system This neural system sits between the brain's older parts and its cerebral hemispheres. The limbic system's hypothalamus controls the nearby pituitary gland.



The Limbic System

At the border ("limbus") between the brain's older parts and the *cerebral hemispheres*—the two halves of the brain—is the **limbic system** (**FIGURE 4.6**). One limbic system component, the *hippocampus*, processes memory: If animals or humans lose their hippocampus to surgery or injury, they become unable to process new memories of facts and episodes. For now, let's look at the limbic system's links to emotions (such as fear and anger) and to basic motives (such as those for food and sex).

The Amygdala

In the limbic system, two lima-bean–sized neural clusters, the **amygdala,** influence aggression and fear (**FIGURE 4.7**). In 1939, psychologist Heinrich Klüver and neurosurgeon Paul Bucy surgically lesioned the part of a rhesus monkey's brain that included the amygdala. The result? The formerly ill-tempered monkey turned into the most mellow of creatures. Poke it, pinch it, do virtually anything that normally would trigger a ferocious response, and still the animal remained placid. What then might happen if we electrically stimulated the amygdala in a normally placid domestic animal, such as a cat? Do so in one spot and the cat prepares to attack, hissing with its back arched, its pupils dilated, its hair on end (**FIGURE 4.8**). Move the electrode only slightly within the amygdala, cage the cat with a small mouse, and now it cowers in terror.

These experiments confirm the amygdala's role in rage and fear, including the perception of these emotions and the processing of emotional memories (Anderson & Phelps, 2000; Poremba & Gabriel, 2001). Still, we must be careful. The brain is not neatly organized into structures that correspond to our categories of behavior.

limbic system neural system (including the *hippocampus*, *amygdala*, and *hypothalamus*) located below the cerebral hemispheres; associated with emotions and drives.

amygdala [uh-MIG-duh-la] two lima-bean–sized neural clusters in the limbic system; linked to emotion.

hypothalamus [hi-po-THAL-uh-muss] a neural structure lying below *(hypo)* the thalamus; it directs several maintenance activities (eating, drinking, body temperature), helps govern the endocrine system via the pituitary gland, and is linked to emotion and reward.


Moonrunner Design Ltd., UK


Frank Siteman/Stock, Boston

FIGURE 4.7 The amygdala

FIGURE 4.8 Aggression as a brain state Back arched and fur fluffed, this fierce cat is ready to attack. Electrical stimulation of a cat's amygdala provokes reactions such as the one shown here, suggesting its role in emotions like rage.

Aggressive and fearful behavior involves neural activity in many brain levels. Even within the limbic system, stimulating structures other than the amygdala can evoke such behavior. If you charge your car's dead battery, you can activate the engine. Yet the battery is merely one link in an integrated system that makes a car go.

The Hypothalamus

Just below *(hypo)* the thalamus is the **hypothalamus** (**FIGURE 4.9**), an important link in the chain of command governing bodily maintenance. Some neural clusters in the hypothalamus influence hunger; others regulate thirst, body temperature, and sexual behavior.

The hypothalamus both monitors blood chemistry and takes orders from other parts of the brain. For example, thinking about sex (in your brain's cerebral cortex) can stimulate your hypothalamus to secrete hormones. These hormones in turn trigger the adjacent "master gland," the pituitary (see Figure 4.6), to influence hormones released by other glands. (Notice the interplay between the nervous and endocrine systems: The brain influences the endocrine system, which in turn influences the brain.)

A remarkable discovery about the hypothalamus illustrates how progress in science often occurs—when curious, open-minded investigators make an unexpected observation. Two young McGill University neuropsychologists, James Olds and Peter Milner (1954), were trying to implant an electrode in a rat's reticular formation when they made a magnificent mistake: They incorrectly placed the electrode in what they later discovered was a region of the rat's hypothalamus (Olds, 1975). Curiously, as if seeking more stimulation, the rat kept returning to the location where it had been stimulated by this misplaced electrode. On discovering their mistake, Olds and Milner alertly realized they had stumbled upon a brain center that provides a pleasurable reward.

In a meticulous series of experiments, Olds (1958) went on to locate other "pleasure centers," as he called them. (What the rats actually experience only they know, and they aren't telling. Rather than attribute human feelings to rats, today's scientists refer to *reward centers,* not "pleasure centers.") When allowed to press pedals to trigger their own stimulation in these areas, rats would sometimes do so at a feverish pace—up to 7000 times per hour—until they dropped from exhaustion. Moreover, to get this stimulation, they would even cross an electrified floor that a starving rat would not cross to reach food (**FIGURE 4.10**).

Reward centers in nearby brain areas were later discovered in many other species, including goldfish, dolphins, and monkeys. In fact, animal research has revealed both a general reward system that triggers the release of the neurotransmitter dopamine, and distributed specific centers associated with the pleasures of eating, drinking, and sex. Animals, it seems, come equipped with built-in systems that reward activities essential to survival.

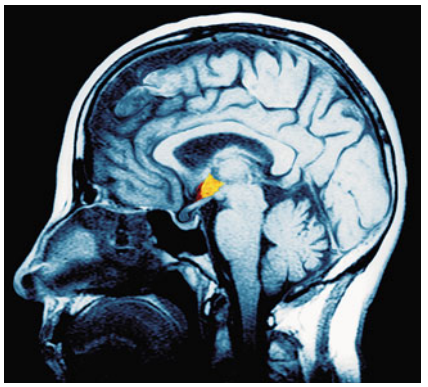
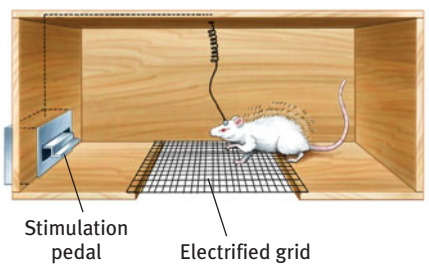

ISM/Phototake

FIGURE 4.9 The hypothalamus This small but important structure, colored yellow-orange in this MRI scan photograph, helps keep the body's internal environment in a steady state.

FIGURE 4.10 Rat with an implanted electrode With an electrode implanted in a reward center of its hypothalamus, the rat readily crosses an electrified grid, accepting the painful shocks, to press a pedal that sends electrical impulses to that center.



"If you were designing a robot vehicle to walk into the future and survive, . . . you'd wire it up so that behavior that ensured the survival of the self or the species—like sex and eating—would be naturally reinforcing."

—Candace Pert (1986)

Do we humans also have brain centers for pleasure? Indeed we do. To calm violent patients, one neurosurgeon implanted electrodes in such areas. Stimulated patients reported mild pleasure; however, unlike Olds' rats, they were not driven to a frenzy (Deutsch, 1972; Hooper & Teresi, 1986). Some researchers believe that addictive disorders, such as alcohol dependence, substance abuse, and binge eating, may stem from a *reward deficiency syndrome*—a genetically disposed deficiency in the natural brain systems for pleasure and well-being that leads people to crave whatever provides that missing pleasure or relieves negative feelings (Blum et al., 1996).

FIGURE 4.11 locates the brain areas we have discussed, as well as the cerebral cortex, our next topic.

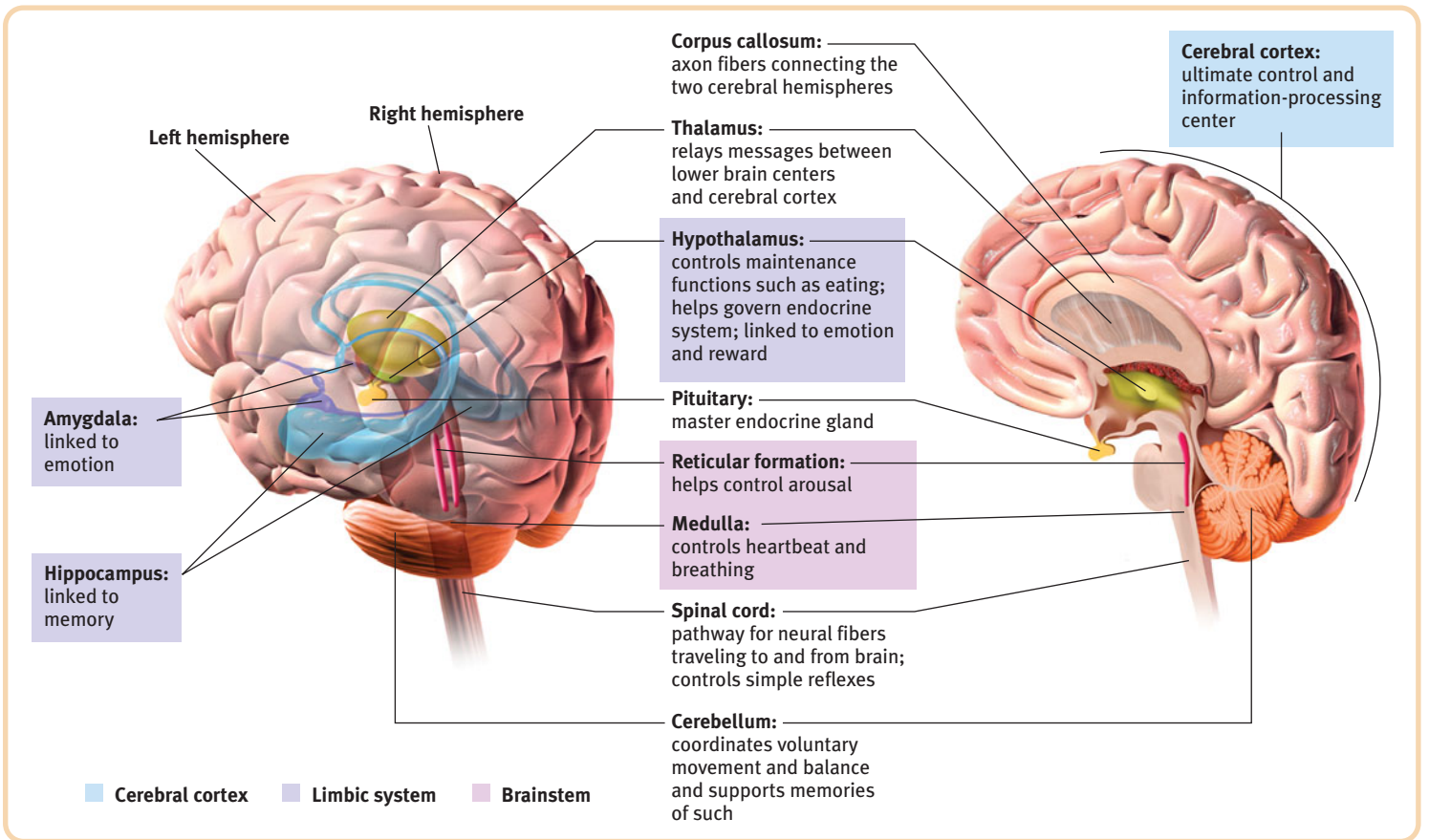
The Cerebral Cortex

The people who first dissected and labeled the brain used the language of scholars—Latin and Greek. Their words are actually attempts at graphic description: For example, cortex *means "bark,"* cerebellum *is "little brain," and* thalamus *is "inner chamber."*

Older brain networks sustain basic life functions and enable memory, emotions, and basic drives. Newer neural networks within the *cerebrum*—the two large hemispheres that contribute 85 percent of the brain's weight—form specialized work teams that enable our perceiving, thinking, and speaking. Covering those hemispheres, like bark on a tree, is the **cerebral cortex,** a thin surface layer of interconnected neural cells. It is your brain's thinking crown, your body's ultimate control and information-processing center.

As we move up the ladder of animal life, the cerebral cortex expands, tight genetic controls relax, and the organism's adaptability increases. Frogs and other amphibians with a small cortex operate extensively on preprogrammed genetic instructions. The larger cortex of mammals offers increased capacities for learning and thinking, enabling them to be more adaptable.

FIGURE 4.11 Brain structures and their functions



Structure of the Cortex

4-3: How is the cerebral cortex organized?

If you opened a human skull, exposing the brain, you would see a wrinkled organ, shaped somewhat like the meat of an oversized walnut. Without these wrinkles, a flattened cerebral cortex would require triple the area—roughly that of a very large pizza. The brain's ballooning left and right hemispheres are filled mainly with axons connecting the cortex to the brain's other regions. The cerebral cortex—that thin surface layer—contains some 20 to 23 billion nerve cells and 300 trillion synaptic connections (de Courten-Myers, 2005). Being human takes a lot of nerve.

Stepping back to consider the whole cortex, you would see that each hemisphere is divided into four *lobes,* geographic subdivisions separated by prominent *fissures,* or folds (**FIGURE 4.12**). Starting at the front of your brain and moving over the top, there are the **frontal lobes** (behind your forehead), the **parietal lobes** (at the top and to the rear), and the **occipital lobes** (at the back of your head). Reversing direction and moving forward, just above your ears, you find the **temporal lobes.** Each of the four lobes carries out many functions, and many functions require the interplay of several lobes.

cerebral [seh-REE-bruhl] **cortex** the intricate fabric of interconnected neural cells covering the cerebral hemispheres; the body's ultimate control and information-processing center.

frontal lobes portion of the cerebral cortex lying just behind the forehead; involved in speaking and muscle movements and in making plans and judgments.

parietal [puh-RYE-uh-tuhl] **lobes** portion of the cerebral cortex lying at the top of the head and toward the rear; receives sensory input for touch and body position.

occipital [ahk-SIP-uh-tuhl] **lobes** portion of the cerebral cortex lying at the back of the head; includes areas that receive information from the visual fields.

temporal lobes portion of the cerebral cortex lying roughly above the ears; includes the auditory areas, each receiving information primarily from the opposite ear.

Functions of the Cortex

4-4: What are the functions of the cerebral cortex?

More than a century ago, autopsies of people who had been partially paralyzed or speechless revealed damaged cortical areas. But this rather crude evidence did not convince researchers that specific parts of the cortex perform specific complex functions. After all, if control of speech and movement were diffused across the cortex, damage to almost any area might produce the same effect. A television with its power cord cut would go dead, but we would be fooling ourselves if we thought we had "localized" the picture in the cord.

Motor Functions

Scientists had better luck in localizing simpler brain functions. For example, in 1870, when German physicians Gustav Fritsch and Eduard Hitzig applied mild electrical stimulation to parts of a dog's cortex, they made an important discovery: They could make parts of its body move. The effects were selective. Stimulation

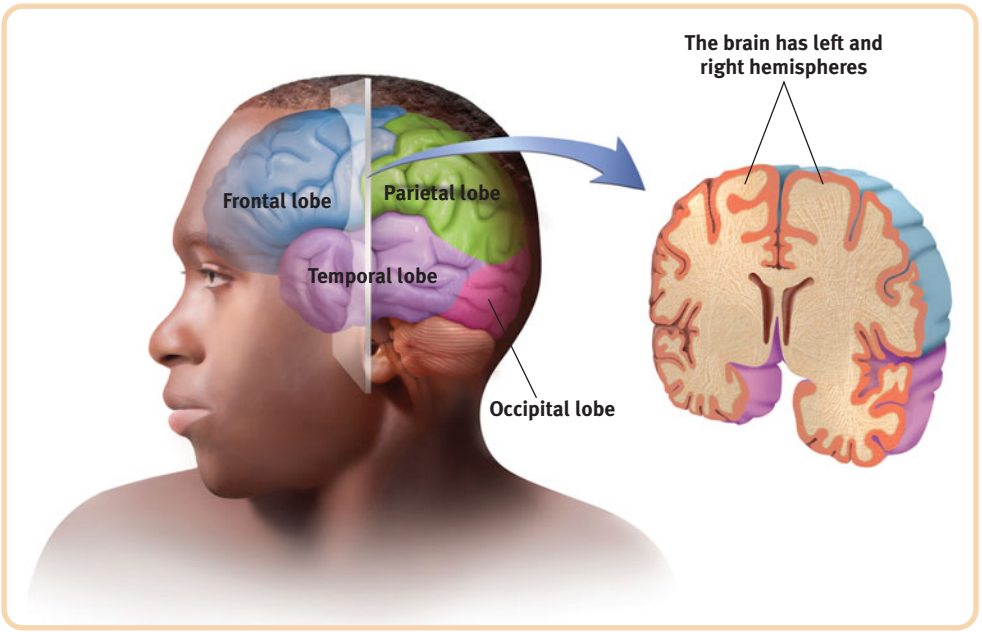


FIGURE 4.12 The cortex and its basic subdivisions

Demonstration: *Try moving your right hand in a circular motion, as if polishing a table. Now start your right foot doing the same motion synchronized with the hand. Now reverse the foot motion (but not the hand). Tough, huh? But easier if you try moving the* left *foot opposite to the right hand. The left and right limbs are controlled by opposite sides of the brain, so their opposed activities interfere less with each other.*

caused movement only when applied to an arch-shaped region at the back of the frontal lobes, running roughly ear-to-ear across the top of the brain. Moreover, stimulating parts of this region in the left or right hemisphere caused movements of specific body parts on the *opposite* side of the body. Fritsch and Hitzig had discovered what is now called the **motor cortex.**

Mapping the Motor Cortex

Luckily for brain surgeons and their patients, the brain has no sensory receptors. Knowing this, Otfrid Foerster and Wilder Penfield in the 1930s were able to map the motor cortex in hundreds of wide-awake patients by stimulating different cortical areas and observing the body's responses. They discovered that body areas requiring precise control, such as the fingers and mouth, occupied the greatest amount of cortical space.

Spanish neuroscientist José Delgado repeatedly demonstrated the mechanics of motor behavior. In one human patient, he stimulated a spot on the left motor cortex that triggered the right hand to make a fist. Asked to keep the fingers open during the next stimulation, the patient, whose fingers closed despite his best efforts, remarked, "I guess, Doctor, that your electricity is stronger than my will" (Delgado, 1969, p. 114).

More recently, scientists have been able to predict a monkey's arm motion a tenth of a second before it moves—by repeatedly measuring motor cortex activity preceding specific arm movements (Gibbs, 1996). Such findings have opened the door to a new generation of *prosthetics* (artificial body part replacements).

Sensory Functions

If the motor cortex sends messages out to the body, where does the cortex receive the incoming messages? Penfield also identified the cortical area that specializes in receiving information from the skin senses and from the movement of body parts. This area at the front of the parietal lobes, parallel to and just behind the motor cortex, we now call the **sensory cortex.** (FIGURE 4.13 outlines both the motor cortex

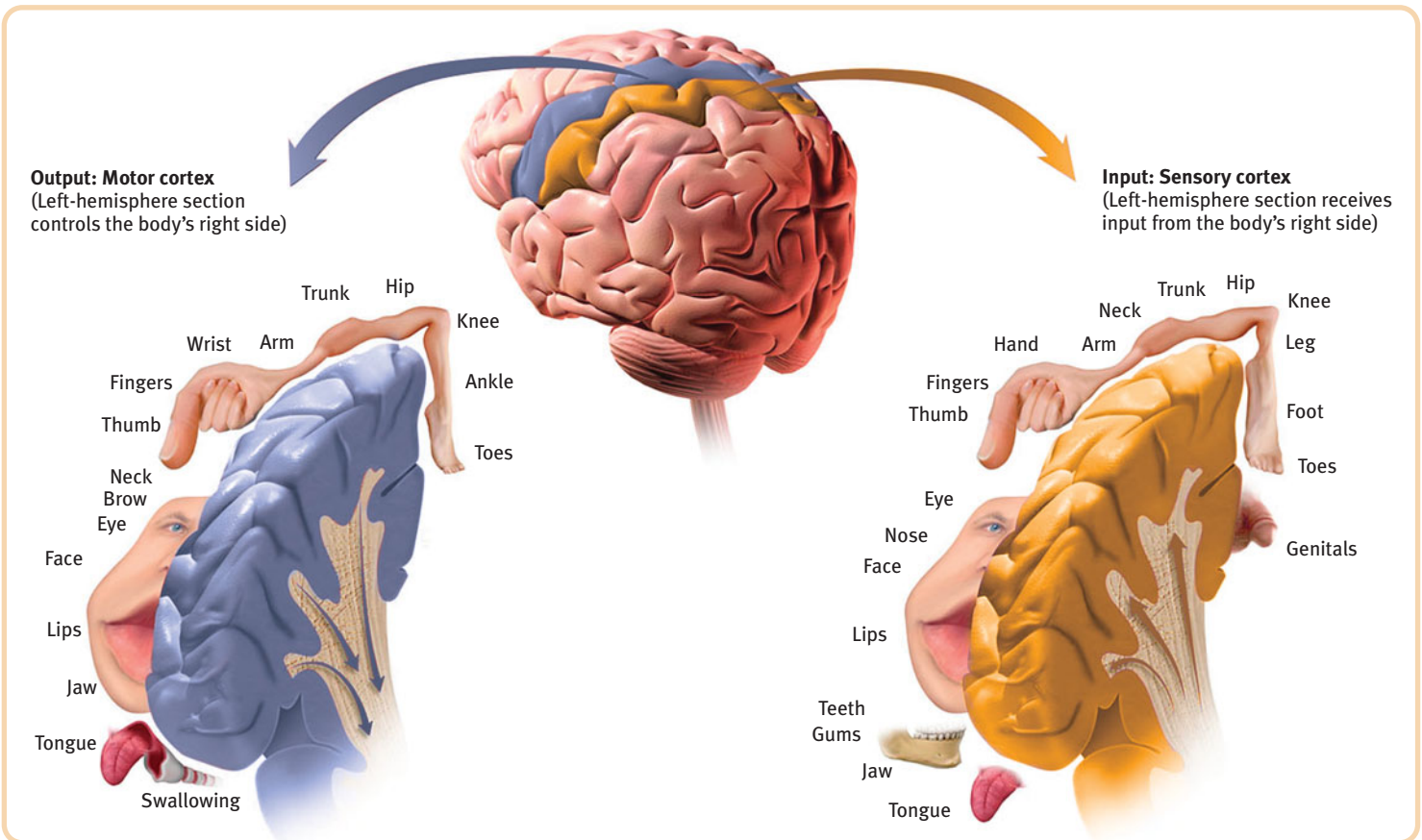
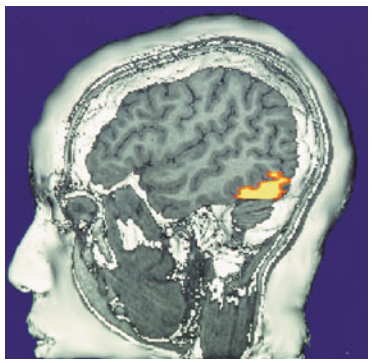


FIGURE 4.13 Left-hemisphere tissue devoted to each body part in the motor cortex and the sensory cortex As you can see from this classic though inexact representation, the amount of cortex devoted to a body part is not proportional to that part's size. Rather, the brain devotes more tissue to sensitive areas and to areas requiring precise control. Thus, the fingers have a greater representation in the cortex than does the upper arm.

and the sensory cortex.) Stimulate a point on the top of this band of tissue and a person may report being touched on the shoulder; stimulate some point on the side and the person may feel something on the face.

The more sensitive the body region, the larger the sensory cortex area devoted to it. Your supersensitive lips project to a larger brain area than do your toes, which is one reason we kiss with our lips rather than touch toes. Rats have a large brain area devoted to their whisker sensations, and owls to their hearing sensations.



Courtesy of V. P. Clark, K. Keil, J. Ma. Maisog, S. Courtney, L. G. Ungerleider, and J. V. Haxby, National Institute of Mental Health

FIGURE 4.14 New technology shows the brain in action This fMRI (functional MRI) scan shows the visual cortex in the occipital lobes activated (color representation of increased bloodflow) as a research participant looks at a photo. When the person stops looking, the region instantly calms down.

Scientists have identified additional areas where the cortex receives input from senses other than touch. At this moment, you are receiving visual information in the visual cortex in your occipital lobes, at the very back of your brain (**FIGURES 4.14** and **4.15**). A bad enough bash there would make you blind. Stimulated there, you might see flashes of light or dashes of color. (In a sense, we *do* have eyes in the back of our head!) From your occipital lobes, visual information goes to other areas that specialize in tasks such as identifying words, detecting emotions, and recognizing faces.

Any sound you now hear is processed by your auditory cortex in your temporal lobes (Figure 4.15). (If you think of your clenched fist as your brain, and hold it in front of you, your thumb would roughly correspond to one of your temporal lobes.) Most of this auditory information travels a circuitous route from one ear to the auditory receiving area above your opposite ear. If stimulated there, you might hear a sound. MRI scans of people with schizophrenia reveal active auditory areas in the temporal lobes during auditory hallucinations (Lennox et al., 1999). Even the phantom ringing sound experienced by people with hearing loss is—if heard in one ear—associated with activity in the temporal lobe on the brain's opposite side (Muhlnickel, 1998).

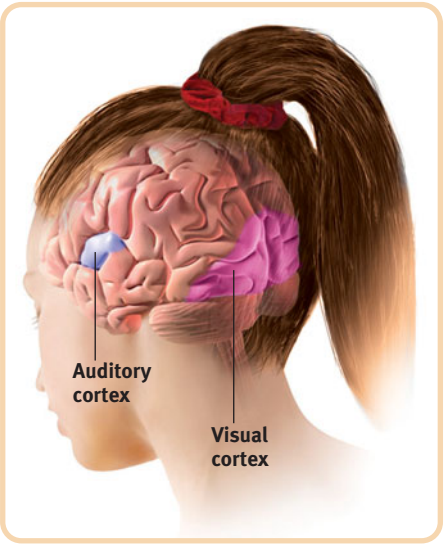


FIGURE 4.15 The visual cortex and auditory cortex The visual cortex of the occipital lobes at the rear of your brain receives input from your eyes. The auditory cortex, in your temporal lobes—above your ears—receives information from your ears.

Association Areas

So far, we have pointed out small areas of the cortex that either receive sensory input or direct muscular output. In humans, that leaves a full three-fourths of the thin, wrinkled layer, the cerebral cortex, uncommitted to sensory or motor activity. What, then, goes on in this vast region of the brain? Neurons in these **association areas** (the peach-colored areas in **FIGURE 4.16**) integrate information. They link sensory inputs with stored memories—a very important part of thinking.

Electrically probing the association areas doesn't trigger any observable response. So, unlike the sensory and motor areas, association area functions cannot be neatly mapped. Their silence has led to what Donald McBurney (1996, p. 44) called "one of the hardiest weeds in the garden of psychology": the claim that we ordinarily use only 10 percent of our brains. (If true, wouldn't this imply a 90 percent chance that a bullet to your brain would land in an unused area?) Surgically

motor cortex an area at the rear of the frontal lobes that controls voluntary movements.

sensory cortex area at the front of the parietal lobes that registers and processes body touch and movement sensations.

association areas areas of the cerebral cortex that are not involved in primary motor or sensory functions; rather, they are involved in higher mental functions, such as learning, remembering, thinking, speaking, and integrating information.

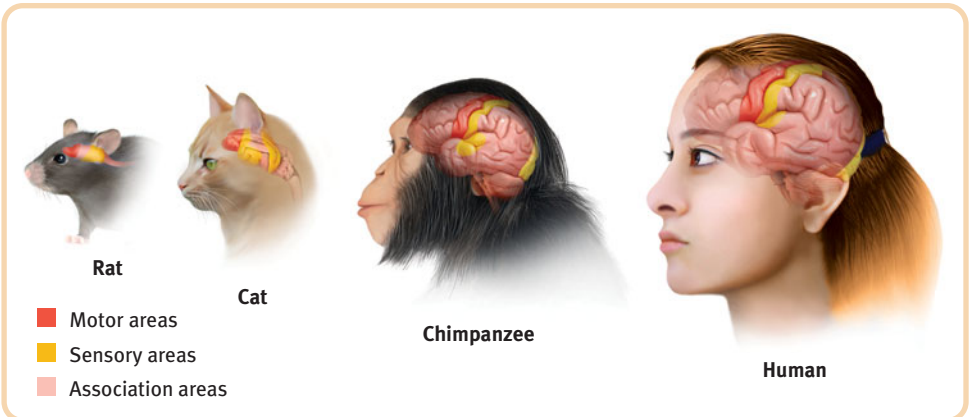
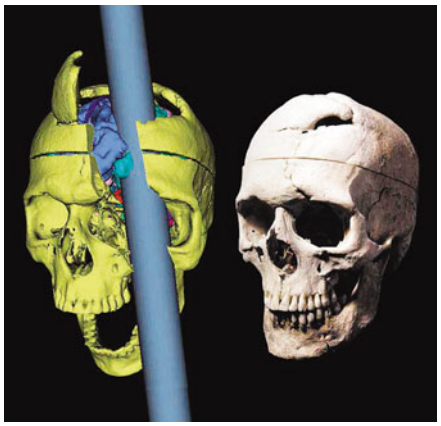
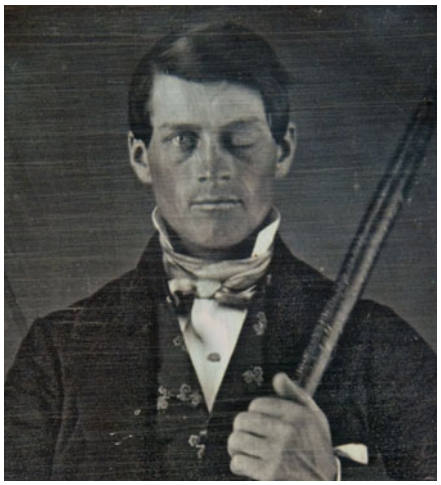


FIGURE 4.16 Areas of the cortex in four mammals More intelligent animals have increased "uncommitted" or association areas of the cortex. These vast areas of the brain are responsible for integrating and acting on information received and processed by sensory areas.



(a)



(b)

FIGURE 4.17 Phineas Gage reconsidered
(a) Using measurements of his skull (which was kept as a medical record) and modern neuroimaging techniques, researcher Hanna Damasio and her colleagues (1994) reconstructed the probable path of the rod through Gage's brain. (b) This recently discovered photo shows how Gage looked after the accident. *(The image has been laterally reversed to show the features correctly given that early photos, such as this one, are actually mirror images.)*

lesioned animals and brain-damaged humans bear witness that association areas are not dormant. Rather, these areas interpret, integrate, and act on information processed by the sensory areas.

Association areas are found in all four lobes. In the frontal lobes, they enable judgment, planning, and processing of new memories. People with damaged frontal lobes may have intact memories, high scores on intelligence tests, and great cake-baking skills. Yet they would not be able to plan ahead to *begin* baking a cake for a birthday party (Huey et al., 2006).

Frontal lobe damage also can alter personality, removing a person's inhibitions. Consider the classic case of railroad worker Phineas Gage. One afternoon in 1848, Gage, then 25 years old, was packing gunpowder into a rock with a tamping iron. A spark ignited the gunpowder, shooting the rod up through his left cheek and out the top of his skull, leaving his frontal lobes massively damaged (**FIGURE 4.17**). To everyone's amazement, he was immediately able to sit up and speak, and after the wound healed he returned to work. But the affable, soft-spoken Phineas Gage was now irritable, profane, and dishonest. Although his mental abilities and memories were intact, his personality was not. This person, said his friends, was "no longer Gage." He eventually lost his job and ended up earning his living as a fairground exhibit.

With his frontal lobes ruptured, Gage's moral compass had disconnected from his behavior. Similar impairments to moral judgment have appeared in more recent studies of people with damaged frontal lobes. Not only may they become less inhibited (without the frontal lobe brakes on their impulses), but their moral judgments seem unrestrained by normal emotions. Would you advocate pushing someone in front of a runaway boxcar to save five others? Most people do not, but those with damage to a brain area behind the eyes often do (Koenigs et al., 2007).

Association areas also perform other mental functions. In the parietal lobes, parts of which were large and unusually shaped in Albert Einstein's normal-weight brain, they enable mathematical and spatial reasoning (Witelson et al., 1999). An area on the underside of the right temporal lobe enables us to recognize faces. If a stroke or head injury destroyed this area of your brain, you would still be able to describe facial features and to recognize someone's gender and approximate age, yet be strangely unable to identify the person as, say, Jack Black, or even your grandmother.

Language: Specialization and Integration

We think of speaking and reading, or writing and reading, or singing and speaking as merely different examples of the same general ability—language. But consider this curious finding: **Aphasia,** an impaired use of language, can result from damage to any one of several cortical areas. Even more curious, some people with aphasia can speak fluently but cannot read (despite good vision), while others can comprehend what they read but cannot speak. Still others can write but not read, read but not write, read numbers but not letters, or sing but not speak. What does this tell us about the mystery of how we use language, and how did researchers solve this mystery?

Clue 1 In 1865, French physician Paul Broca reported that after damage to a specific area of the left frontal lobe (later called **Broca's area**) a person would struggle to speak words while still being able to sing familiar songs and comprehend speech. Damage to Broca's area disrupts speaking.

Clue 2 In 1874, German investigator Carl Wernicke discovered that after damage to a specific area of the left temporal lobe (**Wernicke's area**) people could speak only meaningless words. Asked to describe a picture that showed two boys stealing cookies behind a woman's back, one patient responded: "Mother is away her working her work to get her better, but when she's looking the two boys looking the other part. She's working another time" (Geschwind, 1979). Damage to Wernicke's area also disrupts understanding.

aphasia impairment of language, usually caused by left-hemisphere damage either to Broca's area (impairing speaking) or to Wernicke's area (impairing understanding).

Broca's area controls language expression; an area of the frontal lobe, usually in the left hemisphere, that directs the muscle movements involved in speech.

Wernicke's area controls language reception; a brain area, usually in the left temporal lobe, that is involved in language comprehension and expression.

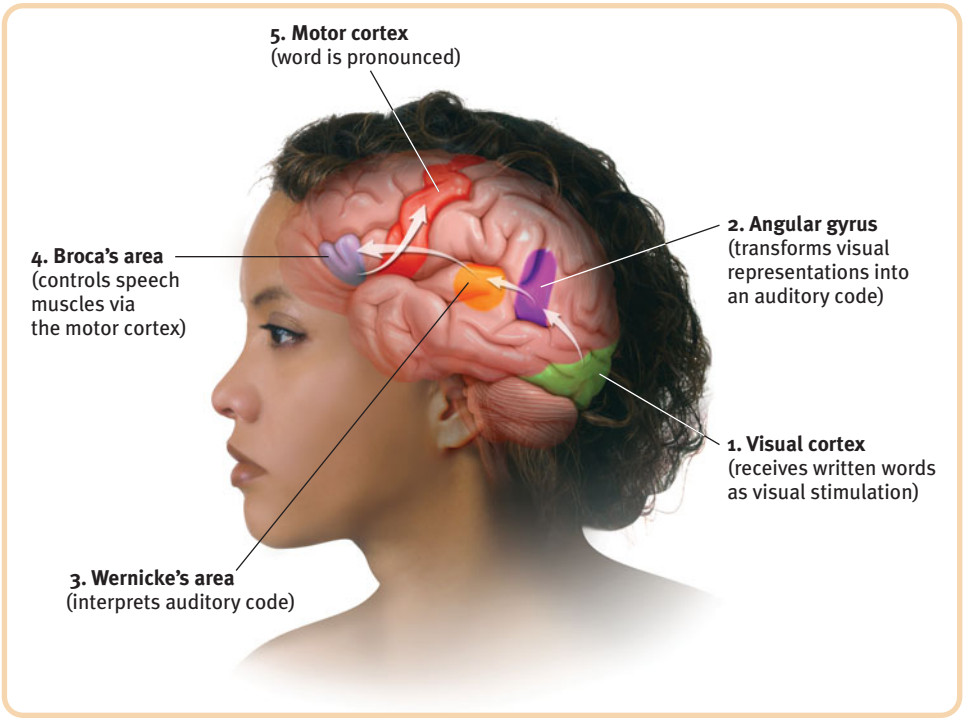


FIGURE 4.18 A simplified model of brain areas involved in language processing

Clue 3 A third brain area, the *angular gyrus,* is involved in reading aloud. It receives visual information from the visual area and recodes it into an auditory form, which Wernicke's area uses to derive its meaning. Damage to the angular gyrus leaves a person able to speak and understand, but unable to read.

Clue 4 Nerve fibers interconnect these brain areas.

Almost a century after Broca's and Wernicke's findings, Norman Geschwind assembled these and other clues into an explanation of how distinct neural networks in our brain enable language (**FIGURES 4.18** and **4.19**). When you read aloud, the words (1) register in the visual area, (2) are relayed to the angular gyrus, which transforms the words into an auditory code that (3) is received and understood in the nearby Wernicke's area, and (4) is sent to Broca's area, which (5) controls the motor cortex as it creates the pronounced word. Depending on which link in this chain is damaged, a different form of aphasia occurs.

The big point to remember is this: *In processing language, as in other forms of information processing, the brain operates by dividing its mental functions—speaking, perceiving, thinking, remembering—into subfunctions.* Your conscious experience of reading this

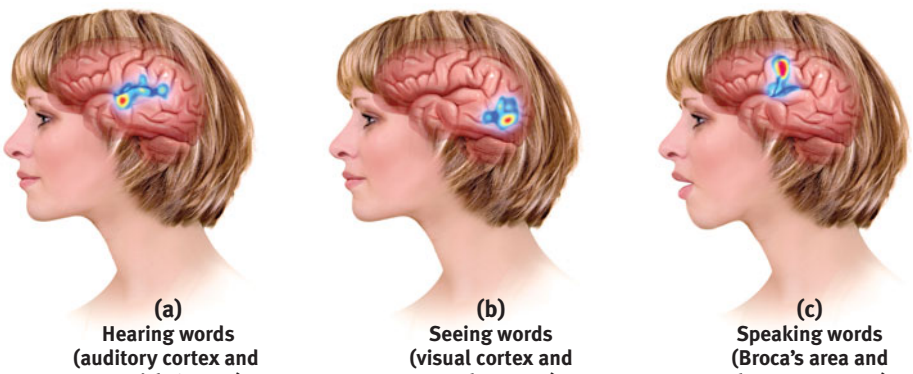


FIGURE 4.19 Brain activity when hearing, seeing, and speaking words
PET scans such as these detect the activity of different areas of the brain.

page *seems* indivisible, but your brain is computing each word's form, sound, and meaning using different neural networks (Posner & Carr, 1992). This division of labor appears again and again—for example, in the way the brain processes visual information.

These specialized language networks help explain a funny finding. Functional MRI scans show that we process jokes playing on meaning ("Why don't sharks bite lawyers? . . . Professional courtesy") in a different brain area than jokes playing on words ("What kind of lights did Noah use on the ark? . . . Flood lights") (Goel & Dolan, 2001). Think about it: *What you experience as a continuous, indivisible stream of experience is actually but the visible tip of a subdivided information-processing iceberg, most of which lies beneath the surface of your awareness.*

To sum up, the mind's subsystems are localized in particular brain regions, yet the brain acts as a unified whole. Moving your hand, recognizing faces, perceiving scenes, comprehending language—all depend on specific neural networks. Yet complex functions such as listening, learning, and loving involve the coordination of many brain areas. Together, these two principles—specialization and integration—describe the brain's functioning.

"It is the way systems interact and have a dynamic interdependence that is—unless one has lost all sense of wonder—quite awe-inspiring."

—Simon Conway Morris, "The Boyle Lecture," 2005

The Brain's Plasticity

4-5: To what extent can a damaged brain reorganize itself?

Our brains are sculpted not only by our genes but also by our experiences. Other modules discuss developmental research that demonstrates how experience molds the brain. In this module, we focus on the brain's **plasticity,** its ability to modify itself after some types of damage.

Unlike cut skin, severed neurons usually do not regenerate (if your spinal cord were severed, you would probably be permanently paralyzed). And some very specific brain functions seem preassigned to particular areas. One newborn who suffered damage to the facial recognition areas on both temporal lobes never regained a normal ability to recognize faces (Farah et al., 2000). But there is good news: Some neural tissue can *reorganize* in response to damage. It happens within all of us, as the brain repairs itself after little mishaps.

Our brains are most plastic when we are young children (Kolb, 1989; see also FIGURE 4.20). The brain's plasticity is good news for those blind or deaf. Blindness or deafness makes unused brain areas available for other uses (Amedi et al., 2005). If a blind person uses one finger to read Braille, the brain area dedicated to that finger expands as the sense of touch invades the visual cortex that normally helps people see (Barinaga, 1992a; Sadato et al., 1996). Temporarily "knock out" the visual cortex with magnetic stimulation, and a lifelong-blind person will make more errors on a *language* task (Amedi et al., 2004). Similarly, in people whose native language is signed, not spoken, the area of the temporal lobe normally dedicated to hearing waits in vain for stimulation. Finally, it looks for other signals to process, such as those from the visual system. That helps explain the finding that many deaf people have enhanced peripheral vision (Bosworth & Dobkins, 1999).

Plasticity is especially evident after serious damage. If a slow-growing tumor in the left hemisphere disrupts language, the right hemisphere may compensate (Thiel et al., 2006). Lose a finger and the sensory cortex that received its input will begin to receive input from the adjacent fingers, which then become more sensitive (Fox, 1984). Lost fingers also feature in another mysterious phenomenon. As Figure 4.13 shows, the hand is between the sensory cortex's face and arm regions. When stroking the arm of someone whose hand had been amputated, V. S. Ramachandran found that the person felt the sensations not only on the area stroked but also on the nonexistent ("phantom") fingers. Sensory fibers that terminate on adjacent areas had invaded the brain area vacated by the hand.

Note, too, that the toes region is adjacent to the genitals. So what do you suppose was the sexual intercourse experience of another Ramachandran patient whose

FIGURE 4.20 Brain plasticity If surgery or an injury destroys one part of a child's brain or, as in the case of this 6-year-old, even an entire *hemisphere* (removed to eliminate seizures), the brain will compensate by putting other areas to work. One Johns Hopkins medical team reflected on the child hemispherectomies they had performed. Although use of the opposite hand is compromised, they reported being "awed" by how well children retain their memory, personality, and humor after removal of either brain hemisphere (Vining et al., 1997). The younger the child, the greater the chance that the remaining hemisphere can take over the functions of the one that was surgically removed (Choi, 2008).

Joe McNally/Joe McNally Photography

lower leg had been amputated? "I actually experience my orgasm in my foot. And there it's much bigger than it used to be because it's no longer just confined to my genitals" (Ramachandran & Blakeslee, 1998, p. 36).

Although brain modification often takes the form of reorganization, evidence suggests that, contrary to long-held belief, adult mice and humans can also generate new brain cells (Jessberger et al., 2008). Monkey brains illustrate **neurogenesis** by forming thousands of new neurons each day. These baby neurons originate deep in the brain and may then migrate elsewhere and form connections with neighboring neurons (Gould, 2007). Master stem cells that can develop into any type of brain cell have also been discovered in the human embryo. If mass-produced in a lab and injected into a damaged brain, might neural stem cells turn themselves into replacements for lost brain cells? Might we someday be able to rebuild damaged brains, much as we reseed damaged lawns? Might new drugs spur the production of new nerve cells? Stay tuned. Today's biotech companies are hard at work on such possibilities (Gage, 2003). In the meantime, we can all benefit from other natural promoters of neurogenesis, such as exercise, sleep, and nonstressful but stimulating environments (Iso et al., 2007; Pereira et al., 2007; Stranahan et al., 2006).

plasticity the brain's ability to change, especially during childhood, by reorganizing after damage or by building new pathways based on experience.

neurogenesis the formation of new neurons.

corpus callosum [KOR-pus kah-LOW-sum] the large band of neural fibers connecting the two brain hemispheres and carrying messages between them.

Our Divided Brain

4-6: What do split brains reveal about the functions of our two brain hemispheres?

For more than a century, clinical evidence has shown that the brain's two sides serve differing functions. This hemispheric specialization (or *lateralization*) is apparent after brain damage. Accidents, strokes, and tumors in the left hemisphere can impair reading, writing, speaking, arithmetic reasoning, and understanding. Similar lesions in the right hemisphere seldom have such dramatic effects.

By 1960, many interpreted these differences as evidence that the left hemisphere is the "dominant" or "major" hemisphere, and its silent companion to the right is the "subordinate" or "minor" hemisphere. Then researchers found that the "minor" right hemisphere was not so limited after all. The story of this discovery is a fascinating chapter in psychology's history.

Splitting the Brain

In 1961, two Los Angeles neurosurgeons, Philip Vogel and Joseph Bogen, speculated that major epileptic seizures were caused by an amplification of abnormal brain activity bouncing back and forth between the two cerebral hemispheres. If so, they wondered, could they put an end to this biological tennis game by severing the **corpus callosum** (see FIGURE 4.21), the wide band of axon fibers connecting the two hemispheres and carrying messages between them?

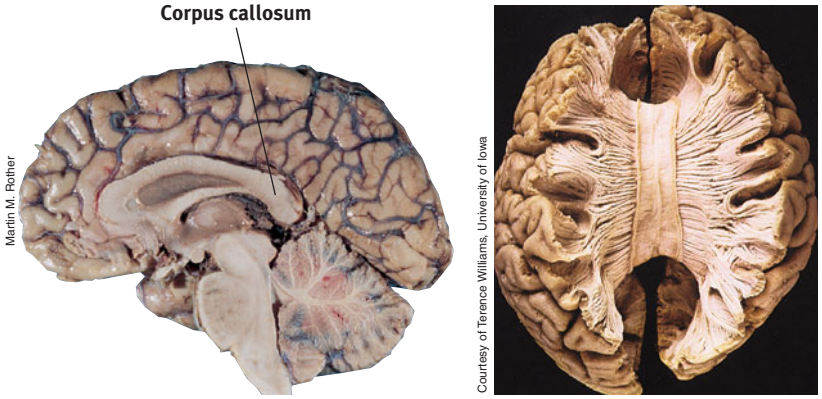


FIGURE 4.21 The corpus callosum This large band of neural fibers connects the two brain hemispheres. To photograph the half brain shown at left, a surgeon separated the hemispheres by cutting through the corpus callosum and lower brain regions. In the view on the right, brain tissue has been cut back to expose the corpus callosum and bundles of fibers coming out from it.

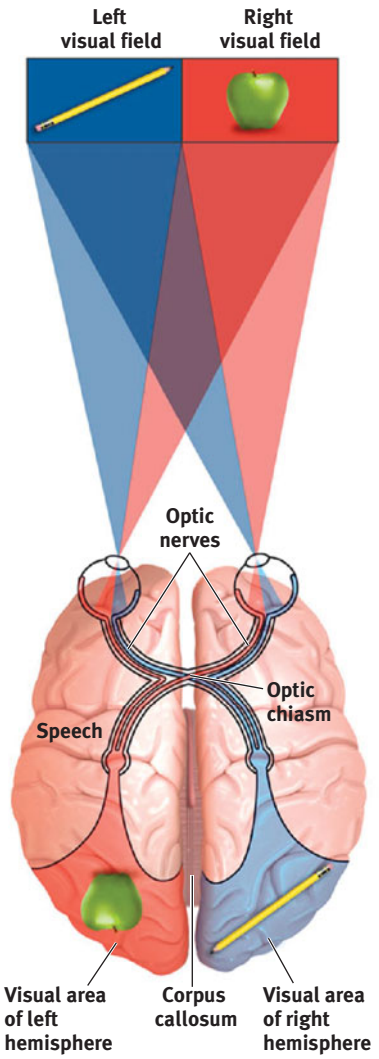


FIGURE 4.22 The information highway from eye to brain Information from the left half of your field of vision goes to your right hemisphere, and information from the right half of your visual field goes to your left hemisphere, which usually controls speech. (Note, however, that each eye receives sensory information from both the right and left visual fields.) Data received by either hemisphere are quickly transmitted to the other across the corpus callosum. In a person with a severed corpus callosum, this information sharing does not take place.

Vogel and Bogen knew that psychologists Roger Sperry, Ronald Myers, and Michael Gazzaniga had divided the brains of cats and monkeys in this manner, with no serious ill effects. So the surgeons operated. The result? The seizures were all but eliminated. Moreover, the patients with these **split brains** were surprisingly normal, their personality and intellect hardly affected. Waking from surgery, one even joked that he had a "splitting headache" (Gazzaniga, 1967).

Sperry and Gazzaniga's studies of people with split brains provide a key to understanding the two hemispheres' complementary functions. The peculiar nature of our visual wiring (**FIGURE 4.22**) enabled the researchers to send information to a patient's left or right hemisphere. As the person stared at a spot, they flashed a stimulus to its right or left. They could do this with you, too, but in your intact brain, the hemisphere receiving the information would instantly pass the news to its partner across the valley. Not so in patients who had undergone split-brain surgery. Their corpus callosum—the phone cables responsible for transmitting messages from one hemisphere to the other—had been severed. This enabled the researchers to quiz each hemisphere separately.

In an early experiment, Gazzaniga (1967) asked these patients to stare at a dot as he flashed HE·ART on a screen (**FIGURE 4.23**). Thus, HE appeared in their left visual field (which transmits to the right hemisphere) and ART in the right field (which transmits to the left hemisphere). When he then asked what they had seen, the patients *said* they had seen ART. But when asked to *point* to the word, they were startled when their left hand (controlled by the right hemisphere) pointed to HE. Given an opportunity to express itself, each hemisphere reported what it had seen. The right hemisphere (controlling the left hand) intuitively knew what it could not verbally report.

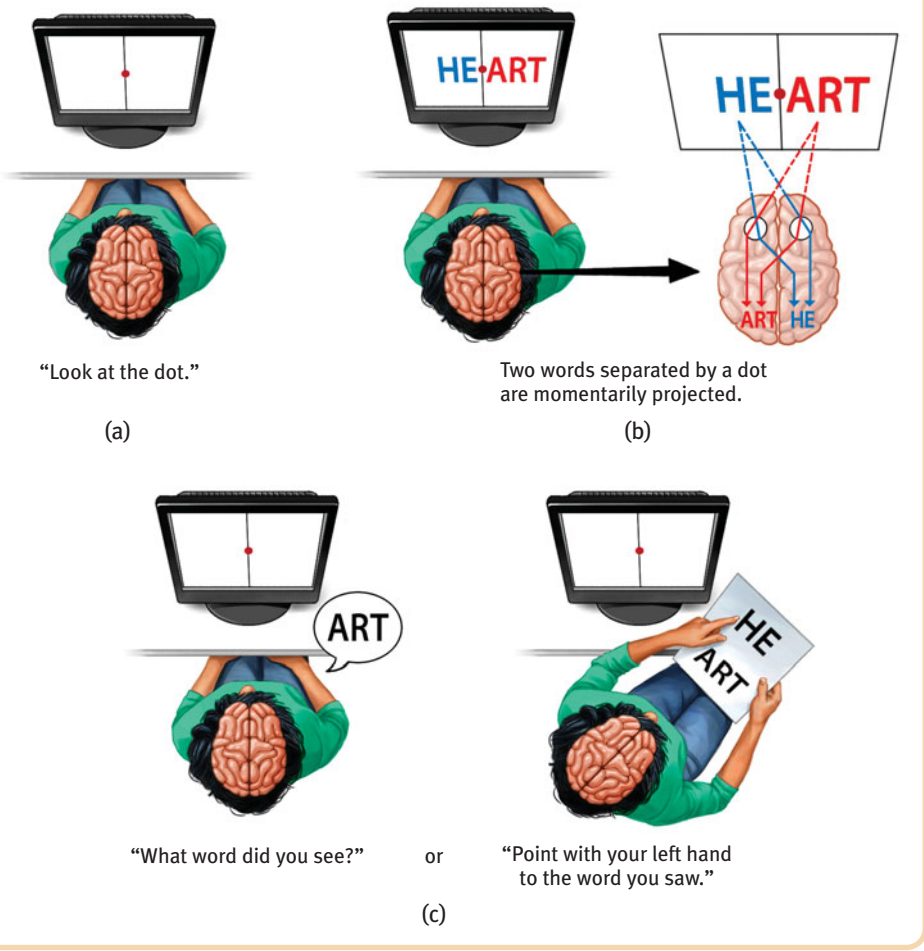


FIGURE 4.23 Testing the divided brain When an experimenter flashes the word HEART across the visual field, a woman with a split brain reports seeing the portion of the word transmitted to her left hemisphere. However, if asked to indicate with her left hand what she saw, she points to the portion of the word transmitted to her right hemisphere. (From Gazzaniga, 1983.)

When a picture of a spoon was flashed to their right hemisphere, the patients could not *say* what they had viewed. But when asked to *identify* what they had viewed by feeling an assortment of hidden objects with their left hand, they readily selected the spoon. If the experimenter said, "Right!" the patient might reply, "What? Right? How could I possibly pick out the right object when I don't know what I saw?" It is, of course, the left hemisphere doing the talking here, bewildered by what the nonverbal right hemisphere knows.

"Do not let your left hand know what your right hand is doing."
—Matthew 6:3

A few people who have had split-brain surgery have been for a time bothered by the unruly independence of their left hand, which might unbutton a shirt while the right hand buttoned it, or put grocery store items back on the shelf after the right hand put them in the cart. It was as if each hemisphere was thinking "I've half a mind to wear my green (blue) shirt today." Indeed, said Sperry (1964), split-brain surgery leaves people "with two separate minds." With a split brain, both hemispheres can comprehend and follow an instruction to copy—*simultaneously*—different figures with the left and right hands (Franz et al., 2000; see also **FIGURE 4.24**). (Reading these reports, I fantasize a person enjoying a solitary game of "rock, paper, scissors"—left versus right hand.)


BBC

FIGURE 4.24 Try this! Joe, who has had split-brain surgery, can simultaneously draw two different shapes.

When the "two minds" are at odds, the left hemisphere does mental gymnastics to rationalize reactions it does not understand. If a patient follows an order sent to the right hemisphere ("Walk"), a strange thing happens. Unaware of the order, the left hemisphere doesn't know why the patient begins walking. Yet, when asked why, the patient doesn't say "I don't know." Instead, the interpretive left hemisphere improvises—"I'm going into the house to get a Coke." Thus, Gazzaniga (1988), who considers these patients "The most fascinating people on earth," concluded that the conscious left hemisphere is an "interpreter" or press agent that instantly constructs theories to explain our behavior.

Question: *If we flashed a red light to the right hemisphere of a person with a split brain and flashed a green light to the left hemisphere, would each observe its own color? Would the person be aware that the colors differ? What would the person verbally report seeing?*

Answers: *Yes. No. Green.*

Right-Left Differences in the Intact Brain

So, what about the 99.99+ percent of us with undivided brains? Does each of *our* hemispheres also perform distinct functions? Several different types of studies indicate they do.

When a person performs a *perceptual* task, for example, brain waves, bloodflow, and glucose consumption reveal increased activity in the *right* hemisphere. When the person speaks or calculates, activity increases in the *left* hemisphere.

A dramatic demonstration of hemispheric specialization happens before some types of brain surgery. To check the location of language centers, the surgeon injects a sedative into the neck artery feeding blood to the left hemisphere. Before the injection, the patient is lying down, arms in the air, chatting with the doctor. Can you predict what happens when the drug flows into the artery going to the left hemisphere? Within seconds, the person's right arm falls limp. The patient also usually becomes speechless until the drug wears off. When the drug enters the artery to the right hemisphere, the *left* arm falls limp, but the person can still speak.

split brain a condition resulting from surgery that isolates the brain's two hemispheres by cutting the fibers (mainly those of the corpus callosum) connecting them.

Which hemisphere would you suppose enables sign language among deaf people? The right, because of its visual-spatial superiority? Or the left, because it typically processes language? Studies reveal that, just as hearing people usually use the left hemisphere to process speech, deaf people use the left hemisphere to process sign language (Corina et al., 1992; Hickok et al., 2001). A stroke in the left hemisphere will disrupt a deaf person's signing, much as it would disrupt a hearing person's speaking. The same brain area is similarly involved in both spoken and signed speech production (Corina, 1998). To the brain, language is language, whether spoken or signed.

Although the left hemisphere is adept at making quick, literal interpretations of language, the right hemisphere excels in making inferences (Beeman & Chiarello, 1998; Bowden & Beeman, 1998; Mason & Just, 2004). Primed with the flashed word *foot,* the left hemisphere will be especially quick to recognize the closely associated word *heel.* But if primed with *foot, cry,* and *glass,* the right hemisphere will more quickly recognize another word distantly related to all three *(cut)*. And if given an insightlike problem—"What word goes with *boot, summer,* and *ground*?"—the right hemisphere more quickly than the left recognizes the solution *(camp)*. As one patient explained after a right-hemisphere stroke, "I understand words, but I'm missing the subtleties."

The right hemisphere performs other tasks as well. It helps us modulate our speech to make meaning clear, as when we ask, "What's that in the road ahead?" instead of "What's that in the road, a head?" (Heller, 1990).

The right hemisphere also helps orchestrate our sense of self. People who suffer partial paralysis will sometimes obstinately deny their impairment—strangely claiming they can move a paralyzed limb—if the damage is to the right hemisphere (Berti et al., 2005). With right-brain damage, some patients have difficulty perceiving who other people are in relation to themselves, as in the case of a man who saw medical caretakers as family (Feinberg & Keenan, 2005). Others fail to recognize themselves in a mirror, or they assign ownership of a limb to someone else ("that's my husband's arm"). The power of the right brain appeared in an experiment in which people with normal brains viewed a series of images that progressively morphed from the face of a co-worker into their own face. As people recognized themselves, parts of their right brain displayed sudden activity. But when magnetic stimulation disrupted their normal right-brain activity, they had difficulty recognizing themselves in the morphed photos (Uddin et al., 2005, 2006).

Simply looking at the two hemispheres, so alike to the naked eye, who would suppose they contribute uniquely to the harmony of the whole? Yet a variety of observations—of people with split brains and people with normal brains—converge beautifully, leaving little doubt that we have unified brains with specialized parts.

The mind seeking to understand the brain—that is indeed among the ultimate scientific challenges. And so it will always be. To paraphrase cosmologist John Barrow, a brain simple enough to be understood is too simple to produce a mind able to understand it.

The Brain

Module Review

4-1: What are the functions of important lower-level brain structures? The *brainstem,* the oldest part of the brain, is responsible for automatic survival functions. Its components are the *medulla* (which controls heartbeat and breathing), the pons (which helps coordinate movements), and the *reticular formation* (which affects arousal). The *thalamus,* the brain's sensory switchboard, sits above the brainstem. The *cerebellum,* attached to the rear of the brainstem, enables some types of nonverbal learning and memory; coordinates muscle movement; and helps process sensory information.

The *limbic system's* neural centers include the hippocampus (which processes memories of facts and episodes), the *amygdala* (involved in emotions such as aggression and fear), and the *hypothalamus* (involved in various drives, maintenance functions, and pleasurable rewards). The hypothalamus also controls the pituitary, which influences other glands to release hormones.

4-2: How do neuroscientists study the brain's connections to behavior and mind? Clinical observations and *lesioning* have revealed the general effects of brain damage. *MRI* scans now reveal brain structures, and *EEG, PET,* and *fMRI (functional MRI)* recordings reveal brain activity.

4-3: How is the cerebral cortex organized? The *cerebral cortex* is the thin layer of interconnected neurons covering the brain's hemispheres. Prominent folds divide each hemisphere into four lobes—the *frontal, parietal, occipital,* and *temporal.*

4-4: What are the functions of the cerebral cortex? Some brain regions serve specific functions. The *motor cortex* (at the rear of the frontal lobes) controls muscle movement. The *sensory cortex* (at the front of the parietal lobes) receives information from our senses. Most of the cortex is devoted to uncommitted *association areas,* which integrate information involved in learning, remembering, thinking, and other higher-level functions. Language depends on a chain of events in several brain regions, particularly *Broca's area, Wernicke's area,* and the angular gyrus. Damage to any of these regions may cause one of several types of *aphasia.*

4-5: To what extent can a damaged brain reorganize itself? If one hemisphere is damaged early in life, the other will pick up many of its functions. This *plasticity* diminishes later in life. Some brain areas are capable of *neurogenesis* (forming new neurons).

4-6: What do split brains reveal about the functions of our two brain hemispheres? *Split-brain* research (experiments on people with a severed *corpus callosum*) has confirmed that in most people, the left hemisphere is the more verbal, and that the right hemisphere excels in visual perception and making inferences. Studies of healthy people with intact brains confirm that each hemisphere makes unique contributions to the integrated functioning of the brain.

Rehearse It!

1. The brainstem is the oldest and innermost region of the brain. The part of the brainstem that controls heartbeat and breathing is the
   a. cerebellum.
   b. medulla.
   c. cortex.
   d. thalamus.

2. The thalamus receives information from the sensory neurons and routes it to the higher brain regions that control the senses. The thalamus functions like a
   a. memory bank.
   b. balance center.
   c. breathing regulator.
   d. switchboard.

3. The lower brain structure that governs arousal is the
   a. spinal cord.
   b. cerebellum.
   c. reticular formation.
   d. medulla.

4. The part of the brain that coordinates voluntary movement is the
   a. cerebellum.
   b. medulla.
   c. thalamus.
   d. reticular formation.

5. The limbic system, a doughnut-shaped structure at the border of the brain's older parts and the cerebral hemispheres, is associated with basic motives, emotions, and memory functions. Two parts of the limbic system are the amygdala and the
   a. cerebral hemispheres.
   b. hippocampus.
   c. thalamus.
   d. pituitary.

6. A cat's ferocious response to electrical brain stimulation would lead you to suppose the electrode had touched the
   a. hippocampus.
   b. pituitary.
   c. hypothalamus.
   d. amygdala.

7. The neural structure that most directly regulates eating, drinking, and body temperature is the
   a. endocrine system.
   b. hypothalamus.
   c. hippocampus.
   d. amygdala.

8. The initial reward center discovered by Olds and Milner was located in the
   a. hippocampus.
   b. brainstem.
   c. hypothalamus.
   d. spinal cord.

9. If a neurosurgeon stimulated your right motor cortex, you would most likely
   a. see light.
   b. hear a sound.
   c. feel a touch on the right arm.
   d. move your left leg.

10. Which of the following body regions has the greatest representation in the sensory cortex?
    a. Knee
    b. Toes
    c. Forehead
    d. Thumb

11. The "uncommitted" areas that make up about three-fourths of the cerebral cortex are called
a. occipital lobes.
b. fissures.
c. association areas.
d. Wernicke's area.

12. Judging and planning are enabled by the _____ lobes.
a. occipital
b. parietal
c. frontal
d. temporal

13. Plasticity—the brain's ability to reorganize itself after damage—is especially evident in the brains of
a. split-brain patients.
b. young adults.
c. young children.
d. right-handed people.

14. An experimenter flashes the word HERON across the visual field of a man whose corpus callosum has been severed. HER is transmitted to his right hemisphere and ON to his left hemisphere. When asked to indicate what he saw, the man
a. says he saw HER but points to ON.
b. says he saw ON but points to HER.
c. says he saw HERON but points to HER.
d. says he saw HERON but points to ON.

15. Studies of people with split brains and brain scans of those with undivided brains indicate that the left hemisphere excels in
a. processing language.
b. visual perceptions.
c. making inferences.
d. neurogenesis.

16. Damage to the brain's right hemisphere is most likely to reduce a person's ability to
a. recite the alphabet rapidly.
b. make inferences.
c. understand verbal instructions.
d. solve arithmetic problems.

Answers: 1. b, 2. d, 3. c, 4. a, 5. b, 6. d, 7. b, 8. c, 9. d, 10. d, 11. c, 12. c, 13. c, 14. b, 15. a, 16. b.

Terms and Concepts to Remember

brainstem, p. 47
medulla [muh-DUL-uh], p. 47
lesion [LEE-zhuhn], p. 48
electroencephalogram (EEG), p. 48
PET (positron emission tomography) scan, p. 48
MRI (magnetic resonance imaging), p. 48
fMRI (functional magnetic resonance imaging), p. 48
thalamus [THAL-uh-muss], p. 49
reticular formation, p. 49
cerebellum [sehr-uh-BELL-um], p. 49
limbic system, p. 50
amygdala [uh-MIG-duh-la], p. 50
hypothalamus [hi-po-THAL-uh-muss], p. 51
cerebral [seh-REE-bruhl] cortex, p. 52
frontal lobes, p. 53
parietal [puh-RYE-uh-tuhl] lobes, p. 53
occipital [ahk-SIP-uh-tuhl] lobes, p. 53
temporal lobes, p. 53
motor cortex, p. 54
sensory cortex, p. 54
association areas, p. 55
aphasia, p. 56
Broca's area, p. 56
Wernicke's area, p. 56
plasticity, p. 58
neurogenesis, p. 59
corpus callosum [KOR-pus kah-LOW-sum], p. 59
split brain, p. 60

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Which area of the human brain is most similar to that of primitive animals? Which part of the human brain distinguishes us the most from primitive animals?

2. We are not conscious of many brain processes that help create our experiences. To appreciate how much is going on outside of our awareness, we can imagine functioning without certain brain areas. For example, what would it be like to talk on the phone with your mother if you didn't have temporal lobe association areas? What would you hear? What would you understand?

3. Neurons bunch together in networks, just as people tend to congregate in cities—in each case, shorter distances enable efficient communication. Yet your brain somehow integrates information transmitted from distant regions. How do different neural networks communicate with one another to let you, for example, respond when a friend greets you at a party?

4. In what brain region would damage be most likely to disrupt your ability to skip rope? Your ability to sense tastes and sounds? In what brain region would damage perhaps leave you in a coma? Without the very breath and heartbeat of life?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Consciousness and the Two-Track Mind

Consciousness and the Two-Track Mind

Consciousness can be a funny thing. It offers us weird experiences, as when entering sleep or leaving a dream, and sometimes it leaves us wondering who is really in control. After putting me under the influence of nitrous oxide, my dentist tells me to turn my head to the left. My conscious mind resists: "No way," I silently say. "You can't boss me around!" Whereupon my robotic head, ignoring my conscious mind, turns obligingly under the dentist's control.

And then there are those times when consciousness seems to split. Reading *Green Eggs and Ham* to my preschooler for the umpteenth time, my obliging mouth could say the words while my mind wandered elsewhere. That wandering half-mind helps me again if someone drops by my office while I'm typing this sentence. It's not a problem; my fingers can complete it as I strike up a conversation.

Was my drug-induced dental experience akin to people's experiences with other *psychoactive drugs* (mood- and perception-altering substances)? Was my automatic obedience to my dentist like people's responses to a hypnotist? Or does a split in consciousness, like those that we have when our mind goes elsewhere while reading or typing, explain people's behavior while under hypnosis? And during sleep, when and why do those weird dream experiences occur?

But first questions first: What is consciousness? Every science has concepts so fundamental they are nearly impossible to define. Biologists agree on what is alive but not on precisely what *life* is. In physics, *matter* and *energy* elude simple definition. To psychologists, *consciousness* is similarly a fundamental yet slippery concept.

In Module 5, we consider the mind's two levels (one conscious and controlled, the other beneath our awareness and automatic), and the fascinating world of our sleep and dreams. In Module 6, we consider what research tells us about consciousness in the hypnotic state. In Module 7, we take a close look at the influence of psychoactive drugs.

MODULE 5

Dual Processing, Sleep, and Dreams

The Brain and Consciousness

The difficulty of scientifically studying consciousness is apparent in psychology's history. At its beginning, *psychology* was "the description and explanation of states of consciousness" (Ladd, 1887). But during the first half of the twentieth century, many psychologists—including those in the emerging school of *behaviorism*—turned instead to direct observations of behavior. By the 1960s, psychology had nearly lost consciousness and was defining itself as "the science of behavior." Consciousness was likened to a car's speedometer: "It doesn't make the car go, it just reflects what's happening" (Seligman, 1991, p. 24).

After 1960, mental concepts began to reemerge. Advances in neuroscience made it possible to relate brain activity to sleeping, dreaming, and other mental states. Psychologists of all persuasions were affirming the importance of *cognition*, or mental processes. Psychology was regaining consciousness. For most psychologists today, **consciousness** is our awareness of ourselves and our environment. Over the course of a day, a week, a month, we flit between various states of consciousness, including sleeping, waking, and various altered states (**FIGURE 5.1**).

In today's science, one of the most hotly pursued research quests is to understand the biology of consciousness. Scientists now assume, in the words of neuroscientist Marvin Minsky (1986, p. 287), that "the mind is what the brain does."

Some psychologists speculate that consciousness must offer an evolutionary advantage (Barash, 2006). Perhaps consciousness helps us act in our long-term interests (by considering consequences and helping us read others' intentions). Even so, that leaves us with the so-called "hard problem": How do brain cells jabbering to one another create our awareness of the taste of a taco, the pain of a toothache, the feeling of fright?

Such questions are at the heart of *cognitive neuroscience*—the interdisciplinary study of brain activity linked with our mental processes—that is today relating specific brain states to conscious experiences. Based on your brain-activation patterns, neuroscientists can now, in some limited ways, read your mind. They can, for example, tell which of 10 similar objects (hammer, drill, and so forth) you are viewing (Shinkareva et al., 2008).

consciousness our awareness of ourselves and our environment.

Maria Teijeiro/Getty Images

Christine Brune

Stuart Franklin/Magnum Photos

AP Photo/Ricardo Mazalan

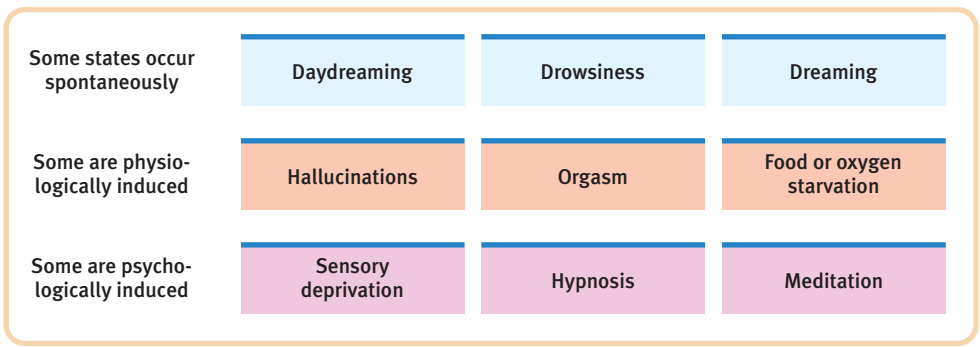


FIGURE 5.1 States of consciousness In addition to normal, waking awareness, consciousness comes to us in altered states, including daydreaming, sleeping, meditating, and drug-induced hallucinating.

Discovering which brain region becomes active with a particular conscious experience strikes many people as interesting but not mind-blowing. (If everything psychological is simultaneously biological, then our ideas, emotions, and spirituality must all, somehow, be embodied.) What *is* mind-blowing to many of us is the growing evidence that we have, so to speak, two minds, each supported by its own neural equipment.

Dual Processing

5-1: What is the "dual processing" being revealed by today's cognitive neuroscience?

At any moment, you and I are aware of little more than what's on the screen of our consciousness. But one of the grand ideas of recent cognitive neuroscience is that much of our brain work occurs off stage, out of sight. Throughout this book, you will see examples of our hidden mind at work in research on unconscious *priming*, on conscious *(explicit)* and unconscious *(implicit)* memories, on conscious versus automatic prejudices, and on the out-of-sight processing that enables sudden insights and creative moments. Perception, memory, thinking, language, and attitudes all operate on two levels—a conscious, deliberate "high road" and an unconscious, automatic "low road." Today's researchers call this **dual processing.** We know more than we know we know.

The Two-Track Mind

A scientific story illustrates the mind's two levels. Sometimes, as this story illustrates, science is stranger than science fiction.

During my sojourns at Scotland's University of St. Andrews, I came to know cognitive neuroscientists Melvyn Goodale and David Milner (2004, 2006). A local woman, whom they call D. F., was overcome by carbon monoxide one day while showering. The resulting brain damage left her unable to recognize and discriminate objects visually. Yet she was only partly blind, for she would act as if she could see. Asked to slip a postcard into a vertical or horizontal mail slot, she could do so without error. Although unable to report the width of a block in front of her, she could grasp it with the correct finger-thumb distance.

How could this be? Don't we have one visual system? Goodale and Milner knew from animal research that the eye sends information simultaneously to different brain areas, which have different tasks. Sure enough, a scan of D. F.'s brain activity revealed normal activity in the area concerned with reaching for and grasping objects, but damage in the area concerned with consciously recognizing objects.

How strangely intricate is this thing we call vision, concluded Goodale and Milner in their aptly titled book, *Sight Unseen.* We may think of our vision as one system that controls our visually guided actions, but it is actually a dual-processing system. A *visual perception track* enables us "to create the mental furniture that allows us to think about the world"—to recognize things and to plan future actions. A *visual action track* guides our moment-to-moment actions.

On rare occasions, the two conflict. Shown the *hollow face illusion* (**FIGURE 5.2**), people will mistakenly perceive the inside of a mask as a protruding face. Yet they will unhesitatingly and accurately reach into the inverted mask to flick off a buglike target stuck on the face. What their mind doesn't know, their hand does.

This big idea—that much of our everyday thinking, feeling, and acting operates outside our conscious awareness—"is a difficult one for people to accept," observed New York University psychologists John Bargh and Tanya Chartrand (1999). We are understandably biased to believe that our own intentions and deliberate choices rule our lives. And, indeed, consciousness enables us to exert voluntary control and to communicate our mental states to others. But in the mind's downstairs, there is much, much more to being human. Beneath the surface, unconscious information processing occurs simultaneously on many parallel tracks.

FIGURE 5.2 The hollow face illusion
What you see (an illusory protruding face from a reverse mask, as in the box at upper right) may differ from what you do (reach for a speck on the face inside the mask).

Adapted from: Milner, A. D. & Goodale, M. A. (2006). *The Visual Brain in Action* 2nd Edition/Oxford University Press

Unconscious parallel processing frees your conscious mind to deal with new challenges. Traveling by car on a familiar route, your hands and feet do the driving while your mind rehearses your upcoming day. Running on automatic pilot allows your consciousness—your mind's CEO—to monitor the whole system and react to problems, while many assistants automatically take care of routine business.

Serial conscious processing, though slower than parallel processing, is skilled at solving new problems, which require our focused attention. Try this: If you are right-handed, you can move your right foot in a smooth counterclockwise circle, and you can write the number 3 repeatedly with your right hand—but probably not at the same time. (If you are musically inclined, try something equally difficult: Tap a steady beat three times with your left hand while tapping four times with your right hand.) Both tasks require attention, which can be in only one place at a time. If time is nature's way of keeping everything from happening at once, then consciousness is nature's way of keeping us from thinking and doing everything at once.

Selective Attention

5-2: How much information do we consciously attend to at once?

Through **selective attention,** your conscious awareness focuses, like a flashlight beam, on only a very limited aspect of all that you experience. By one estimate, your five senses take in 11,000,000 bits of information per second, of which you consciously process about 40 (Wilson, 2002). Yet your mind's unconscious track intuitively makes great use of the other 10,999,960 bits. Until reading this sentence, for example, you have been unaware that your shoes are pressing against your feet or that your nose is in your line of vision. Now, suddenly, your attentional spotlight shifts. Your feet feel encased, your nose stubbornly intrudes on the page before you. While attending to these words, you've also been blocking from awareness information coming from your peripheral vision. But you can change that. As you stare at the X below, notice what surrounds the book (the edges of the page, your desktop, and so forth).

X

Another example of selective attention, the *cocktail party effect,* is your ability to attend to only one voice among many. (Let another voice speak your name and your cognitive radar, operating on the mind's other track, will instantly bring that voice into consciousness.) This focused listening comes at a cost. Imagine hearing two conversations over a headset, one in each ear, and being asked to repeat the message in your left ear while it is spoken. When paying attention to what is being said in your left ear, you won't perceive what is said in your right. Asked later what language your right ear heard, you may draw a blank (though you could report the speaker's gender and loudness).

Selective Attention and Accidents

Trying to talk on the phone while driving requires your selective attention to shift back and forth from the road to the phone. When a demanding situation requires your full attention, you'll probably stop talking. But this process of switching attentional gears, especially when shifting to complex tasks, can entail a slight and sometimes fatal delay in coping (Rubenstein et al., 2001). The U.S. National Highway Traffic Safety Board (2006) estimates that almost 80 percent of vehicle crashes involve driver distraction. In University of Utah driving-simulation experiments, students conversing on cell phones were slower to detect and respond to traffic signals, billboards, and other cars (Strayer & Johnston, 2001; Strayer et al., 2003).

Because attention is selective, attending to a phone call (or a GPS navigation system or a DVD player) causes inattention to other things. Thus, when University of Sydney researchers (McEvoy et al., 2005, 2007) analyzed phone records for the moments before a car crash, they found that cell-phone users (even with hands-free sets) were four times more at risk. Having a passenger increased risk only 1.6 times. This

dual processing the principle that information is often simultaneously processed on separate conscious and unconscious tracks.

selective attention the focusing of conscious awareness on a particular stimulus.

Alex Koester/The New York Times

Cell-phone inattention Just before this 2008 Los Angeles train crashed, killing 25 people, the train engineer reportedly was receiving and sending text messages.

inattentional blindness failing to see visible objects when our attention is directed elsewhere.

change blindness failing to notice changes in the environment.

difference in risk also appeared in an experiment that asked drivers to pull off at a freeway rest stop 8 miles ahead. Of drivers conversing with a passenger, 88 percent pulled off. Of those talking on a cell phone, 50 percent drove on by (Strayer & Drews, 2007). Even hands-free cell-phone talking is more distracting than a conversation with passengers, who can see the driving demands and pause the conversation.

Walking while talking can also pose dangers, as one naturalistic observation of Ohio State University pedestrians found (Nasar et al., 2008). Half the people on cell phones and only a quarter without this distraction exhibited unsafe road-crossing behavior, such as by crossing when a car was approaching.

Selective Inattention

At the level of conscious awareness, we are "blind" to all but a tiny sliver of the immense array of visual stimuli constantly before us. Researchers (Becklen & Cervone, 1983; Neisser, 1979) have demonstrated this dramatically by showing people a one-minute video in which images of three black-shirted men tossing a basketball were superimposed over the images of three white-shirted players. The viewers' supposed task was to press a key every time a black-shirted player passed the ball. Most focused their attention so completely on the game that they failed to notice a young woman carrying an umbrella saunter across the screen midway through the video. Seeing a replay of the video, viewers were astonished at their **inattentional blindness** (Mack & Rock, 2000). In a repeat of the experiment, smart-aleck researchers Daniel Simons and Christopher Chabris (1999) sent a gorilla-suited assistant through the swirl of players (**FIGURE 5.3**). During its 5- to 9-second cameo appearance, the gorilla paused to thump its chest. Still, half the conscientious pass-counting participants failed to see it.

Magicians exploit our change blindness by selectively riveting our attention on one hand's dramatic act with inattention to the change accomplished by the other hand.

Daniel Simons, University of Illinois

FIGURE 5.3 Gorillas in our midst When attending to one task (counting basketball passes by one of the three-person teams) about half the viewers displayed inattentional blindness by failing to notice a clearly visible gorilla passing through.

FIGURE 5.4 Change blindness While a man (white hair) provides directions to a construction worker, two experimenters rudely pass between them carrying a door. During this interruption, the original worker switches places with another person wearing different colored clothing. Most people, focused on their direction giving, do not notice the switch.

In other experiments, people have also exhibited a blindness to change. After a brief visual interruption, a big Coke bottle may disappear, a railing may rise, clothing color may change, but, more often than not, viewers won't notice (Resnick et al., 1997; Simons, 1996; Simons & Ambinder, 2005). This form of inattentional blindness, called **change blindness,** occurred among people giving directions to a construction worker. Most people failed to notice that the worker had been replaced by someone else (**FIGURE 5.4**). Out of sight, out of mind.

Some stimuli, however, are so powerful, so strikingly distinct, that we experience *pop-out,* as with the only smiling face in **FIGURE 5.5**. We don't choose to attend to these stimuli; they draw our eye and demand our attention.

Our selective attention extends even into our sleep, as we will see next.

FIGURE 5.5 The pop-out phenomenon

Sleep and Dreams

Sleep—the irresistible tempter to whom we inevitably succumb. Sleep—the equalizer of presidents and peasants. Sleep—sweet, renewing, mysterious sleep.

"I love to sleep. Do you? Isn't it great? It really is the best of both worlds. You get to be alive and unconscious."

—Comedian Rita Rudner, 1993

While sleeping, you may feel "dead to the world," but you are not. Even when you are deeply asleep, your perceptual window is not completely shut. You move around on your bed, but you manage not to fall out. The occasional roar of passing vehicles may leave your deep sleep undisturbed, but a cry from a baby's nursery quickly interrupts it. So does the sound of your name. EEG recordings confirm that the brain's auditory cortex responds to sound stimuli even during sleep (Kutas, 1990). And when you are asleep, as when you are awake, you process most information outside your conscious awareness.

Many of sleep's mysteries are now being solved as some people sleep, attached to recording devices, while others observe. By recording brain waves and muscle movements, and by observing and occasionally waking sleepers, researchers are glimpsing things that a thousand years of common sense never told us. Perhaps you can anticipate some of their discoveries. Are the following statements true or false?

1. When most people dream of performing some activity, their limbs often move in concert with the dream.
2. Older adults sleep more than young adults.
3. Sleepwalkers are acting out their dreams.
4. Sleep experts recommend treating insomnia with an occasional sleeping pill.
5. Some people dream every night; others seldom dream.

All these statements (adapted from Palladino & Carducci, 1983) are false. To see why, read on.

Dolphins, porpoises, and whales sleep with one side of their brain asleep at a time (Miller et al., 2008).

Biological Rhythms and Sleep

5-3: How do our biological rhythms influence our daily functioning and our sleep and dreams?

Like the ocean, life has its rhythmic tides. Over varying time periods, our bodies fluctuate, and with them, our minds. Let's look more closely at two of those biological rhythms—our 24-hour biological clock and our 90-minute sleep cycle.

Circadian Rhythm

The rhythm of the day parallels the rhythm of life—from our waking at a new day's birth to our nightly return to what Shakespeare called "death's counterfeit." Our bodies roughly synchronize with the 24-hour cycle of day and night through a biological clock called the **circadian rhythm** (from the Latin *circa*, "about," and *diem*, "day"). Body temperature rises as morning approaches, peaks during the day, dips for a time in early afternoon (when many people take siestas), and then begins to drop again before we go to sleep. Thinking is sharpest and memory most accurate when we are at our daily peak in circadian arousal. Pulling an all-nighter, we may feel groggiest about 4:00 A.M., and then we get a second wind after our normal wake-up time arrives.

At about age 20 (slightly earlier for women), we begin to shift from being evening-energized "owls" to being morning-loving "larks" (Roenneberg et al., 2004). Most 20-year-olds are owls, with performance improving across the day (May & Hasher, 1998). Most older adults are larks, with performance declining as the day wears on. Retirement homes are typically quiet by mid-evening; in university dorms, the day is far from over.

Bright light in the morning tweaks the circadian clock by activating light-sensitive retinal proteins. These proteins control the circadian clock by triggering signals to the brain's *suprachiasmatic nucleus (SCN)*—a pair of grain-of-rice–sized, 20,000-cell clusters in the hypothalamus (Foster, 2004). The SCN does its job in part by causing the brain's pineal gland to decrease its production of the sleep-inducing hormone *melatonin* in the morning or increase it in the evening (**FIGURE 5.6**).

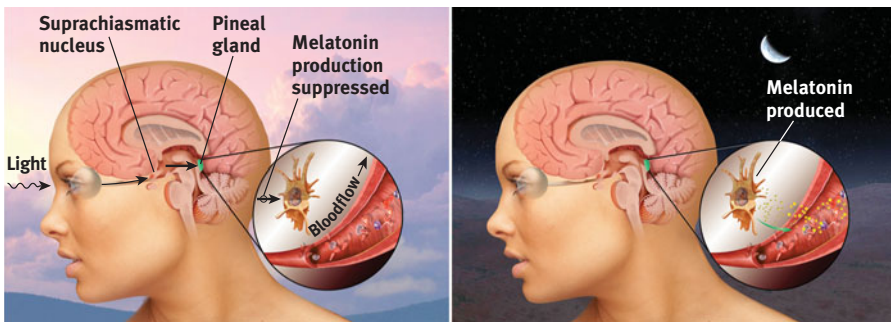


FIGURE 5.6 The biological clock Light striking the retina signals the suprachiasmatic nucleus (SCN) to suppress the pineal gland's production of the sleep hormone melatonin. At night, the SCN quiets down, allowing the pineal gland to release melatonin into the bloodstream.

Bright light at night helps delay sleep, thus resetting our biological clock when we stay up late and sleep in on weekends (Oren & Terman, 1998). Sleep often eludes those who sleep till noon on Sunday and then go to bed just 11 hours later in preparation for the new workweek. They are like New Yorkers whose biology is on California time. But what about North Americans who fly to Europe, and who need to be up when their circadian rhythm cries "Sleep!"? Studies in the laboratory and with shift workers have found that bright light—spending the next day outdoors—helps reset the biological clock (Czeisler et al., 1986, 1989; Eastman et al., 1995).

Curiously—given that our ancestors' body clocks were attuned to the rising and setting sun of the 24-hour day—many of today's young adults adopt something closer to a 25-hour day, by staying up too late to get 8 hours of sleep. For this, we can thank (or blame) Thomas Edison, inventor of the light bulb. Being bathed in light disrupts our 24-hour biological clock (Czeisler et al., 1999; Dement, 1999). This helps explain why, until our later years, we must discipline ourselves to go to bed and force ourselves to get up. Most animals, too, when placed under unnatural constant illumination will exceed a 24-hour day. Artificial light delays sleep.

If our natural circadian rhythm were attuned to a 23-hour cycle, would we instead need to discipline ourselves to stay up later at night and sleep in longer in the morning?

Sleep Stages

5-4: What is the biological rhythm of our sleep?

As sleep overtakes us and different parts of our brain's cortex stop communicating, consciousness fades (Massimini et al., 2005). But our still-active sleeping brain does not then emit a constant dial tone, because sleep has its own biological rhythm. About every 90 minutes, we pass through a cycle of five distinct sleep stages. This elementary fact apparently was unknown until 8-year-old Armond Aserinsky went to bed one night in 1952. His father, Eugene, a University of Chicago graduate student, needed to test an electroencephalograph he had been repairing that day (Aserinsky, 1988; Seligman & Yellen, 1987). Placing electrodes near Armond's eyes to record the rolling eye movements then believed to occur during sleep, Aserinsky watched the machine go wild, tracing deep zigzags on the graph paper. Could the machine still be broken? As the night proceeded and the activity periodically recurred, Aserinsky finally realized that the fast, jerky eye movements were accompanied by energetic brain activity. Awakened during one such episode, Armond reported having a dream. Aserinsky had discovered what we now know as **REM sleep** (*r*apid *e*ye *m*ovement sleep).

To find out if similar cycles occur during adult sleep, Nathaniel Kleitman (1960) and Aserinsky pioneered procedures that have now been used with thousands of volunteers. To appreciate their methods and findings, imagine yourself in their lab. As the hour grows late, you feel sleepy and you yawn in response to reduced brain metabolism. (Yawning, which can be socially contagious, stretches your neck muscles and increases your heart rate, which increases your alertness [Moorcroft, 2003]). When you are ready for bed, the researcher tapes electrodes just outside the corners of your eyes (to detect eye movements), to your scalp (to detect your brain waves), and on your chin (to detect muscle tension) (**FIGURE 5.7**). Other devices allow the researcher to record your heart rate, your respiration rate, and your genital arousal.

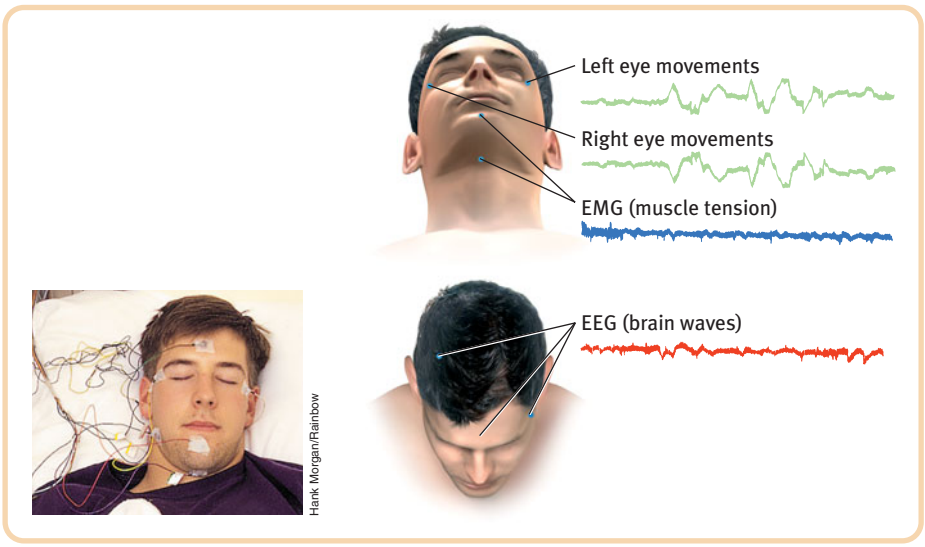


FIGURE 5.7 Measuring sleep activity
Sleep researchers measure brain-wave activity, eye movements, and muscle tension by electrodes that pick up weak electrical signals from the brain, eye, and facial muscles. (From Dement, 1978.)

When you are in bed with your eyes closed, the researcher in the next room sees on the EEG the relatively slow **alpha waves** of your awake but relaxed state (**FIGURE 5.8** on the next page). As you adapt to all this equipment, you grow tired and, in an unremembered moment, slip into **sleep.** The transition is marked by the slowed breathing and the irregular brain waves of Stage 1 (**FIGURE 5.9** on the next page).

In one of his 15,000 research participants, William Dement (1999) observed the moment the brain's perceptual window to the outside world slammed shut. Dement asked this sleep-deprived young man, lying on his back with eyelids taped open, to press a button every time a strobe light flashed in his eyes (about every 6 seconds).

circadian [ser-KAY-dee-an] **rhythm** the biological clock; regular bodily rhythms (for example, of temperature and wakefulness) that occur on a 24-hour cycle.

REM sleep rapid eye movement sleep; a recurring sleep stage during which vivid dreams commonly occur. Also known as *paradoxical sleep,* because the muscles are relaxed (except for minor twitches) but other body systems are active.

alpha waves the relatively slow brain waves of a relaxed, awake state.

sleep periodic, natural loss of consciousness—as distinct from unconsciousness resulting from a coma, general anesthesia, or hibernation. (Adapted from Dement, 1999.)

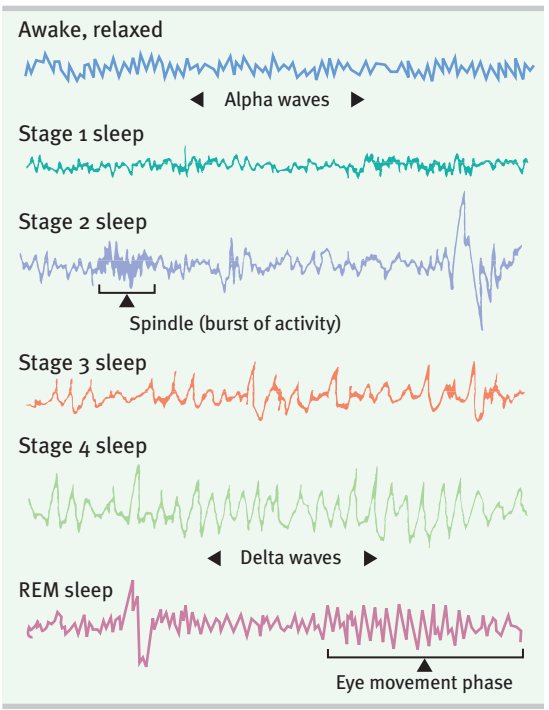


FIGURE 5.8 Brain waves and sleep stages The regular alpha waves of an awake, relaxed state are quite different from the slower, larger delta waves of deep Stage 4 sleep. Although the saw-toothed REM sleep waves resemble the near-waking Stage 1 sleep waves, the body is more aroused during REM sleep than during Stage 1 sleep. (From Dement, 1978.)

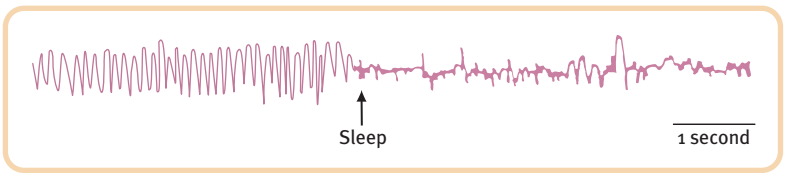


FIGURE 5.9 The moment of sleep We seem unaware of the moment we fall into sleep, but someone eavesdropping on our brain waves could tell. (From Dement, 1999.)

To catch your own hypnagogic experiences after going to bed, you might have a "Snooze" alarm awaken you every five minutes.

After a few minutes the young man missed one. Asked why, he said, "Because there was no flash." But there was a flash. He missed it because (as his brain activity revealed) he had fallen asleep for 2 seconds. Unaware that he had done so, he had missed not only the flash 6 inches from his nose but also the abrupt moment of his entry into sleep.

During this brief Stage 1 sleep you may experience fantastic images, resembling **hallucinations**—sensory experiences that occur without a sensory stimulus. You may have a sensation of falling (at which moment your body may suddenly jerk) or of floating weightlessly. Such *hypnagogic* sensations may later be incorporated into memories. People who claim to have been abducted by aliens—often shortly after getting into bed—commonly recall being floated off or pinned down on their beds (Clancy, 2005).

You next relax more deeply and begin about 20 minutes of Stage 2 sleep, characterized by the periodic appearance of *sleep spindles*—bursts of rapid, rhythmic brain-wave activity (see Figure 5.8). Although you could still be awakened without too much difficulty, you are now clearly asleep.

For the next few minutes, you go through the transitional Stage 3 to the deep sleep of Stage 4. First in Stage 3, and increasingly in Stage 4, your brain emits large, slow **delta waves.** These two slow-wave stages last for about 30 minutes, during which you would be hard to awaken. Curiously, it is at the end of the deep sleep of Stage 4 that children may wet the bed or begin sleepwalking. About 20 percent of 3- to 12-year-olds have at least one episode of sleepwalking, usually lasting 2 to 10 minutes; some 5 percent have repeated episodes (Giles et al., 1994).

"Boy are my eyes tired! I had REM sleep all night long."

REM Sleep

About an hour after you first fall asleep, a strange thing happens. Rather than continuing in deep slumber, you ascend from your initial sleep dive. Returning through Stage 3 and Stage 2 (where you spend about half your night), you enter the most intriguing sleep phase—REM sleep. For about 10 minutes, your brain waves become rapid and saw-toothed, more like those of the nearly awake Stage 1 sleep. But unlike Stage 1 sleep, during REM sleep your heart rate rises, your

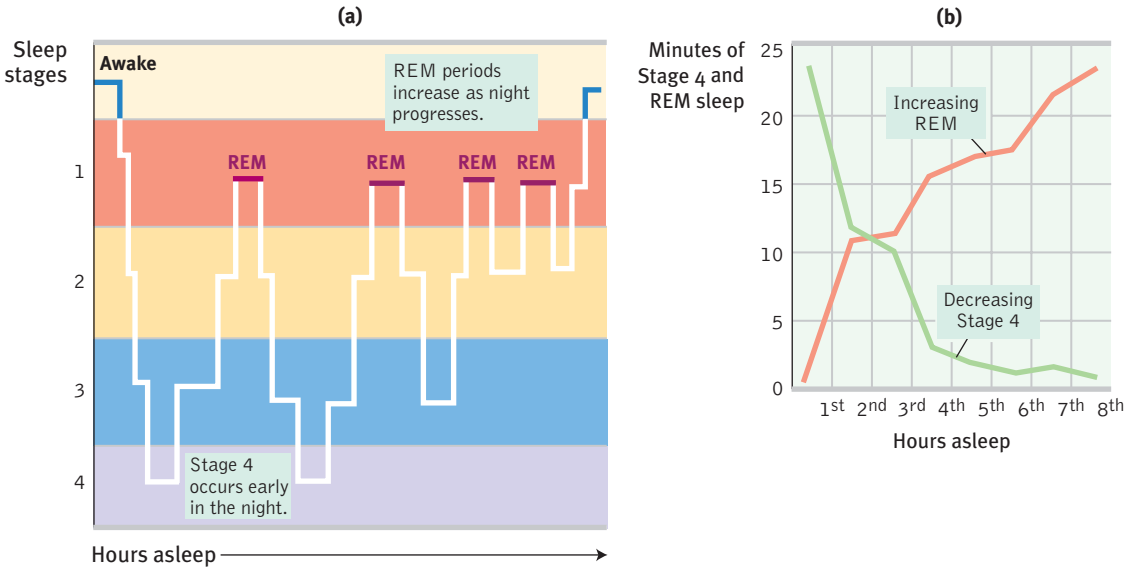


FIGURE 5.10 The stages in a typical night's sleep Most people pass through the five-stage sleep cycle (graph a) several times, with the periods of Stage 4 sleep and then Stage 3 sleep diminishing and REM sleep periods increasing. Graph b plots this increasing REM sleep and decreasing deep sleep based on data from 30 young adults. (From Cartwright, 1978; Webb, 1992.)

breathing becomes rapid and irregular, and every half-minute or so your eyes dart around in momentary bursts of activity behind closed lids. Because anyone watching a sleeper's eyes can notice these REM bursts, it is amazing that science was ignorant of REM sleep until 1952. The stages in a typical night's sleep are summarized in **FIGURE 5.10.**

Except during very scary dreams, your genitals become aroused during REM sleep, and you have an erection or increased vaginal lubrication and clitoral engorgement, regardless of whether the dream's content is sexual (Karacan et al., 1966). Men's common "morning erection" stems from the night's last REM period, often just before waking. In young men, sleep-related erections outlast REM periods, lasting 30 to 45 minutes on average (Karacan et al., 1983; Schiavi & Schreiner-Engel, 1988). A typical 25-year-old man therefore has an erection during nearly half his night's sleep, a 65-year-old man for one-quarter. Many men troubled by *erectile dysfunction* (impotence) have sleep-related erections, suggesting the problem is not between their legs.

Although your brain's motor cortex is active during REM sleep, your brainstem blocks its messages, leaving muscles relaxed—so relaxed that, except for an occasional finger, toe, or facial twitch, you are essentially paralyzed. Moreover, you cannot easily be awakened. Thus, REM sleep is sometimes called *paradoxical* sleep, with the body internally aroused and externally calm.

More intriguing than the paradoxical nature of REM sleep is what the rapid eye movements announce: the beginning of a dream. Even those who claim they never dream will, more than 80 percent of the time, recall a dream after being awakened during REM sleep. Unlike the fleeting images of Stage 1 sleep ("I was thinking about my exam today," or "I was trying to borrow something from someone"), REM sleep dreams are often emotional, usually storylike, and more richly hallucinatory.

The sleep cycle repeats itself about every 90 minutes. As the night wears on, deep Stage 4 sleep gets progressively briefer and then disappears. The REM and Stage 2 sleep periods get longer (see Figure 5.10b). By morning, 20 to 25 percent of our average night's sleep—some 100 minutes—has been REM sleep. Thirty-seven percent of people report rarely or never having dreams "that you can remember the next morning" (Moore, 2004). Unknown to those people, they spend about 600 hours a year experiencing some 1500 dreams, or more than 100,000 dreams over a typical lifetime—dreams swallowed by the night but never acted out, thanks to REM's protective paralysis.

hallucinations false sensory experiences, such as seeing something in the absence of an external visual stimulus.

delta waves the large, slow brain waves associated with deep sleep.

Horses, which spend 92 percent of each day standing and can sleep standing, must lie down for REM sleep (Morrison, 2003).

People rarely snore during dreams. When REM starts, snoring stops.

AP Photo/David Guttenfelder

Some sleep deeply, some not The fluctuating sleep cycle enables safe sleep for these firefighters battling California wildfires. One benefit of communal sleeping is that someone will probably be awake or easily roused in the event of a threat.

Why Do We Sleep?

The idea that "everyone needs 8 hours of sleep" is untrue. Newborns spend nearly two-thirds of their day asleep, most adults no more than one-third. Age-related differences in average sleeping time are rivaled by the differences among individuals at any age. Some people thrive with fewer than 6 hours per night; others regularly rack up 9 hours or more. Such sleep patterns may be genetically influenced. In studies of the pattern and duration of sleep among fraternal and identical twins, only the identical twins were strikingly similar (Webb & Campbell, 1983).

Sleep patterns are also culturally influenced. In the United States and Canada, for example, adults average just over 8 hours per night (Hurst, 2008; Robinson & Martin, 2007). (The weeknight sleep of many students and workers falls short of this average [NSF, 2008].) North Americans are nevertheless sleeping less than their counterparts a century ago. Thanks to modern light bulbs, shift work, and social diversions, those who would have gone to bed at 9:00 P.M. are now up until 11:00 P.M. or later. Thomas Edison (1948) was pleased to accept credit for this, believing that less sleep meant more productive time and greater opportunities.

Allowed to sleep unhindered, most adults will sleep at least 9 hours a night (Coren, 1996). With that much sleep, we awake refreshed, sustain better moods, and perform more efficient and accurate work. Compare that with a succession of 5-hour nights, when we accumulate a sleep debt that cannot be paid off by one long marathon sleep. "The brain keeps an accurate count of sleep debt for at least two weeks," observed sleep researcher William Dement (1999, p. 64). With our body yearning for sleep, we will begin to feel terrible. Trying to stay awake, we will eventually lose. In the tiredness battle, sleep always wins.

Obviously, then, we need sleep. Sleep commands roughly one-third of our lives—some 25 years, on average. But why? It seems an easy question to answer: Just keep people awake for several days and note how they deteriorate. If you were a volunteer in such an experiment, how do you think it would affect your body and mind? You would, of course, become terribly drowsy—especially during the hours when your biological clock programs you to sleep. But could the lack of sleep physically damage you? Would it noticeably alter your biochemistry or body organs? Would you become emotionally disturbed? Mentally disoriented?

The Effects of Sleep Loss

5-5: How does sleep loss affect us?

Good news! Psychologists have discovered a treatment that strengthens memory, increases concentration, boosts mood, moderates hunger and obesity, fortifies the disease-fighting immune system, and lessens the risk of fatal accidents. Even better news: The treatment feels good, it can be self-administered, the supplies are limitless, and it's available free! If you are a typical university-age student, often going to bed near 2:00 A.M. and dragged out of bed six hours later by the dreaded alarm, the treatment is simple: Each night, just add an hour to your sleep.

In a 2001 Gallup poll, 61 percent of men, but only 47 percent of women, said they got enough sleep.

The U.S. Navy and the National Institutes of Health have demonstrated the benefits of unrestricted sleep in experiments in which volunteers spent 14 hours daily in bed for at least a week. For the first few days, the volunteers averaged 12 hours or more sleep each day, apparently paying off a sleep debt that averaged 25 to 30 hours. That accomplished, they then settled back to 7.5 to 9 hours nightly and, with no sleep debt, felt energized and happier (Dement, 1999). In one Gallup survey (Mason, 2005), 63 percent of adults who reported getting the sleep they need also reported being "very satisfied" with their personal life (as did only 36 percent of those needing more sleep).

Unfortunately, many of us are suffering from patterns that not only leave us sleepy but also thwart our having an energized feeling of well-being. Teens who typically need 8 or 9 hours of sleep now average less than 7 hours—nearly 2 hours less each night than did their counterparts of 80 years ago (Holden, 1993; Maas,

1999). In one survey, 28 percent of high school students acknowledged falling asleep in class at least once a week (Sleep Foundation, 2006). When the going gets boring, the students start snoring.

Even when awake, students often function below their peak. And they know it: Four in five American teens and three in five 18- to 29-year-olds wish they could get more sleep on weekdays (Mason, 2003, 2005). Yet that teen who staggers glumly out of bed in response to an unwelcome alarm, yawns through morning classes, and feels half-depressed much of the day may be energized at 11 P.M. and mindless of the next day's looming sleepiness (Carskadon, 2002).

At Stanford University, 80 percent of students are "dangerously sleep deprived." Dement (1997) said, "Sleep deprivation [entails] difficulty studying, diminished productivity, tendency to make mistakes, irritability, fatigue." A large sleep debt "makes you stupid," he noted (1999, p. 231).

It can also make you fatter. Sleep deprivation increases ghrelin, a hunger-arousing hormone, and decreases its hunger-suppressing partner, leptin. Sleep deprivation also increases cortisol, a stress hormone that stimulates the body to make fat. Sure enough, children and adults who sleep less than normal are fatter than those who sleep more (Chen et al., 2008; Knutson et al., 2007; Schoenborn & Adams, 2008). And experimental sleep deprivation of adults increases appetite and eating (Nixon et al., 2008; Patel et al., 2006; Spiegel et al., 2004; Van Cauter et al., 2007). This may help explain the common weight gain among sleep-deprived students (although a review of 11 studies reveals that the mythical "freshman 15" is, on average, closer to a "first-year 4" [Hull et al., 2007]).

Jose Luis Pelaez, Inc/Corbis

Sleepless and suffering This fatigued, sleep-deprived person may also experience a depressed immune system, impaired concentration, and a greater vulnerability to accidents.

In addition to making us more vulnerable to obesity, sleep deprivation can suppress immune cells that fight off viral infections and cancer (Motivala & Irwin, 2007). This may help explain why people who sleep 7 to 8 hours a night tend to outlive those who are chronically sleep deprived, and why older adults who have no difficulty falling or staying asleep tend to live longer than their sleep-deprived agemates (Dement, 1999; Dew et al., 2003). When infections do set in, we typically sleep more, boosting our immune cells.

Chronic sleep debt also alters metabolic and hormonal functioning in ways that mimic aging and are conducive to hypertension and memory impairment (Spiegel et al., 1999; Taheri, 2004). Other effects include irritability, slowed performance, and impaired creativity, concentration, and communication (Harrison & Horne, 2000). Reaction times slow and errors increase on visual tasks similar to those involved in screening airport baggage, performing surgery, and reading X-rays (Horowitz et al., 2003).

Sleep deprivation can be devastating for driving, piloting, and equipment operating. Driver fatigue contributes to an estimated 20 percent of American traffic accidents (Brody, 2002) and to some 30 percent of Australian highway deaths (Maas, 1999). Consider the timing of the 1989 *Exxon Valdez* oil spill; Union Carbide's 1984 Bhopal, India, disaster; and the 1979 Three Mile Island and 1986 Chernobyl nuclear accidents—all occurred after midnight, when operators in charge were likely to be drowsiest and unresponsive to signals that require an alert response. When sleepy frontal lobes confront an unexpected situation, misfortune often results.

In 1989, Michael Doucette was named America's Safest Driving Teen. In 1990, while driving home from college, he fell asleep at the wheel and collided with an oncoming car, killing both himself and the other driver. Michael's driving instructor later acknowledged never having mentioned sleep deprivation and drowsy driving (Dement, 1999).

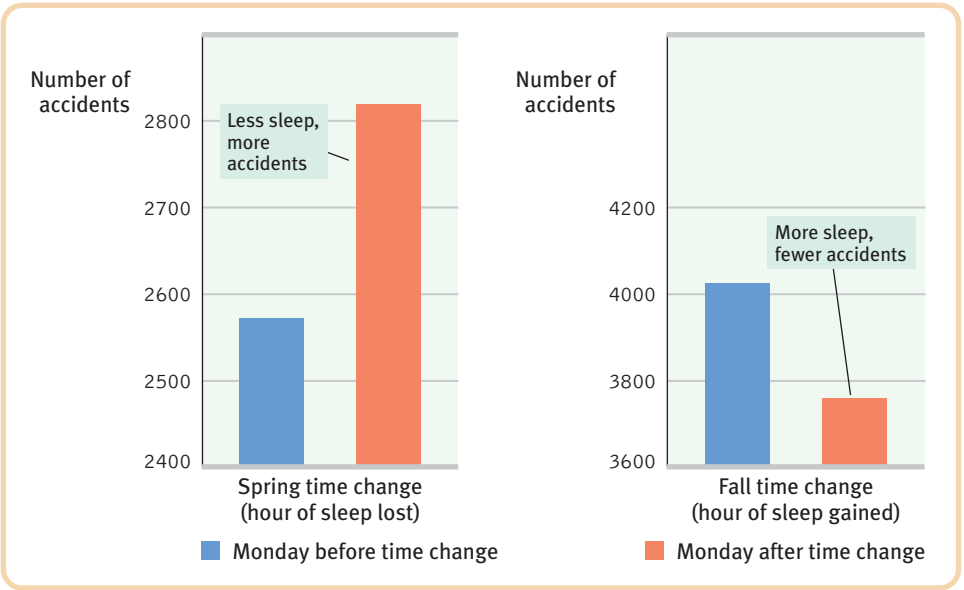


FIGURE 5.11 Canadian traffic accidents
On the Monday after the spring time change, when people lose one hour of sleep, accidents increased as compared with the Monday before. In the fall, traffic accidents normally increase because of greater snow, ice, and darkness, but they diminished after the time change. (Adapted from Coren, 1996.)

Stanley Coren capitalized on what is, for many North Americans, a semi-annual sleep-manipulation experiment—the "spring forward" to "daylight savings" time and "fall backward" to "standard" time. Searching millions of records, Coren found that in both Canada and the United States, accidents increased immediately after the time change that shortens sleep (**FIGURE 5.11**).

But let's put all this positively: To manage your life with enough sleep to awaken naturally and well rested is to be more alert, productive, happy, healthy, and safe.

Sleep Theories

5-6: Why do we sleep?

So, nature charges us for our sleep debt. But why do we have this need for sleep?

"Sleep faster, we need the pillows."
—Yiddish proverb

We have very few answers, but sleep may have evolved for five reasons: First, *sleep protects.* When darkness precluded our distant ancestors' hunting and food gathering and made travel treacherous, they were better off asleep in a cave, out of harm's way. Those who didn't try to navigate around rocks and cliffs at night were more likely to leave descendants. This fits a broader principle: A species' sleep pattern tends to suit its ecological niche. Animals with the most need to graze and the least ability to hide tend to sleep less. Elephants and horses sleep 3 to 4 hours a day, gorillas 12 hours, and cats 14 hours. For bats and eastern chipmunks, both of which sleep 20 hours, to live is hardly more than to eat and to sleep (Moorcroft, 2003). (Would you rather be like a giraffe and sleep 2 hours a day, or a bat and sleep 20?)

Second, *sleep helps us recuperate.* It helps restore and repair brain tissue. Animals with high waking metabolism (such as bats) burn a lot of calories, producing a lot of *free radicals,* molecules that are toxic to neurons. Sleeping a lot gives resting neurons time to repair themselves, while allowing unused connections to weaken (Siegel, 2003; Vyazovskiy et al., 2008). Think of it this way: When consciousness leaves your house, brain construction workers come in for a makeover.

But sleep is not just for keeping us safe and for repairing our brain. New research reveals that *sleep is for making memories*—for restoring and rebuilding our fading memories of the day's experiences. People trained to perform tasks recall them better after a night's sleep, or even after a short nap, than after several hours awake (Walker & Stickgold, 2006). And in both humans and rats, neural activity during slow-wave sleep reenacts and promotes recall of prior novel experiences (Peigneux et al., 2004; Ribeiro et al., 2004).

Sleep also feeds creative thinking. On occasion, dreams have inspired noteworthy literary, artistic, and scientific achievements. It was, for example, a dream that clued chemist August Kekulé to the structure of benzene (Ross, 2006). More common-

place is the boost that a complete night's sleep gives to our thinking and learning. People who work on a task, then sleep on it, solve problems more insightfully than do those who stay awake (Wagner et al., 2004). They can also, after sleep, better discern connections among different novel pieces of information (Ellenbogen et al., 2007). Even 15-month-olds, if retested after a nap, better recall relationships among novel words (Gómez et al., 2006). To think smart and see connections, it often pays to sleep on it.

Finally, *sleep may play a role in the growth process.* During deep sleep, the pituitary gland releases a growth hormone. As we age, we release less of this hormone and spend less time in deep sleep (Pekkanen, 1982). Such discoveries are beginning to solve the ongoing riddle of sleep.

insomnia recurring problems in falling or staying asleep.

narcolepsy a sleep disorder characterized by uncontrollable sleep attacks. The sufferer may lapse directly into REM sleep, often at inopportune times.

Sleep Disorders

5-7: What are the major sleep disorders?

No matter what their normal need for sleep, 1 in 10 adults, and 1 in 4 older adults, complain of **insomnia**—not an occasional inability to sleep when anxious or excited, but persistent problems in falling or staying asleep (Irwin et al., 2006).

From middle age on, sleep is seldom uninterrupted. Being occasionally awakened becomes the norm, not something to fret over or treat with medication. And some people do fret unnecessarily about their sleep (Coren, 1996). In laboratory studies, insomnia complainers do sleep less than others, but they typically overestimate—by about double—how long it takes them to fall asleep. They also underestimate by nearly half how long they actually have slept. Even if we have been awake only an hour or two, we may *think* we have had very little sleep because it's the waking part we remember.

"The lion and the lamb shall lie down together, but the lamb will not be very sleepy."

—Woody Allen, in the movie *Love and Death,* 1975

The most common quick fixes for true insomnia—sleeping pills and alcohol—can aggravate the problem, reducing REM sleep and leaving the person with next-day blahs. Nevertheless, sales of sleeping pills soared 60 percent from 2000 to 2006 (Saul, 2007). Those who rely on them may need increasing doses to get an effect; then, when the drug is discontinued, the insomnia can worsen.

"Sleep is like love or happiness. If you pursue it too ardently it will elude you."

—Wilse Webb, *Sleep: The Gentle Tyrant,* 1992

Scientists are searching for natural chemicals that are abundant during sleep, hoping they might be synthesized as a sleep aid without side effects. In the meantime, sleep experts offer other natural alternatives:

- Exercise regularly but not in the late evening. (Late afternoon is best.)
- Avoid all caffeine after early afternoon, and avoid rich foods before bedtime. Instead, try a glass of milk, which provides raw materials for the manufacture of serotonin, a neurotransmitter that facilitates sleep.
- Relax before bedtime, using dimmer light.
- Sleep on a regular schedule (rise at the same time even after a restless night) and avoid naps. Sticking to a schedule boosts daytime alertness, too, as shown in an experiment in which University of Arizona students averaged 7.5 hours of sleep a night on either a varying or consistent schedule (Manber et al., 1996).
- Hide the clock face so you aren't tempted to check it repeatedly.
- Reassure yourself that a temporary loss of sleep causes no great harm.
- Realize that for any stressed organism, being vigilant is natural and adaptive. A personal conflict during the day often means a fitful sleep that night (Åkerstedt et al., 2007; Brisette & Cohen, 2002). Managing your stress levels will enable more restful sleeping.
- If all else fails, settle for less sleep, either going to bed later or getting up earlier.

"In 1757 Benjamin Franklin gave us the axiom, 'Early to bed, early to rise, makes a man healthy, wealthy, and wise.' It would be more accurate to say 'consistently to bed and consistently to rise . . . ' "

—James B. Maas, *Power Sleep,* 1999

Rarer but also more troublesome than insomnia are the sleep disorders *narcolepsy, sleep apnea, night terrors,* and *sleepwalking.*

Narcolepsy (from *narco,* "numbness," and *lepsy,* "seizure") sufferers experience periodic, overwhelming sleepiness. Attacks usually last less than 5 minutes but sometimes occur at the most inopportune times, perhaps just after taking a terrific swing at a softball or when laughing loudly, shouting angrily, or having sex (Dement, 1978, 1999). In severe cases, the person may collapse directly into a brief

Economic-recession stress can rob sleep A National Sleep Foundation (2009) survey found 27 percent of people reporting sleeplessness related to the economy and their personal finances and employment. Higher stress levels, and more restless sleep, may plague those standing in unemployment lines such as this one.

Spencer Platt/Getty Images

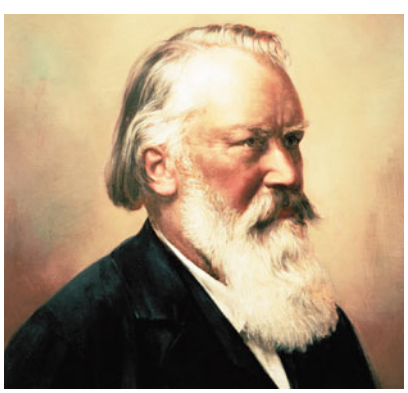
period of REM sleep, with an accompanying loss of muscular tension. People with narcolepsy—1 in 2000 of us, estimates the Stanford University Center for Narcolepsy (2002)—must therefore live with extra caution. As a traffic menace, "snoozing is second only to boozing," says the American Sleep Disorders Association, and those with narcolepsy are especially at risk (Aldrich, 1989).

Imagine observing a person with narcolepsy in medieval times. Might such symptoms (especially the instant dreams from dropping into REM sleep) have seemed like demon possession?

Sleep apnea also puts millions of people at increased risk of traffic accidents (Teran-Santos et al., 1999). Although 1 in 20 of us has this disorder, it was unknown before modern sleep research. *Apnea* means "with no breath," and people with this condition intermittently stop breathing during sleep. After an airless minute or so, decreased blood oxygen arouses them and they wake up enough to snort in air for a few seconds, in a process that repeats hundreds of times each night, depriving them of slow-wave sleep. Apart from complaints of sleepiness and fatigue, and irritability or depression during the day—and their mate's complaints about their loud "snoring"—apnea sufferers often have no recall of these episodes (Peppard et al., 2006).

Sleep apnea is associated with obesity, and as the number of obese Americans has increased, so has this disorder, particularly among overweight men, including some football players (Keller, 2007). Anyone who snores at night, feels tired during the day, and possibly has high blood pressure as well (increasing the risk of a stroke or heart attack) should be checked for apnea (Dement, 1999). A physician may prescribe a masklike device with an air pump that keeps the sleeper's airway open and breathing regular. If one doesn't mind looking a little goofy in the dark (imagine a snorkeler at a slumber party), the treatment can effectively treat both the apnea and associated depressed energy and mood.

Did Brahms need his own lullabies? Cranky, overweight, and nap-prone, Johannes Brahms exhibited common symptoms of sleep apnea (Margolis, 2000).



Archivo Iconografico, S.A./Corbis

Unlike sleep apnea, **night terrors** target mostly children, who may sit up or walk around, talk incoherently, experience a doubling of heart and breathing rates, and appear terrified (Hartmann, 1981). They seldom wake up fully during an episode and recall little or nothing the next morning—at most, a fleeting, frightening image. Night terrors are not nightmares (which, like other dreams, typically occur during early morning REM sleep); night terrors usually occur during the first few hours of Stage 4.

Children also are most prone to *sleepwalking*—another Stage 4 sleep disorder—and to *sleeptalking*, conditions that run in families. (Sleeptalking—usually garbled or nonsensical—can occur during Stage 2 or any other sleep stage [Mahowald & Ettinger, 1990].) Occasional childhood sleepwalking occurs for about one-third of those with a sleepwalking fraternal twin and half of those with a sleepwalking identical twin. The same is true for sleeptalking (Hublin et al., 1997, 1998). Sleepwalking is usually harmless and unrecalled the next morning. Sleepwalkers typically return to bed on their own or are guided there by a family member. Young children, who have the deepest and lengthiest Stage 4 sleep, are the most likely to experience both night terrors and sleepwalking. As we grow older and deep Stage 4 sleep diminishes, so do night terrors and sleepwalking. After being sleep deprived, people sleep more deeply, which increases any tendency to sleepwalk (Zadra et al., 2008).

Dreams

5-8: What do we dream?

Now playing at an inner theater near you: the premiere showing of a sleeping person's vivid dream. This never-before-seen mental movie features captivating characters wrapped in a plot so original and unlikely, yet so intricate and so seemingly real, that the viewer later marvels at its creation.

Waking from a troubling dream, wrenched by its emotions, who among us has not wondered about this weird state of consciousness? How can our brain so creatively, colorfully, and completely construct this alternative, conscious world? In the shadowland between our dreaming and waking consciousness, we may even wonder for a moment which is real.

Discovering the link between REM sleep and dreaming opened a new era in dream research. Instead of relying on someone's hazy recall hours or days after having a dream, researchers could catch dreams as they happened. They could awaken people during or within 3 minutes after a REM sleep period and hear a vivid account.

sleep apnea a sleep disorder characterized by temporary cessations of breathing during sleep and repeated momentary awakenings.

night terrors a sleep disorder characterized by high arousal and an appearance of being terrified; unlike nightmares, night terrors occur during Stage 4 sleep, within two or three hours of falling asleep, and are seldom remembered.

dream a sequence of images, emotions, and thoughts passing through a sleeping person's mind. Dreams are notable for their hallucinatory imagery, discontinuities, and incongruities, and for the dreamer's delusional acceptance of the content and later difficulties remembering it.

What We Dream

Daydreams tend to involve the familiar details of our life—perhaps picturing ourselves explaining to an instructor why a paper will be late, or replaying in our minds personal encounters we relish or regret. REM **dreams**—"hallucinations of the sleeping mind" (Loftus & Ketcham, 1994, p. 67)—are vivid, emotional, and bizarre—so vivid that we may confuse them with reality. Awakening from a nightmare, a 4-year-old may be sure there is a bear in the house.

"I do not believe that I am now dreaming, but I cannot prove that I am not."

—Philosopher Bertrand Russell (1872–1970)

We spend six years of our life in dreams, many of which are anything but sweet. For both women and men, 8 in 10 dreams are marked by at least one negative event or emotion (Domhoff, 2007). People commonly dream of repeatedly failing in an attempt to do something; of being attacked, pursued, or rejected; or of experiencing misfortune (Hall et al., 1982). Dreams with sexual imagery occur less often than you might think. In one study, only 1 dream in 10 among young men and 1 in 30 among young women had sexual overtones (Domhoff, 1996). More commonly, the story line of our dreams incorporates traces of previous days' nonsexual experiences and preoccupations (De Koninck, 2000):

Would you suppose that people dream if blind from birth? Studies of blind people in France, Hungary, Egypt, and the United States all found them dreaming of using their nonvisual senses—hearing, touching, smelling, tasting (Buquet, 1988; Taha, 1972; Vekassy, 1977).

- After suffering a trauma, people commonly report nightmares (Levin & Nielsen, 2007). One sample of Americans who were recording their dreams during September 2001 reported an increase in threatening dreams following the 9/11 attack (Propper et al., 2007).
- After playing the computer game "Tetris" for seven hours and then being awakened repeatedly during their first hour of sleep, 3 in 4 people reported experiencing images of the game's falling blocks (Stickgold et al., 2000).
- People in hunter-gatherer societies often dream of animals; urban Japanese rarely do (Mestel, 1997).
- Compared with nonmusicians, musicians report twice as many dreams of music (Uga et al., 2006).

"For what one has dwelt on by day, these things are seen in visions of the night."

—Menander of Athens (342–292 B.C.E.), *Fragments*

Sensory stimuli in our sleeping environment may also intrude. A particular odor or the telephone's ringing may be instantly and ingeniously woven into the dream story. In a classic experiment, William Dement and Edward Wolpert (1958) lightly sprayed cold water on dreamers' faces. Compared with sleepers who did not get the cold-water treatment, these people were more likely to dream about a waterfall, a leaky roof, or even about being sprayed by someone. Even while in REM sleep, focused on internal stimuli, we maintain some awareness of changes in our external environment.

A popular sleep myth: If you dream you are falling and hit the ground (or if you dream of dying), you die. (Unfortunately, those who could confirm these ideas are not around to do so. Some people, however, have had such dreams and are alive to report them.)

So, could we learn a foreign language by hearing it played while we sleep? If only it were so easy. While sleeping we can learn to associate a sound with a mild electric shock (and to react to the sound accordingly). But we do not remember recorded information played while we are soundly asleep (Eich, 1990; Wyatt & Bootzin, 1994).

"Follow your dreams, except for that one where you're naked at work."

—Attributed to Henny Youngman

MAXINE

In fact, anything that happens during the 5 minutes just before we fall asleep is typically lost from memory (Roth et al., 1988). This explains why sleep apnea patients, who repeatedly awaken with a gasp and then immediately fall back to sleep, do not recall the episodes. It also explains why dreams that momentarily awaken us are mostly forgotten by morning. To remember a dream, get up and stay awake for a few minutes.

Why We Dream

5-9: Why do we dream?

Dream theorists have proposed several explanations of why we dream, including these:

To satisfy our own wishes. In 1900, in his landmark book *The Interpretation of Dreams,* Freud offered what he thought was "the most valuable of all the discoveries it has been my good fortune to make": Dreams provide a psychic safety valve that discharges otherwise unacceptable feelings. According to Freud, a dream's **manifest content** (the remembered story line) is a censored, symbolic version of its **latent content,** which consists of unconscious drives and wishes that would be threatening if expressed directly. Although most dreams have no overt sexual imagery, Freud nevertheless believed that most adult dreams can be "traced back by analysis to erotic wishes." Thus, a cylindrical object such as a gun might be a disguised representation of a penis.

"When people interpret [a dream] as if it were meaningful and then sell those interpretations, it's quackery."
—Sleep researcher J. Allan Hobson (1995)

Freud considered dreams the key to understanding our inner conflicts. However, his critics say it is time to wake up from Freud's dream theory, which is a scientific nightmare. Based on the accumulated science, "there is no reason to believe any of Freud's specific claims about dreams and their purposes," notes dream researcher William Domhoff (2003). Some contend that even if dreams are symbolic, they could be interpreted any way one wished. Others maintain that dreams hide nothing. A dream about a gun is a dream about a gun. Legend has it that even Freud, who loved to smoke cigars, acknowledged that "sometimes, a cigar is just a cigar." Freud's wish-fulfillment theory of dreams has in large part given way to other theories.

To file away memories. Researchers who see dreams as *information processing* believe that dreams may help sift, sort, and fix the day's experiences in our memory. As we noted earlier, people tested the next day generally improve on a learned task after a night of memory consolidation. Even after two nights of recovery sleep, those who have been deprived of both slow-wave and REM sleep don't do as well as those who sleep undisturbed on their new learning (Stickgold et al., 2000, 2001). People who hear unusual phrases or learn to find hidden visual images before bedtime remember less the next morning if awakened every time they begin REM sleep than they do if awakened during other sleep stages (Empson & Clarke, 1970; Karni & Sagi, 1994).

Brain scans confirm the link between REM sleep and memory. The brain regions that buzz as rats learn to navigate a maze, or as people learn to perform a visual-discrimination task, buzz again during later REM sleep (Louie & Wilson, 2001; Maquet, 2001). So precise are these activity patterns that scientists can tell where in the maze the rat would be if awake. Others, unpersuaded by such studies, note that memory consolidation may occur during non-REM sleep (Siegel, 2001; Vertes & Siegel, 2005). This much seems true: A night of solid sleep (and dreaming) has an important place in our lives. To sleep, perchance to remember. This is important news for students, many of whom, observed researcher Robert Stickgold (2000), suffer from a kind of sleep bulimia—binge sleeping on the weekend. "If you don't get good sleep and enough sleep after you learn new stuff, you won't integrate it effectively into your memories," he warned. That helps explain why secondary students with high grades have averaged 25 minutes more sleep a night and have gone to bed 40 minutes earlier than their lower-achieving classmates (Wolfson & Carskadon, 1998).

To develop and preserve neural pathways. Some researchers speculate that dreams may also serve a *physiological* function. Perhaps the brain activity associated with REM sleep provides the sleeping brain with periodic stimulation. This theory makes developmental sense: Stimulating experiences strengthen and preserve the brain's neural pathways. Infants, whose neural networks are fast developing, spend much of their abundant sleep time in REM sleep.

Rapid eye movements also stir the liquid behind the cornea; this delivers fresh oxygen to corneal cells, preventing their suffocation.

To make sense of neural static. Other theories propose that dreams erupt from neural activity spreading upward from the brainstem (Antrobus, 1991; Hobson, 2003, 2004). According to one version—the *activation-synthesis* theory—this neural activity is random, and dreams are the brain's attempt to make sense of it. Much as a neurosurgeon can produce hallucinations by stimulating different parts of a patient's cortex, so can stimulation originating within the brain. These internal stimuli activate brain areas that process visual images, but not the visual cortex area, which receives raw input from the eyes.

PET scans of sleeping people also reveal increased activity during REM sleep in the amygdala, in the emotion-related limbic system. In contrast, frontal lobe regions responsible for inhibition and logical thinking seem to idle, which may explain why our dreams are less inhibited than we are when awake (Maquet et al., 1996). Add the limbic system's emotional tone to the brain's visual bursts and—Voila!—we dream. Damage either the limbic system or the visual centers active during dreaming, and dreaming itself may be impaired (Domhoff, 2003).

To reflect cognitive development. Some dream researchers dispute both the Freudian and activation-synthesis theories, preferring instead to see dreams as part of brain maturation and cognitive development (Domhoff, 2003; Foulkes, 1999). For example, prior to age 9, children's dreams seem more like a slide show and less like an active story in which the dreamer is an actor. Dreams overlap with waking cognition and feature coherent speech. They draw on our concepts and knowledge.

TABLE 5.1 on the next page compares major dream theories. Although sleep researchers debate dreams' function—and some are skeptical that dreams serve any function—there is one thing they agree on: We need REM sleep. Deprived of it by repeatedly being awakened, people return more and more quickly to the REM stage after falling back to sleep. When finally allowed to sleep undisturbed, they literally sleep like babies—with increased REM sleep, a phenomenon called **REM rebound.** Withdrawing REM-suppressing sleep medications also increases REM sleep, but with accompanying nightmares.

Question: *Does eating spicy foods cause one to dream more?*

Answer: *Any food that causes you to awaken more increases your chance of recalling a dream (Moorcroft, 2003).*

Most other mammals also experience REM rebound, suggesting that the causes and functions of REM sleep are deeply biological. That REM sleep occurs in mammals—and not in animals such as fish, whose behavior is less influenced by learning—also fits the information-processing theory of dreams.

So does this mean that because dreams serve physiological functions and extend normal cognition, they are psychologically meaningless? Not necessarily.

manifest content according to Freud, the remembered story line of a dream (as distinct from its latent, or hidden, content).

latent content according to Freud, the underlying meaning of a dream (as distinct from its manifest content).

REM rebound the tendency for REM sleep to increase following REM sleep deprivation (created by repeated awakenings during REM sleep).

TABLE 5.1 Dream Theories

Theory	Explanation	Critical Considerations
Freud's wish-fulfillment	Dreams provide a "psychic safety valve"—expressing otherwise unacceptable feelings; contain manifest (remembered) content and a deeper layer of latent content—a hidden meaning.	Lacks any scientific support; dreams may be interpreted in many different ways.
Information-processing	Dreams help us sort out the day's events and consolidate our memories.	But why do we sometimes dream about things we have not experienced?
Physiological function	Regular brain stimulation from REM sleep may help develop and preserve neural pathways.	This may be true, but it does not explain why we experience *meaningful* dreams.
Activation-synthesis	REM sleep triggers neural activity that evokes random visual memories, which our sleeping brain weaves into stories.	The individual's brain is weaving the stories, which still tells us something about the dreamer.
Cognitive development	Dream content reflects dreamers' cognitive development—their knowledge and understanding.	Does not address the neuroscience of dreams.

Every psychologically meaningful experience involves an active brain. We are once again reminded of a basic principle: *Biological and psychological explanations of behavior are partners, not competitors.* Dreams may be akin to abstract art—open to more than one meaningful interpretation.

REVIEWING

Dual Processing, Sleep, and Dreams

5-1: What is the "dual processing" being revealed by today's cognitive neuroscience? Cognitive neuroscientists and others studying the brain mechanisms underlying *consciousness* and cognition have discovered a two-track human mind, each with its own neural processing. This *dual processing* affects our perception, memory, and attitudes at an explicit, conscious level and at an implicit, unconscious level.

5-2: How much information do we consciously attend to at once? We *selectively attend* to, and process, a very limited aspect of incoming information. We even display *inattentional blindness,* blocking out events and changes in our visual world. Shifting the spotlight of our attention from one thing to another contributes to car and pedestrian accidents.

5-3: How do our biological rhythms influence our daily functioning and our sleep and dreams? Our internal biological rhythms create periodic physiological fluctuations. The *circadian rhythm's* 24-hour cycle regulates our daily schedule of sleeping and waking, in part in response to light on the retina. Shifts in schedules can reset our biological clock.

5-4: What is the biological rhythm of our sleep? We cycle through five *sleep* stages in about 90 minutes. Leaving the *alpha waves* of the awake, relaxed stage, we descend into transitional Stage 1 sleep, often with the sensation of falling or floating. Stage 2 sleep (in which we spend the most time) follows about 20 minutes later, with its characteristic sleep spindles. Then follow Stages 3 and 4, together lasting about 30 minutes, with large, slow *delta waves.* Reversing course, we retrace our path, but with one difference: We experience periods of *REM (rapid eye movement) sleep.* Most dreaming occurs in this fifth stage (also known as paradoxical sleep) of internal arousal but outward paralysis. During a normal night's sleep, periods of Stages 3 and 4 sleep shorten and REM sleep lengthens.

5-5: How does sleep loss affect us? Sleep deprivation causes fatigue and impairs concentration, creativity, and communication. It also can lead to obesity, hypertension, a suppressed immune system, irritability, and slowed performance (with greater vulnerability to accidents).

5-6: Why do we sleep? Sleep (1) may have played a protective role in human evolution by keeping people safe during potentially dangerous periods; gives the brain time to (2) restore and repair damaged neurons and (3) store and rebuild memories of the day's experiences. Sleep also (4) promotes creative problem solving the next day, and (5) encourages growth (the pituitary gland secretes a growth hormone in Stage 4 sleep).

5-7: What are the major sleep disorders? The major disorders of sleep include *insomnia* (recurring wakefulness), *narcolepsy* (sudden uncontrollable sleepiness or lapsing into REM sleep), *sleep apnea* (the stopping of breathing while asleep), *night terrors* (high arousal and the appearance of being terrified), sleepwalking, and sleeptalking. Sleep apnea mainly targets older overweight men. Children are most prone to night terrors, sleepwalking, and sleeptalking.

5-8: What do we dream? We usually *dream* of ordinary events and everyday experiences, most involving some anxiety or misfortune. Fewer than 10 percent (and less among women) of dreams

have any sexual content. Most dreams occur during REM sleep; those that happen during non-REM sleep tend to be vague fleeting images.

5-9: Why do we dream? There are five major views of the function of dreams. (1) Freudian: to provide a safety valve, with *manifest content* (or story line) acting as a censored version of *latent content* (a hidden meaning that gratifies our unconscious wishes). (2) Information-processing: to sort out the day's experiences and fix them in memory. (3) Brain stimulation: to preserve neural pathways in the brain. (4) Activation-synthesis: to make sense of the brain's neural static by weaving it into a story line. (5) Cognitive-development: Dream content represents the dreamer's level of development, knowledge, and understanding. The belief that REM sleep and its associated dreams serve an important function is supported by *REM rebound,* which occurs following REM deprivation.

Rehearse It!

1. Failure to see visible objects when our attention is occupied elsewhere is called
a. parallel processing.
b. awareness unconsciousness.
c. inattentional blindness.
d. subconscious processing.

2. We register and react to stimuli outside of our awareness by means of _____ processing. When we devote full conscious attention to stimuli, we use _____ processing.
a. parallel; serial
b. serial; parallel
c. selective; complete
d. complete; selective

3. Our body temperature tends to rise and fall in sync with a biological clock, which is referred to as
a. the circadian rhythm.
b. narcolepsy.
c. REM sleep.
d. hypnagogic sensations.

4. During Stage 1 light sleep, a person is most likely to experience
a. sleep spindles.
b. hallucinations.
c. night terrors or nightmares.
d. rapid eye movements.

5. The brain emits large, slow delta waves during the deepest stage of sleep, called
a. Stage 2.
b. Stage 4.
c. REM sleep.
d. paradoxical sleep.

6. During sleep we pass through a cycle of five stages, each with characteristic brain waves. As the night progresses, the REM stage
a. gradually disappears.
b. becomes briefer and briefer.
c. remains about the same.
d. becomes progressively longer.

7. Which of the following is NOT one of the theories that have been proposed to explain why we need sleep?
a. Sleep has survival value.
b. Sleep helps us recuperate.
c. Sleep rests the eyes.
d. Sleep plays a role in the growth process.

8. Two sleep disorders are narcolepsy and sleep apnea. With narcolepsy, the person _____; with sleep apnea, the person _____.
a. has persistent problems falling sleep; experiences a doubling of heart and breathing rates
b. experiences a doubling of heart and breathing rates; has persistent problems falling asleep
c. intermittently stops breathing; suffers periodic, overwhelming sleepiness
d. suffers periodic, overwhelming sleepiness; intermittently stops breathing

9. In interpreting dreams, Freud was most interested in their
a. information-processing function.
b. physiological function.
c. manifest content, or story line.
d. latent content, or hidden meaning.

10. The activation-synthesis theory suggests that dreams
a. are the brain's attempt to make sense of random neural activity.
b. provide a rest period for overworked brains.
c. serve as a safety valve for unfulfilled desires.
d. reflect the dreamer's level of cognitive development.

11. The tendency for REM sleep to increase following REM sleep deprivation is referred to as
a. paradoxical sleep.
b. deep sleep.
c. REM rebound.
d. slow-wave sleep.

Answers: 1. c, 2. a, 3. a, 4. b, 5. b, 6. d, 7. c, 8. d, 9. d, 10. a, 11. c.

Terms and Concepts to Remember

consciousness, p. 67
dual processing, p. 68
selective attention, p. 69
inattentional blindness, p. 70
change blindness, p. 71
circadian [ser-KAY-dee-an] rhythm, p. 72
REM sleep, p. 73
alpha waves, p. 73
sleep, p. 73
hallucinations, p. 74
delta waves, p. 74
insomnia, p. 79
narcolepsy, p. 79
sleep apnea, p. 80
night terrors, p. 80
dream, p. 81
manifest content, p. 82
latent content, p. 82
REM rebound, p. 83

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Research on the two-track mind shows that we know more than we know we know. Might we function better if we were completely conscious of all of our thought processes?
2. In the discussion of sleep stages, a man in a cartoon states, "Boy, are my eyes tired! I had REM sleep all night long!" In reality, how tiring is REM sleep, and how much time do we spend in it?
3. Sleep researcher William Dement said that a large sleep debt "makes you stupid" (1999, p. 231). What are some of the ways sleep deprivation can affect cognitive performance?
4. "For what one has dwelt on by day, these things are seen in visions of the night" (Menander of Athens [342–292 B.C.E.], *Fragments*). Consider this quote from the wish-fulfillment, information-processing, and activation-synthesis perspectives on dreaming.

The Test for Success questions offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 6

Hypnosis

Imagine you are about to be hypnotized. The hypnotist invites you to sit back, fix your gaze on a spot high on the wall, and relax. In a quiet voice the hypnotist suggests, "Your eyes are growing tired. . . . Your eyelids are becoming heavy . . . now heavier and heavier. . . . They are beginning to close. . . . You are becoming more deeply relaxed. . . . Your breathing is now deep and regular. . . . Your muscles are becoming more and more relaxed. Your whole body is beginning to feel like lead."

After a few minutes of this *hypnotic induction,* you may experience **hypnosis.** When the hypnotist suggests, "Your eyelids are shutting so tight that you cannot open them even if you try," it may indeed seem beyond your control to open your eyelids. Told to forget the number 6, you may be puzzled when you count 11 fingers on your hands. Invited to smell a sensuous perfume that is actually ammonia, you may linger delightedly over its pungent odor. Told that you cannot see a certain object, such as a chair, you may indeed report that it is not there, although you manage to avoid the chair when walking around (illustrating once again that two-track mind of yours).

But is hypnosis really an *altered* state of consciousness? Let's start with some agreed-upon facts and falsehoods.

Facts and Falsehoods

6-1: What powers does a hypnotist have over a hypnotized subject?

Those who study hypnosis have agreed that its power resides not in the hypnotist but in the subject's openness to suggestion (Bowers, 1984). Hypnotists have no magical mind-control power; they merely engage people's ability to focus on certain images or behaviors. But how open to suggestions are we?

Can Anyone Experience Hypnosis?

To some extent, we are all open to suggestion. When people stand upright with their eyes closed and are told that they are swaying back and forth, most will indeed sway a little. In fact, *postural sway* is one of the items assessed on the Stanford Hypnotic Susceptibility Scale. People who respond to such suggestions without hypnosis are the same people who respond with hypnosis (Kirsch & Braffman, 2001).

After giving a brief hypnotic induction, a hypnotist suggests a series of experiences ranging from easy (your outstretched arms will move together) to difficult (with eyes open, you will see a nonexistent person). Highly hypnotizable people—say, the 20 percent who can carry out a suggestion not to smell or react to a bottle of ammonia held under their nose—are those who easily become deeply absorbed in imaginative activities (Barnier & McConkey, 2004; Silva & Kirsch, 1992). Typically, they have rich fantasy lives and become totally engaged in the imaginary events of a novel or movie. (Perhaps you can recall being riveted by a movie into a trancelike state, oblivious to the people or noise surrounding you.) Many researchers refer to hypnotic "susceptibility" as hypnotic *ability*—the ability to focus attention totally on a task, to become imaginatively absorbed in it, to entertain fanciful possibilities.

Can Hypnosis Enhance Recall of Forgotten Events?

Can hypnotic procedures enable people to recall kindergarten classmates? To retrieve forgotten or suppressed details of a crime? Should testimony obtained under hypnosis be admissible in court?

hypnosis a social interaction in which one person (the hypnotist) suggests to another (the subject) that certain perceptions, feelings, thoughts, or behaviors will spontaneously occur.

Most people wrongly believe that our experiences are all "in there," recorded in our brain and available for recall if only we can break through our own defenses (Loftus, 1980). (In fact, memory research indicates that we do not encode everything that occurs around us, that we permanently store only some of our experiences, and that we may be unable to retrieve some memories we have stored.) In one community survey, 3 in 4 people agreed with the inaccurate statement that hypnosis enables people to "recover accurate memories as far back as birth" (Johnson & Hauck, 1999). But 60 years of research disputes such claims. "Hypnotically refreshed" memories combine fact with fiction. Without either person being aware of what is going on, a hypnotist's hints—"Did you hear loud noises?"—can plant ideas that become the subject's pseudomemory. Thus, American, Australian, and British courts generally ban testimony from witnesses who have been hypnotized (Druckman & Bjork, 1994; Gibson, 1995; McConkey, 1995).

"Hypnosis is not a psychological truth serum and to regard it as such has been a source of considerable mischief."
—Researcher Kenneth Bowers (1987)

Other striking examples of memories created under hypnosis come from the thousands of people who since 1980 have reported being abducted by UFOs. Most such reports have come from people who are predisposed to believe in aliens, are highly hypnotizable, and have undergone hypnosis (Newman & Baumeister, 1996; Nickell, 1996).

Can Hypnosis Force People to Act Against Their Will?

Researchers have induced hypnotized people to perform an apparently dangerous act: plunging one hand briefly into fuming "acid," then throwing the "acid" in a researcher's face (Orne & Evans, 1965). Interviewed a day later, these people exhibited no memory of their acts and emphatically denied they would ever follow such orders.

"It wasn't what I expected. But facts are facts, and if one is proved to be wrong, one must just be humble about it and start again."
—Agatha Christie's Miss Marple

Had hypnosis given the hypnotist a special power to control others against their will? To find out, researchers Martin Orne and Frederich Evans unleashed that enemy of so many illusory beliefs—the control group. Orne asked other individuals to *pretend* they were hypnotized. Laboratory assistants, unaware that those in the experiment's control group had not been hypnotized, treated both groups the same. The result? All the *un*hypnotized participants (perhaps believing that the laboratory context assured safety) performed the same acts as those who were hypnotized.

Such studies illustrate a principle that social psychologist Stanley Milgram demonstrated: *An authoritative person in a legitimate context can induce people—hypnotized or not—to perform some unlikely acts.* Hypnosis researcher Nicholas Spanos (1982) put it directly: "The overt behaviors of hypnotic subjects are well within normal limits."

Can Hypnosis Be Therapeutic?

Hypnotherapists try to help patients harness their own healing powers (Baker, 1987). **Posthypnotic suggestions** have helped alleviate headaches, asthma, and stress-related skin disorders. One woman, who for more than 20 years suffered from open sores all over her body, was asked to imagine herself swimming in shimmering, sunlit liquids that would cleanse her skin, and to experience her skin as smooth and unblemished. Within three months her sores had disappeared (Bowers, 1984).

In one statistical digest of 18 studies, the average client whose therapy was supplemented with hypnosis showed greater improvement than 70 percent of other therapy patients (Kirsch et al., 1995, 1996). Hypnosis seemed especially helpful for the treatment of obesity. However, drug, alcohol, and smoking addictions have not responded well to hypnosis (Nash, 2001). In controlled studies, hypnosis speeds the disappearance of warts, but so do the same positive suggestions given without hypnosis (Spanos, 1991, 1996).

Can Hypnosis Alleviate Pain?

Yes, hypnosis *can* relieve pain (Druckman & Bjork, 1994; Patterson, 2004). When unhypnotized people put their arm in an ice bath, they feel intense pain within 25 seconds. When hypnotized people do the same after being given suggestions to feel

no pain, they indeed report feeling little pain. As some dentists know, even light hypnosis can reduce fear, thus reducing hypersensitivity to pain.

Nearly 10 percent of us can become so deeply hypnotized that we can even undergo major surgery without anesthesia. Half of us can gain at least some pain relief from hypnosis. In surgical experiments, hypnotized patients have required less medication, recovered sooner, and left the hospital earlier than unhypnotized people in control groups, thanks to the inhibition of pain-related brain activity (Askay & Patterson, 2007; Spiegel, 2007). The surgical use of hypnosis has flourished in Europe, where one Belgian medical team has performed more than 5000 surgeries with a combination of hypnosis, local anesthesia, and a mild sedative (Song, 2006).

Explaining the Hypnotized State

6-2: Is hypnosis an extension of normal consciousness or an altered state?

We have seen that hypnosis involves heightened suggestibility. We have also seen that hypnotic procedures do not endow the hypnotist with special powers. But they can sometimes help people overcome stress-related ailments and cope with pain. So, just what *is* hypnosis?

Hypnosis as a Social Phenomenon

Some researchers believe that hypnotic phenomena reflect the workings of normal consciousness and the power of social influence (Lynn et al., 1990; Spanos & Coe, 1992). They point out how powerfully our interpretations and attentional spotlight influence our ordinary perceptions.

Does this mean that people are consciously faking hypnosis? No—like actors caught up in their roles, subjects begin to feel and behave in ways appropriate for "good hypnotic subjects." The more they like and trust the hypnotist, the more they allow that person to direct their attention and fantasies (Gfeller et al., 1987). "The hypnotist's ideas become the subject's thoughts," explained Theodore Barber (2000), "and the subject's thoughts produce the hypnotic experiences and behaviors." If told to scratch their ear later when they hear the word *psychology*, subjects will likely do so only if they think the experiment is still under way (and scratching is therefore expected). If an experimenter eliminates their motivation for acting hypnotized—by stating that hypnosis reveals their "gullibility"—subjects become unresponsive.

Based on such findings, advocates of the *social influence theory* contend that hypnotic phenomena—like the behaviors associated with other supposed altered states, such as dissociative identity disorder (multiple personalities) and spirit or demon possession—are an extension of everyday social behavior, not something unique to hypnosis (Spanos, 1994, 1996).

Hypnosis as Divided Consciousness

Most hypnosis researchers grant that normal social and cognitive processes play a part in hypnosis, but they nevertheless believe hypnosis is more than inducing someone to play the role of "good subject." For one thing, hypnotized subjects will sometimes carry out suggested behaviors on cue, even when they believe no one is watching (Perugini et al., 1998). Moreover, distinctive brain activity accompanies hypnosis. When deeply hypnotized people in one experiment were asked to imagine a color, areas of their brain lit up as if they were really seeing the color. Mere imagination had become—to the hypnotized person's brain—a compelling hallucination (Kosslyn et al., 2000).

These results would not have surprised famed researcher Ernest Hilgard (1986, 1992), who believed hypnosis involves not only social influence but also a special dual-processing state of **dissociation**—a split between different levels of consciousness. Hilgard viewed hypnotic dissociation as a vivid form of everyday mind splits—

posthypnotic suggestion a suggestion, made during a hypnosis session, to be carried out after the subject is no longer hypnotized; used by some clinicians to help control undesired symptoms and behaviors.

dissociation a split in consciousness, which allows some thoughts and behaviors to occur simultaneously with others.

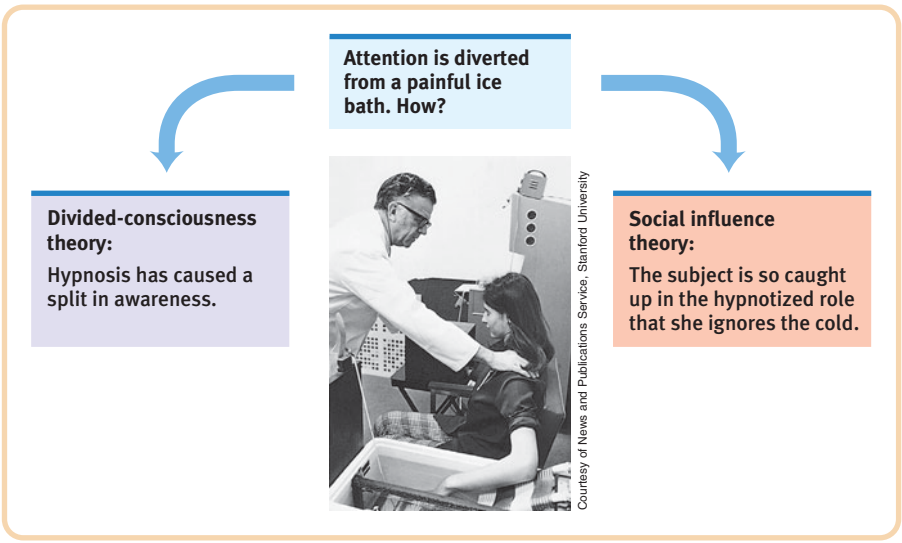


FIGURE 6.1 Dissociation or role-playing? This hypnotized woman tested by Ernest Hilgard exhibited no pain when her arm was placed in an ice bath. But asked to press a key if some part of her felt the pain, she did so. To Hilgard, this was evidence of dissociation, or divided consciousness. Proponents of social influence theory, however, maintain that people responding this way are caught up in playing the role of "good subject."

similar to doodling while listening to a lecture or typing the end of a sentence while starting a conversation. Hilgard felt that when, for example, hypnotized people lower their arm into an ice bath, as in **FIGURE 6.1**, that hypnosis dissociates the sensation of the pain stimulus (of which the subjects are still aware) from the emotional suffering that defines their experience of pain. The ice water therefore feels cold—very cold—but not painful.

Hypnotic pain relief may also result from another form of dual processing—*selective attention*—as when an injured athlete, caught up in the competition, feels little or no pain until the game ends. Support for this view comes from PET scans showing that hypnosis reduces brain activity in a region that processes painful stimuli, but not in the sensory cortex, which receives the raw sensory input (Rainville et al., 1997). Hypnosis does not block sensory input, but it may block our *attention* to those stimuli.

"The total possible consciousness may be split into parts which co-exist but mutually ignore each other."

—William James, *Principles of Psychology,* 1890

Although the divided-consciousness theory of hypnosis is controversial, this much seems clear: There is, without doubt, much more to thinking and acting than we are conscious of. Our information processing, which starts with selective attention, is divided into simultaneous conscious and nonconscious realms. In hypnosis as in life, *much of our behavior occurs on autopilot.* We have two-track minds.

Yet, there is also little doubt that social influences do play an important role in hypnosis. So, might the two views—social influence and divided consciousness—be bridged? Researchers John Kihlstrom and Kevin McConkey (1990) have argued that there is no contradiction between the two approaches, which are converging toward a *unified account of hypnosis:* Thus, hypnosis can be an extension *both* of normal principles of social influence and of everyday dissociations between our conscious awareness and our automatic behaviors. Hypnosis researchers are moving beyond the "hypnosis is social influence" *versus* "hypnosis is divided consciousness" debate (Killeen & Nash, 2003; Woody & McConkey, 2003). They are instead exploring how brain activity, attention, and social influences interact to affect hypnotic phenomena.

Hypnosis

Module Review

6-1: What powers does a hypnotist have over a hypnotized subject? *Hypnosis* is a social interaction in which one person suggests to another that certain perceptions, feelings, thoughts, or behaviors will spontaneously occur. Hypnotized people, like unhypnotized people, may perform unlikely acts when told to do so by an authoritative person. *Posthypnotic suggestions* have helped people harness their own healing powers but have not been very effective in treating addiction. Hypnosis can help relieve pain, but it does not enhance recall of forgotten events (it may even evoke false memories).

6-2: Is hypnosis an extension of normal consciousness or an altered state? Many psychologists believe that hypnosis is a form of normal social influence and that hypnotized people act out the role of "good subject." Other psychologists view hypnosis as a *dissociation*, an instance of the dual-track mind in which normal sensations and conscious awareness are split. A unified account of hypnosis melds these two views and studies how brain activity, attention, and social influences interact in hypnosis.

Rehearse It!

1. People who are hypnotizable and will carry out a hypnotic suggestion typically
   a. have rich fantasy lives.
   b. have low self-esteem.
   c. are subject to hallucinations.
   d. are faking their actions.

2. Most experts agree that hypnosis can be effectively used to
   a. elicit testimony about a "forgotten" event.
   b. re-create childhood experiences.
   c. relieve pain.
   d. block sensory input.

3. Hilgard believed that hypnosis involves dissociation, or
   a. an extension of social pressure.
   b. heightened suggestibility.
   c. a state of divided consciousness.
   d. conscious enactment of a hypnotic role.

Answers: 1. a, 2. c, 3. c.

Terms and Concepts to Remember

hypnosis, p. 87

posthypnotic suggestion, p. 88

dissociation, p. 89

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. Muriel believes that exploring her suppressed, painful childhood memories will help alleviate her chronic arthritis. In what ways might hypnosis help her?

The Test for Success questions offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

7

Dependence and Addiction

Psychoactive Drugs

Influences on Drug Use

© 1992 by Sidney Harris.

"Just tell me where you kids got the idea to take so many drugs."

Drugs

There is controversy about whether hypnosis uniquely alters consciousness, but there is little dispute that some drugs do. **Psychoactive drugs** are chemicals that change perceptions and moods through their actions at the neural synapses, the tiny junctions between sending and receiving neurons. Let's imagine a day in the life of a legal-drug user. It begins with a wake-up latte. By midday, several cigarettes have calmed frazzled nerves before an appointment at the plastic surgeon's office for wrinkle-smoothing Botox injections. A diet pill before dinner helps stem the appetite, and its stimulating effects can later be partially offset with a glass of wine and two Tylenol PMs. And if performance needs enhancing, there are beta blockers for onstage performers, Viagra for middle-aged men, hormone-delivering "libido patches" for middle-aged women, and Adderall for students hoping to focus their concentration. Before drifting off into REM-depressed sleep, our hypothetical drug user is dismayed by news reports of pill-sharing, pill-popping college students and of celebrity deaths attributed to accidental overdoses of lethal drug combinations.

Dependence and Addiction

7-1: What are tolerance, dependence, and addiction, and what are some common misconceptions about addiction?

Why might a person who rarely drinks alcohol get tipsy on one can of beer, but an experienced drinker show few effects until the second six-pack? Continued use of alcohol and other psychoactive drugs produces **tolerance.** As the user's brain adapts its chemistry to offset the drug effect (a process called *neuroadaptation*), the user requires larger and larger doses to experience the same effect (**FIGURE 7.1**). Despite the connotations of alcohol "tolerance," the person's brain, heart, and liver suffer damage from the chronic, excessive amounts of alcohol being "tolerated."

Users who stop taking psychoactive drugs may experience the undesirable side effects of **withdrawal.** As the body responds to the drug's absence, the user may feel physical pain and intense cravings, indicating **physical dependence.** People can also develop **psychological dependence,** particularly for stress-relieving drugs. Such drugs, although not physically addictive, can become an important part of the user's life, often as a way of relieving negative emotions. With either physical or psychological dependence, the user's primary focus may be obtaining and using the drug.

psychoactive drug a chemical substance that alters perceptions and moods.

tolerance the diminishing effect with regular use of the same dose of a drug, requiring the user to take larger and larger doses before experiencing the drug's effect.

withdrawal the discomfort and distress that follow discontinuing the use of an addictive drug.

physical dependence a physiological need for a drug, marked by unpleasant withdrawal symptoms when the drug is discontinued.

psychological dependence a psychological need to use a drug, such as to relieve negative emotions.

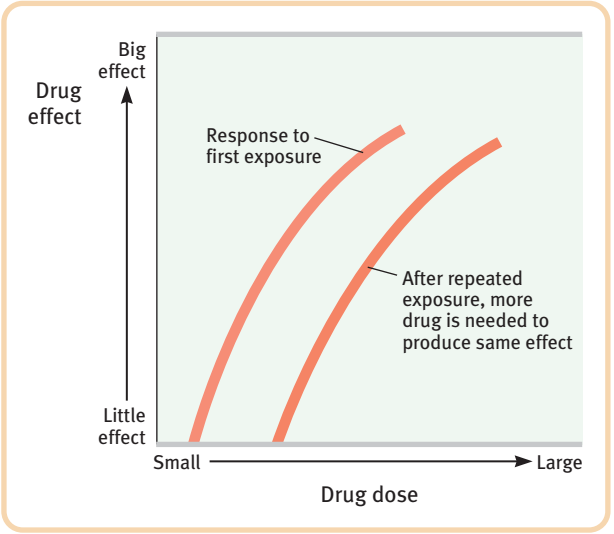


FIGURE 7.1 Drug tolerance In most cases, the drug's effect lessens with repeated exposure to a psychoactive drug. Thus, it takes bigger doses to get the desired effect.

Misconceptions About Addiction

addiction compulsive drug craving and use, despite adverse consequences.

An **addiction** is a compulsive craving for a substance despite adverse consequences and often with physical symptoms such as aches, nausea, and distress following sudden withdrawal. Worldwide, reports the World Health Organization (2008), 90 million people suffer from such problems related to alcohol and other drugs.

In recent pop psychology, the supposedly irresistible seduction of addiction has been extended to cover many behaviors formerly considered bad habits or even sins. Has the concept been stretched too far? Are addictions as irresistible as commonly believed? Let's consider three big questions.

1. Do addictive drugs quickly corrupt? For example, morphine taken to control pain is powerfully addictive. Does it often lead to heroin abuse? People given morphine to control pain rarely develop the cravings of the addict who uses morphine as a mood-altering drug (Melzack, 1990). But some people—perhaps 10 percent—do indeed have a hard time using a psychoactive drug in moderation or stopping altogether. Even so, controlled, occasional users of drugs such as alcohol and marijuana far outnumber those addicted to these substances (Gazzaniga, 1988; Siegel, 1990). "Even for a very addictive drug like cocaine, only 15 to 16 percent of people become addicted within 10 years of first use," report Terry Robinson and Kent Berridge (2003). Much the same is true for rats, only some of which become compulsively addicted to cocaine (Deroche-Garmonet et al., 2004).

The odds of getting hooked after trying various drugs:

Marijuana:	*9 percent*
Alcohol:	*15 percent*
Heroin:	*23 percent*
Tobacco:	*32 percent*

Source: *National Academy of Science, Institute of Medicine (Brody, 2003).*

2. Can addictions be overcome voluntarily, without therapy? Helpful as therapy or group support may be, people often recover on their own. True, addictions can be powerful, and some addicts do benefit from treatment programs. Alcoholics Anonymous, for example, has supported many people in overcoming their alcohol dependence. But the recovery rates of treated and untreated groups differ less than one might suppose.

Moreover, viewing addiction as a disease, as diabetes is a disease, can undermine self-confidence and the will to change cravings that, without treatment, "one cannot fight." And that, critics say, would be unfortunate, for many people do voluntarily stop using addictive drugs, without any treatment. Most of America's 41 million ex-smokers kicked the habit on their own, usually after prior failed efforts or treatments.

3. Can we extend the concept of addiction to cover not just drug dependencies, but a whole spectrum of repetitive, pleasure-seeking behaviors? We can, and we have, but should we? The addiction-as-disease-needing-treatment idea has been suggested for a host of driven behaviors, including too much eating, shopping, exercise, sex, gambling, and work. Initially, we may use the term metaphorically ("I'm a science fiction addict"), but if we begin taking the metaphor as reality, addiction can become an all-purpose excuse. Those who embezzle to feed their "gambling addiction," surf the Web half the night to satisfy their "Internet addiction," or abuse or betray to indulge their "sex addiction" can then explain away their behavior as an illness.

Sometimes, though, behaviors such as gambling, playing video games, or surfing the Internet do become compulsive and dysfunctional, much like abusive drug taking (Griffiths, 2001; Hoeft et al., 2008). Some Internet users, for example, do display an apparent inability to resist logging on, and staying on, even when this excessive use impairs their work and relationships (Ko et al., 2005). So, there may be justification for stretching the addiction concept to cover certain social behaviors. Debates over the addiction-as-disease model continue.

"About 70 percent of Americans have tried illicit drugs, but . . . only a few percent have done so in the last month. . . . Past age 35, the casual use of illegal drugs virtually ceases." Having sampled the pleasures and their aftereffects, "most people eventually walk away."

—Neuropsychologist Michael Gazzaniga (1997)

Psychoactive Drugs

The three major categories of psychoactive drugs—*depressants, stimulants,* and *hallucinogens*—all do their work at the brain's synapses. They stimulate, inhibit, or mimic the activity of the brain's own chemical messengers, the neurotransmitters. Our culturally influenced expectations also play a role in the way drugs affect us (Ward, 1994). If one culture assumes that a particular drug produces euphoria (or aggression or sexual arousal) and another does not, each culture may find its expectations fulfilled.

"That is not one of the seven habits of highly effective people."

Depressants

7-2: What are depressants, and what are their effects?

Depressants are drugs such as alcohol, barbiturates (tranquilizers), and opiates that calm neural activity and slow body functions.

Alcohol

True or false? In large amounts, alcohol is a depressant; in small amounts, it is a stimulant. *False.* Low doses of alcohol may, indeed, enliven a drinker, but they do so by slowing brain activity that controls judgment and inhibitions. Alcohol lowers our inhibitions, slows neural processing, disrupts memory formation, and reduces self-awareness.

Disinhibition Alcohol is an equal-opportunity drug: It increases harmful tendencies—as when angered people become aggressive after drinking. And it increases helpful tendencies—as when tipsy restaurant patrons leave extravagant tips (M. Lynn, 1988). *The urges you would feel if sober are the ones you will more likely act upon when intoxicated.*

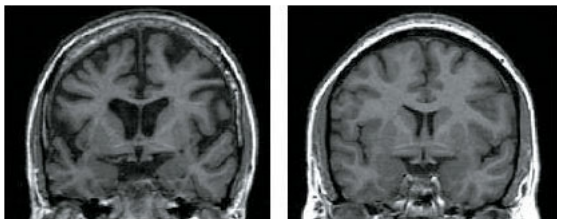
Slowed Neural Processing Low doses of alcohol relax the drinker by slowing sympathetic nervous system activity. In larger doses, alcohol can become a staggering problem: Reactions slow, speech slurs, skilled performance deteriorates. Paired with sleep deprivation, alcohol is a potent sedative. (Although either sleep deprivation or drinking can put a driver at risk, their combination is deadlier yet.) These physical effects, combined with lowered inhibitions, contribute to alcohol's worst consequences—several hundred thousand lives claimed worldwide each year in alcohol-related accidents and violent crime. Car accidents occur despite most drinkers' belief (when sober) that driving under the influence of alcohol is wrong and despite their insisting that they would not do so. Yet, as blood-alcohol levels rise and moral judgments falter, people's qualms about drinking and driving lessen. Virtually all will drive home from a bar, even if given a breathalyzer test and told they are intoxicated (Denton & Krebs, 1990; MacDonald et al., 1995).

Memory Disruption Alcohol disrupts the processing of recent experiences into long-term memories. Thus, heavy drinkers may not recall people they met the night before or what they said or did while intoxicated. These blackouts result partly from the way alcohol suppresses REM sleep, which helps fix the day's experiences into permanent memories.

Ray Ng/Time & Life Pictures/Getty Images

Dangerous disinhibition Alcohol consumption leads to feelings of invincibility, which become especially dangerous behind the wheel of a car, such as this one totaled by a teenage drunk driver. This Colorado University Alcohol Awareness Week exhibit prompted many students to post their own anti-drinking pledges (white flags).

The effects of heavy drinking on the brain and cognition can be long-term. In rats, at a developmental period corresponding to human adolescence, binge-drinking diminishes the genesis of nerve cells, impairs the growth of synaptic connections, and contributes to nerve cell death (Crews et al., 2006, 2007). MRI scans show another way prolonged and excessive drinking can affect cognition (**FIGURE 7.2**). It can shrink the brain, especially in women, who have less of a stomach enzyme that digests alcohol (Wuethrich, 2001). Girls and young women can also become addicted to alcohol more quickly than boys and young men do, and they are at risk for lung, brain, and liver damage at lower consumption levels (CASA, 2003).



Scan of woman with alcohol dependence

Scan of woman without alcohol dependence

Daniel Hommer, NIAAA, NIH, HHS

FIGURE 7.2 Alcohol dependence shrinks the brain MRI scans show brain shrinkage in women with alcohol dependence (left) compared with women in a control group (right).

Reduced Self-Awareness and Self-Control Alcohol also reduces self-awareness (Hull et al., 1986). This may help explain why people who want to suppress their awareness of failures or shortcomings are more likely to drink than are those who feel good about themselves. Losing a business deal, a game, or a romantic partner sometimes elicits a drinking binge. By focusing attention on the immediate situation and away from any future consequences, alcohol also lessens impulse control (Steele & Josephs, 1990). In surveys of rapists, more than half acknowledge drinking before committing their offense (Seto & Barbaree, 1995).

A University of Illinois campus survey showed that before sexual assaults, 80 percent of the male assailants and 70 percent of the female victims had been drinking (Camper, 1990). Another survey of 89,874 American collegians found alcohol or drugs involved in 79 percent of unwanted sexual intercourse experiences (Presley et al., 1997).

Expectancy Effects As with other psychoactive drugs, alcohol's behavioral effects stem not only from its alteration of brain chemistry but also from the user's expectations. When people believe that alcohol affects social behavior in certain ways, and believe, rightly or wrongly, that they have been drinking alcohol, they will behave accordingly (Leigh, 1989). In a now-classic experiment, researchers (Abrams & Wilson, 1983) gave Rutgers University men who volunteered for a study on "alcohol and sexual stimulation" either an alcoholic or a nonalcoholic drink. (Both had strong tastes that masked any alcohol.) In each group, half the participants thought they were drinking alcohol and half thought they were not. After watching an erotic movie clip, the men who *thought* they had consumed alcohol were more likely to report having strong sexual fantasies and feeling guilt-free. Being able to *attribute* their sexual responses to alcohol released their inhibitions—whether they actually had drunk alcohol or not. Alcohol's effect lies partly in that powerful sex organ, the mind.

Alcohol + Sex = The Perfect Storm Alcohol's effects on self-control and social expectations often converge in sexual situations. More than 600 studies have explored the link between drinking and risky sex, with "the overwhelming majority" finding the two correlated (Cooper, 2006).

Barbiturates

The **barbiturate** drugs, or *tranquilizers,* mimic the effects of alcohol. Because they depress nervous system activity, barbiturates such as Nembutal, Seconal, and Amytal are sometimes prescribed to induce sleep or reduce anxiety. In larger doses, they can lead to impaired memory and judgment or even death. If combined with alcohol—as sometimes happens when people take a sleeping pill after an evening of heavy drinking—the total depressive effect on body functions can be lethal.

Opiates

The **opiates**—opium and its derivatives, morphine and heroin—also depress neural functioning. Pupils constrict, breathing slows, and lethargy sets in as blissful pleasure replaces pain and anxiety. But for this short-term pleasure the user may pay a long-term price: a gnawing craving for another fix, a need for progressively larger doses, and the extreme discomfort of withdrawal. When repeatedly flooded with an artificial opiate, the brain eventually stops producing its own opiates, the *endorphins.* If the artificial opiate is then withdrawn, the brain lacks the normal level of these painkilling neurotransmitters. Those who cannot or choose not to tolerate this state may pay an ultimate price—death by overdose.

depressants drugs (such as alcohol, barbiturates, and opiates) that reduce neural activity and slow body functions.

barbiturates drugs that depress the activity of the central nervous system, reducing anxiety but impairing memory and judgment.

opiates opium and its derivatives, such as morphine and heroin; they depress neural activity, temporarily lessening pain and anxiety.

stimulants drugs (such as caffeine, nicotine, amphetamines, and the even more powerful cocaine, Ecstasy, and methamphetamine) that excite neural activity and speed up body functions.

amphetamines drugs that stimulate neural activity, causing speeded-up body functions and associated energy and mood changes.

methamphetamine a powerfully addictive drug that stimulates the central nervous system, with speeded-up body functions and associated energy and mood changes; over time, appears to reduce baseline dopamine levels.

Stimulants

7-3: What are stimulants, and what are their effects?

Stimulants such as caffeine and nicotine temporarily excite neural activity and arouse body functions. People use these substances to stay awake, lose weight, or boost mood or athletic performance. This category of drugs also includes **amphetamines,** and the even more powerful cocaine, Ecstasy, and *methamphetamine* ("speed"). All strong stimulants increase heart and breathing rates and cause pupils to dilate, appetite to diminish (because blood sugar increases), and energy and self-confidence to rise. And, as with other drugs, the benefits of stimulants come with a price. These substances can be addictive and may induce an aftermath crash into fatigue, headaches, irritability, and depression (Silverman et al., 1992).

National Pictures/Topham/The Image Works

Dramatic drug-induced decline This woman's methamphetamine addiction led to obvious physical changes. Her decline is evident in these two photos, taken at age 36 (left) and, after four years of addiction, at age 40 (right).

Methamphetamine

Methamphetamine is chemically related to its parent drug, *amphetamine* (NIDA, 2002, 2005), but has even greater effects. Methamphetamine triggers the release of the neurotransmitter dopamine, which stimulates brain cells that enhance energy and mood. The result can include eight hours or so of heightened energy and euphoria.

Over time, methamphetamine may reduce baseline dopamine levels, leaving the user with permanently depressed functioning. Methamphetamine's possible aftereffects include irritability, insomnia, hypertension, seizures, social isolation, depression, and occasional violent outbursts (Homer et al., 2008). The British government now classifies *crystal meth,* the highly addictive crystalized form of methamphetamine, alongside cocaine and heroin as one of the most dangerous drugs (BBC, 2006).

Caffeine

Caffeine, the world's most widely consumed psychoactive substance, can now be found not only in coffee, tea, and soda but also in fruit juices, mints, energy drinks, bars, and gels—and even in soap. Coffees and teas vary in their caffeine content, with a cup of drip coffee surprisingly having more caffeine than a shot of espresso, and teas having less. A mild dose of caffeine typically lasts three or four hours, which—if taken in the evening—may be long enough to impair sleep. Like other drugs, caffeine used regularly and in heavy doses produces tolerance: Its stimulating effects lessen. And discontinuing heavy caffeine intake often produces withdrawal symptoms, including fatigue and headache.

Nicotine

"There is an overwhelming medical and scientific consensus that cigarette smoking causes lung cancer, heart disease, emphysema, and other serious diseases in smokers. Smokers are far more likely to develop serious diseases, like lung cancer, than nonsmokers."

—Philip Morris Companies Inc., 1999

Imagine that cigarettes were harmless—except, once in every 25,000 packs, an occasional innocent-looking one is filled with dynamite instead of tobacco. Not such a bad risk of having your head blown off. But with 250 million packs a day consumed worldwide, we could expect more than 10,000 gruesome daily deaths (more than three times the 9/11 fatalities each and every day)—surely enough to have cigarettes banned everywhere.[1]

The lost lives from these dynamite-loaded cigarettes approximate those from today's actual cigarettes. Each year throughout the world, tobacco kills nearly 5.4 million of its 1.3 billion customers, reports the World Health Organization (WHO). (Imagine the outrage if terrorists took down an equivalent of 25 loaded jumbo jets today, let alone tomorrow and every day thereafter.) And by 2030, annual deaths will increase to 8 million, according to WHO predictions. That means that *1 billion* twenty-first-century people may be killed by tobacco (WHO, 2008).

Smoke a cigarette and nature will charge you 12 minutes—ironically, just about the length of time you spend smoking it (Discover, *1996*).

[1]This analogy, adapted here with world-based numbers, was suggested by mathematician Sam Saunders, as reported by K. C. Cole (1998).

A teen-to-the-grave smoker has a 50 percent chance of dying from the habit, and the death is often agonizing and premature. Eliminating smoking would increase life expectancy more than any other preventive measure. Why, then, do so many people smoke?

Smoking usually begins during early adolescence. (If you are in college or university, and if by now the cigarette manufacturers haven't attracted your business, they almost surely never will.) Adolescents, self-conscious and often thinking the world is watching their every move, are vulnerable to smoking's allure. They may first light up to imitate glamorous celebrities, or to project a mature image, or to get the social reward of being accepted by other smokers (Cin et al., 2007; Tickle et al., 2006). Mindful of these tendencies, cigarette companies have effectively modeled smoking with themes that appeal to youths: sophistication, independence, adventure-seeking, social approval. Typically, teens who start smoking also have friends who smoke, who suggest its pleasures, and who offer them cigarettes (Eiser, 1985; Evans et al., 1988; Rose et al., 1999). Among teens whose parents and best friends are nonsmokers, the smoking rate is close to zero (Moss et al., 1992; also see **FIGURE 7.3**).

Humorist Dave Barry (1995) recalling why he smoked his first cigarette the summer he turned 15: "Arguments against smoking: 'It's a repulsive addiction that slowly but surely turns you into a gasping, gray-skinned, tumor-ridden invalid, hacking up brownish gobs of toxic waste from your one remaining lung.' Arguments for smoking: 'Other teenagers are doing it.' Case closed! Let's light up!"

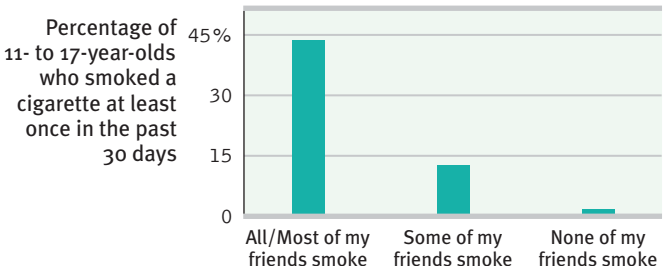


FIGURE 7.3 Peer influence Kids don't smoke if their friends don't (Philip Morris, 2003). A correlation-causation question: Does the close link between teen smoking and friends' smoking reflect peer influence? Teens seeking similar friends? Or both?

Those addicted to nicotine find it very hard to quit because tobacco products are as powerfully and quickly addictive as heroin and cocaine. As with other addictions, a smoker becomes dependent; each year fewer than one of every seven smokers who want to quit will do so. Smokers also develop tolerance, eventually needing larger and larger doses to get the same effect. Quitting causes nicotine-withdrawal symptoms, including craving, insomnia, anxiety, and irritability. Even attempts to quit within the first weeks of smoking often fail as nicotine cravings set in (DiFranza, 2008). And all it takes to relieve this aversive state is a cigarette—a portable nicotine dispenser.

"To cease smoking is the easiest thing I ever did; I ought to know because I've done it a thousand times."
—Mark Twain, 1835–1910

Nicotine, like other addictive drugs, is not only mood-altering, it is also reinforcing. Smoking delivers its hit of nicotine within 7 seconds, triggering the release of epinephrine and norepinephrine, which in turn diminish appetite and boost alertness and mental efficiency (**FIGURE 7.4** on the next page). At the same time, nicotine stimulates the central nervous system to release other neurotransmitters that calm anxiety and reduce sensitivity to pain. For example, nicotine stimulates the release of dopamine and (like heroin and morphine) natural opioids (Nowak, 1994; Scott et al., 2004). These rewards keep people smoking even when they wish they could stop—indeed, even when they know they are committing slow-motion suicide (Saad, 2002).

Asked "If you had it to do all over again, would you start smoking?" more than 85 percent of adult smokers answer No *(Slovic et al., 2002).*

Nic-A-Teen Aware that virtually all smokers start as teenagers—and that sales would plummet if no teens were enticed to smoke—cigarette companies target teens. They have portrayed tough, appealing, socially adept smokers in the hopes that teens will imitate. Teen smoking went up in the 1990s (Brody, 2001), coinciding with an increased number of appealing smokers in popular films, including a younger Johnny Depp in this film, *The Source*.

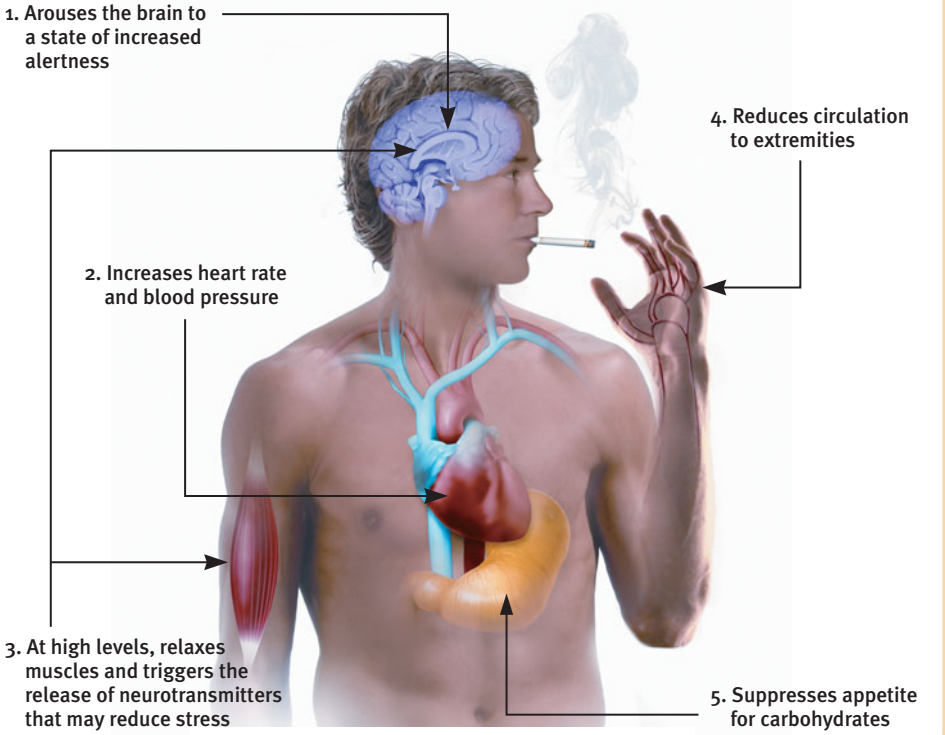


FIGURE 7.4 Where there's smoke . . . : The physiological effects of nicotine
Nicotine reaches the brain within 7 seconds, twice as fast as intravenous heroin. Within minutes, the amount in the blood soars.

Nevertheless, half of all Americans who have ever smoked have quit, and 81 percent of those who haven't yet quit wish to (Jones, 2007). For those who endure, the acute craving and withdrawal symptoms gradually dissipate over the ensuing six months (Ward et al., 1997). These nonsmokers may live not only healthier but also happier lives. Smoking correlates with higher rates of depression, chronic disabilities, and divorce (Doherty & Doherty, 1998; Vita et al., 1998). Healthy living seems to add both years to life and life to years.

Cocaine

Cocaine use offers a fast track from euphoria to crash. When sniffed ("snorted"), and especially when injected or smoked ("free-based"), cocaine enters the bloodstream quickly. The result: a "rush" of euphoria that depletes the brain's supply of the neurotransmitters dopamine, serotonin, and norepinephrine (**FIGURE 7.5**). Within 15 to 30 minutes, a crash of agitated depression follows as the drug's effect wears off.

"Cocaine makes you a new man. And the first thing that new man wants is more cocaine."
—Comedian George Carlin (1937–2008)

In national surveys, 5 percent of U.S. high school seniors and 5 percent of British 18- to 24-year-olds reported having tried cocaine during the past year (Home Office, 2003; Johnston et al., 2008). Nearly half of the drug-using seniors had smoked *crack*, a crystallized form of cocaine. This faster-working, potent form of the drug produces a briefer but more intense high, a more intense crash, and a craving for more, which wanes after several hours only to return several days later (Gawin, 1991).

The recipe for Coca Cola originally included the extract of the coca plant, creating a cocaine tonic for tired elderly people. Between 1896 and 1905, Coke was indeed "the real thing."

Cocaine-addicted monkeys have pressed levers more than 12,000 times to gain one cocaine injection (Siegel, 1990). Many regular cocaine users—animal and human—do become addicted. In situations that trigger aggression, ingesting cocaine may heighten reactions. Caged rats fight when given foot shocks, and they fight even more when given cocaine *and* foot shocks. Likewise, humans ingesting high doses of cocaine in laboratory experiments impose higher shock levels on a presumed opponent than do those receiving a placebo (Licata et al., 1993). Cocaine use may also lead to emotional disturbances, suspiciousness, convulsions, cardiac arrest, or respiratory failure.

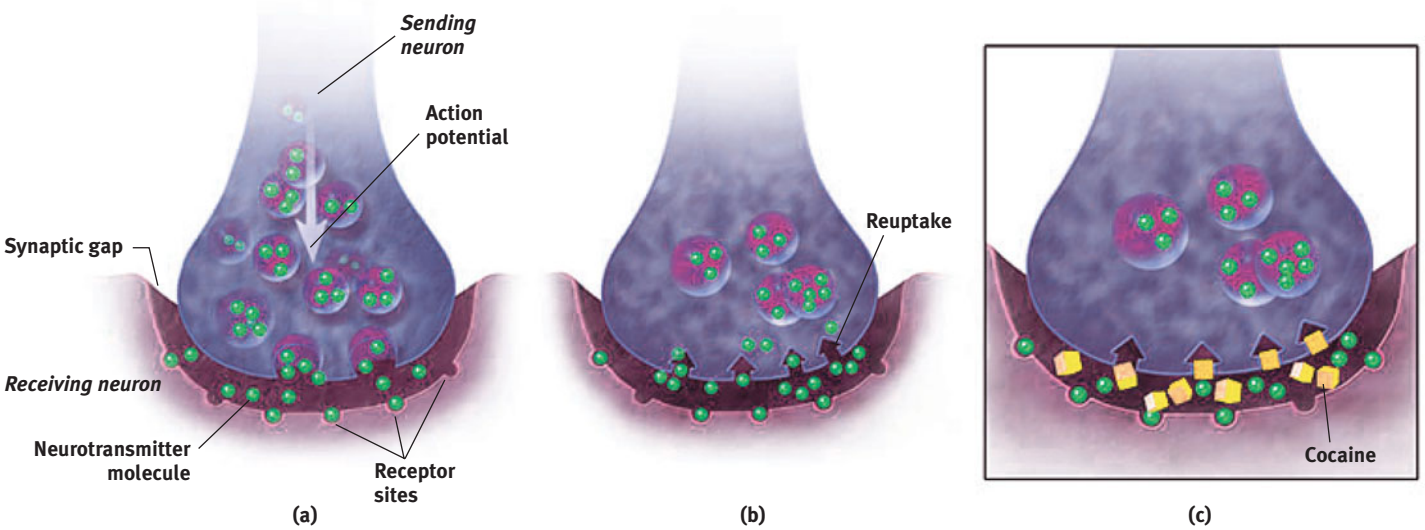


FIGURE 7.5 Cocaine euphoria and crash

As with all psychoactive drugs, cocaine's psychological effects depend not only on the dosage and form consumed but also on the situation and the user's expectations and personality. Given a placebo, cocaine users who *think* they are taking cocaine often have a cocainelike experience (Van Dyke & Byck, 1982).

Ecstasy

Ecstasy, a street name for **MDMA** (methylenedioxymethamphetamine), is both a stimulant and a mild hallucinogen. As an amphetamine derivative, it triggers dopamine release. But its major effect is releasing stored serotonin and blocking its reabsorption, thus prolonging serotonin's feel-good flood (Braun, 2001). About a half-hour after taking an Ecstasy pill, users enter a three- to four-hour period of feelings of emotional elevation and, given a social context, connectedness with those around them ("I love everyone").

AP Photo/Dale Sparks

The hug drug MDMA, known as Ecstasy, produces a euphoric high and feelings of intimacy. But repeated use destroys serotonin-producing neurons and may permanently deflate mood and impair memory.

Ecstasy (MDMA) a synthetic stimulant and mild hallucinogen. Produces euphoria and social intimacy, but with short-term health risks and longer-term harm to serotonin-producing neurons and to mood and cognition.

hallucinogens psychedelic ("mind-manifesting") drugs, such as LSD, that distort perceptions and evoke sensory images in the absence of sensory input.

LSD a powerful hallucinogenic drug; also known as acid *(lysergic acid diethylamide)*.

near-death experience an altered state of consciousness reported after a close brush with death (such as through cardiac arrest); often similar to drug-induced hallucinations.

During the late 1990s, Ecstasy's popularity soared as a "club drug" taken at night clubs and all-night raves (Landry, 2002). There are, however, reasons not to be ecstatic about Ecstasy. One is its dehydrating effect, which—when combined with prolonged dancing—can lead to severe overheating, increased blood pressure, and death. Another is that long-term, repeated leaching of brain serotonin can damage serotonin-producing neurons, leading to decreased output and increased risk of permanently depressed mood (Croft et al., 2001; McCann et al., 2001; Roiser et al., 2005). Ecstasy also suppresses the disease-fighting immune system, impairs memory, slows thought, and disrupts sleep by interfering with serotonin's control of the circadian clock (Laws & Kokkalis, 2007; Pacifici et al., 2001; Schilt et al., 2007). Ecstasy delights for the night but dispirits the morrow.

Hallucinogens

7-4: What are hallucinogens, and what are their effects?

Hallucinogens distort perceptions and evoke sensory images in the absence of sensory input (which is why these drugs are also called *psychedelics*, meaning "mind-manifesting"). Some, such as LSD and MDMA (Ecstasy), are synthetic. Others, including the mild hallucinogen marijuana, are natural substances.

LSD

In 1943, Albert Hofmann reported perceiving "an uninterrupted stream of fantastic pictures, extraordinary shapes with intense, kaleidoscopic play of colors" (Siegel, 1984). Hofmann, a chemist, had created—and on one Friday afternoon in April 1943 accidentally ingested—**LSD** (lysergic acid diethylamide). The result reminded him of a childhood mystical experience that had left him longing for another glimpse of "a miraculous, powerful, unfathomable reality" (Smith, 2006).

LSD and other powerful hallucinogens are chemically similar to (and therefore block the actions of) a subtype of the neurotransmitter serotonin (Jacobs, 1987). The emotions of an LSD trip vary from euphoria to detachment to panic. The user's current mood and expectations color the emotional experience, but the perceptual distortions and hallucinations have some commonalities. Psychologist Ronald Siegel (1982) reported that whether you provoke your brain to hallucinate by drugs, loss of oxygen, or extreme sensory deprivation, "it will hallucinate in basically the same way." The experience typically begins with simple geometric forms, such as a lattice, a cobweb, or a spiral. The next phase consists of more meaningful images; some may be superimposed on a tunnel or funnel, others may be replays of past emotional experiences. As the hallucination peaks, people frequently feel separated from their body and experience dreamlike scenes so real that they may become panic-stricken or harm themselves.

These sensations are strikingly similar to the **near-death experience,** an altered state of consciousness reported by about one-third of those who survive a brush with death, as when revived from cardiac arrest (Moody, 1976; Ring, 1980; Schnaper, 1980). Many experience bright lights or beings of light, a replay of old memories, visions of tunnels (**FIGURE 7.6**), and out-of-body sensations (Siegel, 1980). Given that oxygen deprivation and other insults to the brain are known to produce hallucinations, it is difficult to resist wondering whether a brain under stress manufactures the near-death experiences. Patients who have experienced temporal lobe seizures have reported similarly profound mystical experiences, as have solitary sailors and polar explorers while enduring monotony, isolation, and cold (Suedfeld & Mocellin, 1987).

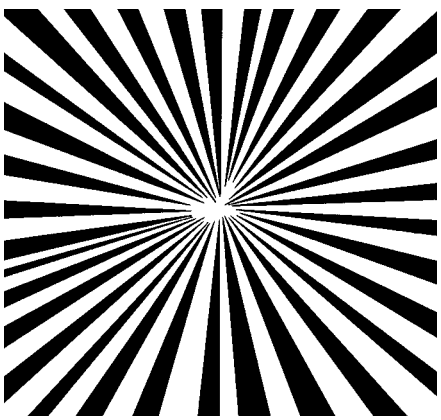


FIGURE 7.6 Near-death vision or hallucination? Psychologist Ronald Siegel (1977) reported that people under the influence of hallucinogenic drugs often see "a bright light in the center of the field of vision. . . . The location of this point of light create[s] a tunnel-like perspective."

Marijuana

THC the major active ingredient in marijuana; triggers a variety of effects, including mild hallucinations.

Marijuana consists of the leaves and flowers of the hemp plant, which for 5000 years has been cultivated for its fiber. Whether smoked or eaten, marijuana's major active ingredient, **THC** (delta-9-tetrahydrocannabinol), produces a mix of effects. (Smoking marijuana gets the drug into the brain in about 7 seconds, producing a greater effect than does eating the drug, which causes its peak concentration to be reached at a slower, unpredictable rate.) Like alcohol, marijuana relaxes, disinhibits, and may produce a euphoric high. But marijuana is also a mild hallucinogen, amplifying sensitivity to colors, sounds, tastes, and smells. And unlike alcohol, which the body eliminates within hours, THC and its by-products linger in the body for a month or more. Thus, contrary to the usual tolerance phenomenon, regular users may achieve a high with smaller amounts of the drug than occasional users would need to get the same effect.

A user's experience can vary with the situation. If the person feels anxious or depressed, using marijuana may intensify these feelings. And studies controlling for other drug use and personal traits have found that the more one uses marijuana, the greater one's risk of anxiety, depression, or possibly schizophrenia (Hall, 2006; Murray et al., 2007; Patton et al., 2002). Daily use bodes a worse outcome than infrequent use.

The National Academy of Sciences (1982, 1999) and National Institute on Drug Abuse (2004) have identified other marijuana consequences. Like alcohol, marijuana impairs the motor coordination, perceptual skills, and reaction time necessary for safely operating an automobile or other machine. "THC causes animals to misjudge events," reported Ronald Siegel (1990, p. 163). "Pigeons wait too long to respond to buzzers or lights that tell them food is available for brief periods; and rats turn the wrong way in mazes." Marijuana also disrupts memory formation and interferes with immediate recall of information learned only a few minutes before. Such cognitive effects outlast the period of smoking (Messinis et al., 2006). Prenatal exposure through maternal marijuana use also impairs brain development (Berghuis et al., 2007; Huizink & Mulder, 2006). Heavy adult use for over 20 years is associated with a shrinkage of brain areas that process memories and emotions (Yücel et al., 2008).

Scientists have shed light on marijuana's cognitive, mood, and motor effects with the discovery of concentrations of THC-sensitive receptors in the brain's frontal lobes, limbic system, and motor cortex (Iversen, 2000). As the 1970s discovery of receptors for morphine put researchers on the trail of morphinelike neurotransmitters (the endorphins), so the more recent discovery of *cannabinoid receptors* has led to a successful hunt for naturally occurring THC-like molecules that bind with cannabinoid receptors. These molecules may naturally control pain. If so, this would help explain why marijuana can be therapeutic for those who suffer the pain, nausea, and severe weight loss associated with AIDS (Watson et al., 2000). Such uses have motivated legislation in some states to make the drug legally available for medical purposes. To avoid the toxicity of marijuana smoke—which, like cigarette smoke, can cause cancer, lung damage, and pregnancy complications—the Institute of Medicine recommends medical inhalers to deliver the THC.

* * *

Despite their differences, the psychoactive drugs summarized in **TABLE 7.1** on the next page share a common feature: They trigger negative aftereffects that offset their immediate positive effects and grow stronger with repetition. And that helps explain both tolerance and withdrawal. As the opposing, negative aftereffects grow stronger, it takes larger and larger doses to produce the desired high (tolerance), causing the aftereffects to worsen in the drug's absence (withdrawal). This in turn creates a need to switch off the withdrawal symptoms by taking yet more of the drug.

"How strange would appear to be this thing that men call pleasure! And how curiously it is related to what is thought to be its opposite, pain! . . . Wherever the one is found, the other follows up behind."

—Plato, *Phaedo,* fourth century B.C.E.

TABLE 7.1 A Guide to Selected Psychoactive Drugs

Drug	Type	Pleasurable Effects	Adverse Effects
Alcohol	Depressant	Initial high followed by relaxation and disinhibition	Depression, memory loss, organ damage, impaired reactions
Heroin	Depressant	Rush of euphoria, relief from pain	Depressed physiology, agonizing withdrawal
Caffeine	Stimulant	Increased alertness and wakefulness	Anxiety, restlessness, and insomnia in high doses; uncomfortable withdrawal
Methamphetamine	Stimulant	Euphoria, alertness, energy	Irritability, insomnia, hypertension, seizures
Cocaine	Stimulant	Rush of euphoria, confidence, energy	Cardiovascular stress, suspiciousness, depressive crash
Nicotine	Stimulant	Arousal and relaxation, sense of well-being	Heart disease, cancer
Ecstasy (MDMA)	Stimulant; mild hallucinogen	Emotional elevation, disinhibition	Dehydration, overheating, depressed mood, impaired cognitive and immune functioning
Marijuana	Mild hallucinogen	Enhanced sensation, relief of pain, distortion of time, relaxation	Impaired learning and memory, increased risk of psychological disorders, lung damage from smoke

Influences on Drug Use

7-5: Why do some people become regular users of consciousness-altering drugs?

In the real world, alcohol accounts for one-sixth or less of beverage use. In TV land, drinking alcohol occurs more often than the combined drinking of coffee, tea, soft drinks, and water (Gerbner, 1990).

Drug use by North American youth increased during the 1970s. Then, with increased drug education and a more realistic and deglamorized media depiction of taking drugs, drug use declined sharply. After the early 1990s, the cultural antidrug voice softened, and drugs for a time were again glamorized in some music and films. Consider these marijuana-related trends:

- In the University of Michigan's annual survey of 15,000 U.S. high school seniors, the proportion who believe there is "great risk" in regular marijuana use rose from 35 percent in 1978 to 79 percent in 1991, then retreated to 55 percent in 2007 (Johnston et al., 2008).
- After peaking in 1978, marijuana use by U.S. high school seniors declined through 1992, then rose, but has recently been tapering off (**FIGURE 7.7**). Among Canadian 15- to 24-year-olds, 23 percent report using marijuana monthly, weekly, or daily (Health Canada, 2007).

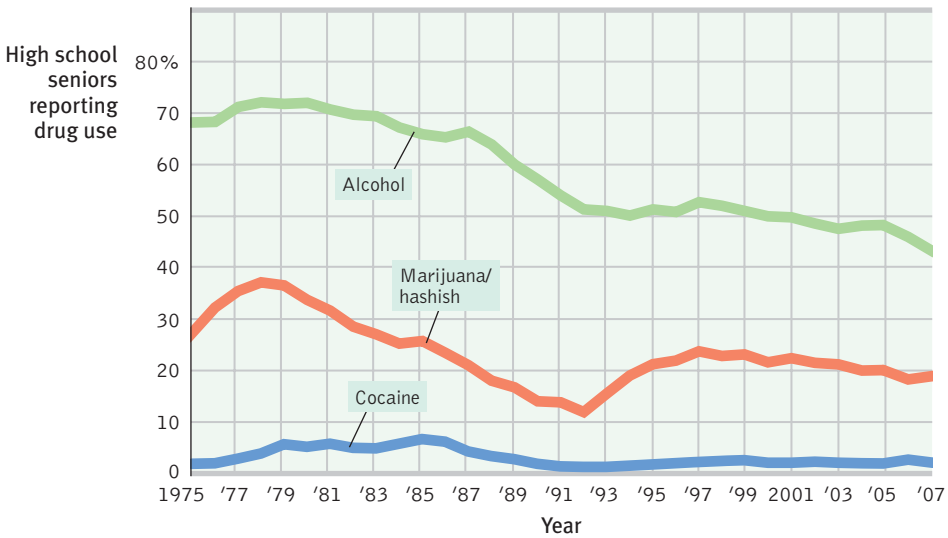


FIGURE 7.7 Trends in drug use The percentage of U.S. high school seniors who report having used alcohol, marijuana, or cocaine during the past 30 days declined from the late 1970s to 1992, when it partially rebounded for a few years. (From Johnston et al., 2009.)

For some adolescents, occasional drug use represents thrill seeking. Why, though, do others become regular drug users? In search of answers, researchers have engaged biological, psychological, and social-cultural levels of analysis.

Biological Influences

Some people may be biologically vulnerable to particular drugs. For example, evidence accumulates that heredity influences some aspects of alcohol abuse problems, especially those appearing by early adulthood (Crabbe, 2002):

- Adopted individuals are more susceptible to alcohol dependence if one or both biological parents have a history of it.
- Having an identical rather than fraternal twin with alcohol dependence puts one at increased risk for alcohol problems (Kendler et al., 2002). (In marijuana use also, identical twins more closely resemble each other than do fraternal twins.)
- Boys who at age 6 are excitable, impulsive, and fearless (genetically influenced traits) are more likely as teens to smoke, drink, and use other drugs (Masse & Tremblay, 1997).
- Researchers have bred rats and mice that prefer alcoholic drinks to water. One such strain has reduced levels of the brain chemical NPY. Mice engineered to *overproduce* NPY are very sensitive to alcohol's sedating effect and drink little (Thiele et al., 1998).
- Researchers have identified genes that are more common among people and animals predisposed to alcohol dependency, and they are seeking genes that contribute to tobacco addiction (NIH, 2006; Nurnberger & Bierut, 2007). These culprit genes seemingly produce deficiencies in the brain's natural dopamine reward system, which is impacted by addictive drugs. With repeated use, the drugs disrupt normal dopamine balance while triggering temporary dopamine-produced pleasure. Studies of how drugs reprogram the brain's reward systems raise hopes for anti-addiction drugs that might block or blunt the effects of alcohol and other drugs (Miller, 2008; Wilson & Kuhn, 2005).

Psychological and Social-Cultural Influences

Psychological and social-cultural influences also contribute to drug use (**FIGURE 7.8**). One psychological factor that has appeared in studies of youth and young adults (Newcomb & Harlow, 1986) is the feeling that life is meaningless and directionless,

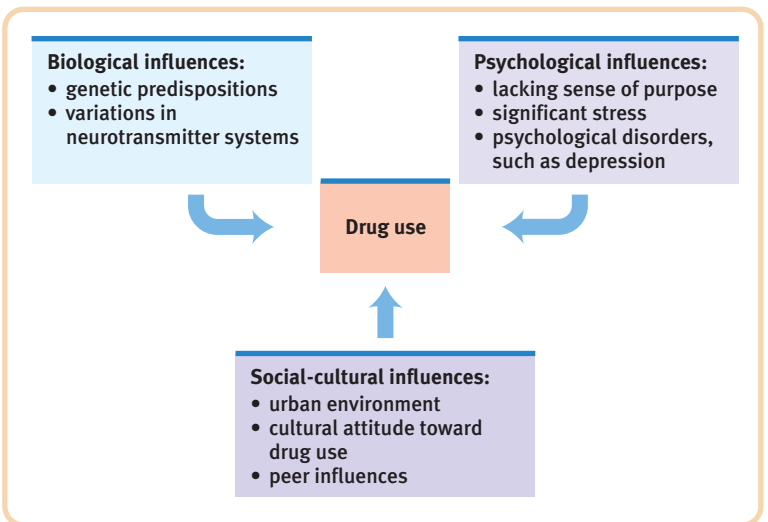


FIGURE 7.8 Levels of analysis for drug use The biopsychosocial approach enables researchers to investigate drug use from complementary perspectives.

a common feeling among school dropouts who subsist without job skills, without privilege, and with little hope.

Heavy users of alcohol, marijuana, and cocaine often display other psychological influences. Many have experienced significant stress or failure and are depressed. Females with a history of depression, eating disorders, or sexual or physical abuse are at risk for substance addiction, as are those undergoing school or neighborhood transitions (CASA, 2003; Logan et al., 2002). Monkeys, too, develop a taste for alcohol when stressed by permanent separation from their mother at birth (Small, 2002). By temporarily dulling the pain of self-awareness, alcohol may offer a way to avoid coping with depression, anger, anxiety, or insomnia. The relief may be temporary, but behavior is often controlled more by its immediate consequences than by its later ones.

Warning signs of alcohol dependence
- *Drinking binges*
- *Regretting things done or said when drunk*
- *Feeling low or guilty after drinking*
- *Failing to honor a resolve to drink less*
- *Drinking to alleviate depression or anxiety*
- *Avoiding family or friends when drinking*

Drug use also has social roots. When young unmarried adults leave home, alcohol and other drug use increases; when they marry and have children, it decreases (Bachman et al., 1997). Among teenagers, most drinking is done for social reasons, not as a way to cope with problems (Kuntsche et al., 2005). Social influence also appears in the differing rates of drug use across cultural and ethnic groups. For example, a 2003 survey of 100,000 teens in 35 European countries found that marijuana use in the prior 30 days ranged from zero to 1 percent in Romania and Sweden to 20 to 22 percent in Britain, Switzerland, and France (ESPAD, 2003). Independent U.S. government studies of drug use in households nationwide and among high schoolers in all regions reveal that African-American teens have sharply lower rates of drinking, smoking, and cocaine use (Johnston et al., 2007). Alcohol and other drug addiction rates have also been extremely low in the United States among Orthodox Jews, Mormons, the Amish, and Mennonites (Trimble, 1994). Relatively drug-free small towns and rural areas tend to constrain any genetic predisposition to drug use, report Lisa Legrand and her colleagues (2005). For those whose genetic predispositions nudge them toward substance use, "cities offer more opportunities" and less supervision.

Culture and Alcohol

Percentage drinking weekly or more:

United States	*30%*
Canada	*40%*
Britain	*58%*

(Gallup poll, from Moore, 2006)

Whether in cities or rural areas, peers influence attitudes about drugs. They also throw the parties and provide the drugs. If an adolescent's friends use drugs, the odds are that he or she will, too. If the friends do not, the opportunity may not even arise. Teens who come from happy families, who do not begin drinking before age 14, and who do well in school tend not to use drugs, largely because they rarely associate with those who do (Bachman et al., 2007; Hingson et al., 2006; Oetting & Beauvais, 1987, 1990).

Peer influence, however, is not just a matter of what friends do and say but also of what adolescents *believe* friends are doing and favoring. In one survey of sixth graders in 22 U.S. states, 14 percent believed their friends had smoked marijuana, though only 4 percent acknowledged doing so (Wren, 1999). University students are not immune to such misperceptions: Drinking dominates social occasions partly because students overestimate their fellow students' enthusiasm for alcohol and underestimate their views of its risks (Prentice & Miller, 1993; Self, 1994) (**TABLE 7.2**).

TABLE 7.2 Facts About "Higher" Education

College and university students drink more alcohol than their nonstudent peers and exhibit 2.5 times the general population's rate of substance abuse.

Fraternity and sorority members report nearly twice the binge-drinking rate of nonmembers.

Since 1993, campus smoking rates have declined, alcohol use has been steady, and abuse of prescription opioids, stimulants, tranquilizers, and sedatives has increased, as has marijuana use.

Source: NCASA, 2007.

People whose beginning use of drugs was influenced by their peers are more likely to stop using when friends stop or the social network changes (Kandel & Raveis, 1989). One study that followed 12,000 adults over 32 years found that smokers tend to quit in clusters (Christakis & Fowler, 2008). Within a social network, the odds of a person's quitting increased when a spouse, friend, or co-worker stopped smoking. Similarly, most soldiers who became drug-addicted while in Vietnam ceased their drug use after returning home (Robins et al., 1974).

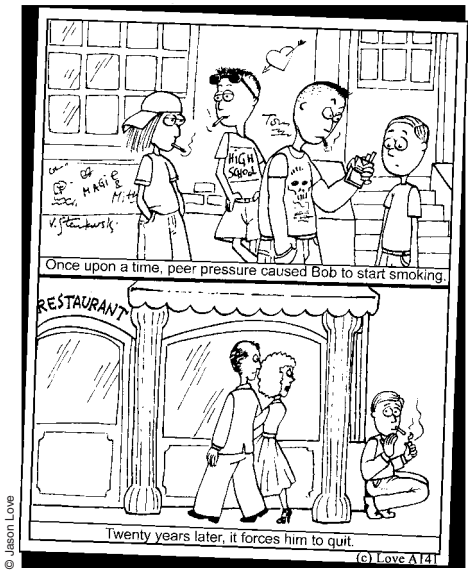
As always with correlations, the traffic between friends' drug use and our own may be two-way: Our friends influence us. Social networks matter. But we also select as friends those who share our likes and dislikes.

What do the findings on drug use suggest for drug prevention and treatment programs? Three channels of influence seem possible:

- Educate young people about the long-term costs of a drug's temporary pleasures.
- Help young people find other ways to boost their self-esteem and purpose in life.
- Attempt to modify peer associations or to "inoculate" youths against peer pressures by training them in refusal skills.

People rarely abuse drugs if they understand the physical and psychological costs, feel good about themselves and the direction their lives are taking, and are in a peer group that disapproves of using drugs. These educational, psychological, and social-cultural factors may help explain why 42 percent of U.S. high school dropouts, but only 15 percent of college graduates, have reported smoking (Ladd, 1998).

SNAPSHOTS



REVIEWING

Drugs

7-1: What are tolerance, dependence, and addiction, and what are some common misconceptions about addiction? *Psychoactive drugs* alter perceptions and moods. Their continued use produces *tolerance* (requiring larger doses to achieve the same effect) and may lead to *physical* or *psychological dependence*. *Addiction* is compulsive drug craving and use. Despite popular beliefs, addictive drugs do not usually quickly corrupt, and therapy is not always required to overcome addiction. Debate continues over whether the concept of addiction can meaningfully be extended to other behaviors in addition to chemical dependence.

7-2: What are depressants, and what are their effects? *Depressants,* such as alcohol, *barbiturates,* and the *opiates,* dampen neural activity and slow body functions. Alcohol disinhibits—it increases the likelihood that we will act on our impulses, whether harmful or helpful. Alcohol also slows nervous system activity and impairs judgment, disrupts memory processes by suppressing REM sleep, and reduces self-awareness. User expectations strongly influence alcohol's behavioral effects.

7-3: What are stimulants, and what are their effects? *Stimulants*—caffeine, nicotine, the *amphetamines,* cocaine, *Ecstasy,* and *methamphetamine*—excite neural activity and speed up body functions. All are highly addictive. Continued use of methamphetamine may permanently reduce dopamine production. Nicotine's effects make smoking a difficult habit to kick, but the percentage of Americans who smoke is nevertheless decreasing. Cocaine gives users a 15- to 30-minute high, followed by a crash. Its risks include suspiciousness and cardiovascular stress. Ecstasy, a combined stimulant and mild hallucinogen, produces a euphoric high and feelings of intimacy. Its users risk immune system suppression, permanent damage to mood and memory, and (if taken during physical activity) dehydration and escalating body temperatures.

7-4: What are hallucinogens, and what are their effects? *Hallucinogens*—such as *LSD* and marijuana—distort perceptions and evoke hallucinations—sensory images in the absence of sensory input. Mood and expectations influence LSD's effects, but hallucinations and emotions varying from euphoria to panic are common. Patients who report a *near-death experience* often describe profound mystical feelings that may resemble drug-induced hallucinations. Marijuana's main ingredient, *THC,* may trigger feelings of disinhibition, euphoria, relaxation, relief from pain, and intense sensitivity to sensory stimuli. It may also increase feelings of depression or anxiety, impair motor coordination and reaction time, disrupt memory formation, and damage lung tissue (because of the inhaled smoke).

7-5: Why do some people become regular users of consciousness-altering drugs? Some people may be biologically more likely to become dependent on drugs such as alcohol. Psychological factors (such as stress, depression, and hopelessness) and social factors (such as peer pressure) combine to lead many people to experiment with—and sometimes become dependent on—drugs. Cultural and ethnic groups have differing rates of drug use. Each type of influence—biological, psychological, and social-cultural—offers a possible path for drug prevention and treatment programs.

Rehearse It!

1. Continued use of a psychoactive drug produces tolerance. This usually means that the user will
   a. feel physical pain and intense craving.
   b. be irreversibly addicted to the substance.
   c. need to take larger doses to get the desired effect.
   d. be able to take smaller doses to get the desired effect.

2. The depressants include alcohol, barbiturates,
   a. and opiates.
   b. cocaine, and morphine.
   c. caffeine, nicotine, and marijuana.
   d. and amphetamines.

3. Because alcohol_____, it may make a person more helpful or more aggressive.
   a. causes alcoholic blackouts
   b. destroys REM sleep
   c. produces hallucinations
   d. lowers inhibitions

4. Nicotine and cocaine stimulate neural activity, speed up body functions, and
   a. induce sensory hallucinations.
   b. interfere with memory.
   c. induce a temporary sense of well-being.
   d. lead to heroin use.

5. Long-term use of Ecstasy can
   a. depress sympathetic nervous system activity.
   b. deplete the brain's supply of epinephrine.
   c. deplete the brain's supply of dopamine.
   d. damage serotonin-producing neurons.

6. Near-death experiences are strikingly similar to the hallucinations evoked by
   a. heroin.
   b. cocaine.
   c. LSD.
   d. alcohol.

7. Use of marijuana
   a. impairs motor coordination, perception, reaction time, and memory.
   b. inhibits people's emotions.
   c. leads to dehydration and overheating.
   d. stimulates brain cell development.

8. Social-cultural explanations for drug use often focus on the effect of peer influence. An important *psychological* contributor to drug use is
   a. inflated self-esteem.
   b. the feeling that life is meaningless and directionless.
   c. genetic predispositions.
   d. overprotective parents.

Answers: 1. c, 2. a, 3. d, 4. c, 5. d, 6. c, 7. a, 8. b.

Terms and Concepts to Remember

psychoactive drug, p. 92
tolerance, p. 92
withdrawal, p. 92
physical dependence, p. 92
psychological dependence, p. 92
addiction, p. 93
depressants, p. 94
barbiturates, p. 95
opiates, p. 95
stimulants, p. 96
amphetamines, p. 96
methamphetamine, p. 96
Ecstasy (MDMA), p. 99
hallucinogens, p. 100
LSD, p. 100
near-death experience, p. 100
THC, p. 101

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. Fourth-century-B.C.E. philosopher Plato observed, "How strange would appear to be this thing that men call pleasure! And how curiously it is related to what is thought to be its opposite, pain! . . . Wherever the one is found, the other follows up behind." Explain how this pleasure-pain description applies to the neurotransmitter activity underlying repeated use of heroin.

The Test for Success questions offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Nature, Nurture, and Human Diversity

Nature, Nurture, and Human Diversity

What makes you you? In important ways, we are each unique. We look different. We sound different. We have varying personalities, interests, and cultural and family backgrounds.

We are also the leaves of one tree. Our human family shares not only a common biological heritage—cut us and we bleed—but also common behavioral tendencies. Our shared brain architecture predisposes us to sense the world, develop language, and feel hunger through identical mechanisms. Whether we live in the Arctic or the tropics, we prefer sweet tastes to sour. We divide the color spectrum into similar colors. And we feel drawn to behaviors that produce and protect offspring.

Our kinship appears in our social behaviors as well. Whether named Wong, Nkomo, Smith, or Gonzales, we start fearing strangers at about eight months, and as adults we prefer the company of those with attitudes and attributes similar to our own. Coming from different parts of the globe, we know how to read one another's smiles and frowns. As members of one species, we affiliate, conform, return favors, punish offenses, organize hierarchies of status, and grieve a child's death. A visitor from outer space could drop in anywhere and find humans dancing and feasting, singing and worshiping, playing sports and games, laughing and crying, living in families and forming groups. Taken together, such universal behaviors define our human nature.

What causes our striking diversity, and also our shared human nature? How much are human differences shaped by our differing genes? And how much by our *environment*—by every external influence, from maternal nutrition while in the womb to social support while nearing the tomb? To what extent are we formed by our upbringing? By our culture? By our current circumstances? By people's reactions to our genetic dispositions? Modules 8 and 9 tell something of the complex story of how our genes *(nature)* and environments *(nurture)* define us.

The nurture of nature Parents everywhere wonder: Will my baby grow up to be peaceful or aggressive? Homely or attractive? Successful or struggling at every step? What comes built in, and what is nurtured—and how? Research reveals that nature and nurture together shape our development—every step of the way.

Courtesy Brendan Baruth

MODULE

8

Behavior Genetics and Evolutionary Psychology

Behavior Genetics: Predicting Individual Differences

If Jaden Agassi, son of tennis stars Andre Agassi and Stephanie Graf, grows up to be a tennis star, should we attribute his superior talent to his Grand Slam genes? To his growing up in a tennis-rich environment? To high expectations? Such questions intrigue **behavior geneticists,** who study our differences and weigh the effects and interplay of heredity and **environment.**

Genes: Our Codes for Life

8-1: Our genes predispose our biology. Does this mean they determine our behavior?

Behind the story of our body and of our brain—surely the most awesome thing on our little planet—is the heredity that interacts with our experience to create both our universal human nature and our individual and social diversity. Barely more than a century ago, few would have guessed that every cell nucleus in your body contains the genetic master code for your entire body. It's as if every room in the Empire State Building had a book containing the architect's plans for the entire structure. The plans for your own book of life run to 46 chapters—23 donated by your mother (from her egg) and 23 by your father (from his sperm). Each of these 46 chapters, called a **chromosome,** is composed of a coiled chain of the molecule **DNA *(deoxyribonucleic acid)*** (FIGURE 8.1). **Genes,** small segments of the giant DNA molecules, form the words of those chapters. All told, you have 30,000 or so gene words. Genes can be either active *(expressed)* or inactive. Environmental events "turn on" genes, rather like hot water enabling a tea bag to express its flavor. When turned on, genes provide the code for creating *protein molecules,* the building blocks of physical development.

"Your DNA and mine are 99.9 percent the same. . . . At the DNA level, we are clearly all part of one big worldwide family."

—Francis Collins, Human Genome Project director, 2007

"We share half our genes with the banana."

—Evolutionary biologist Robert May, president of Britain's Royal Society, 2001

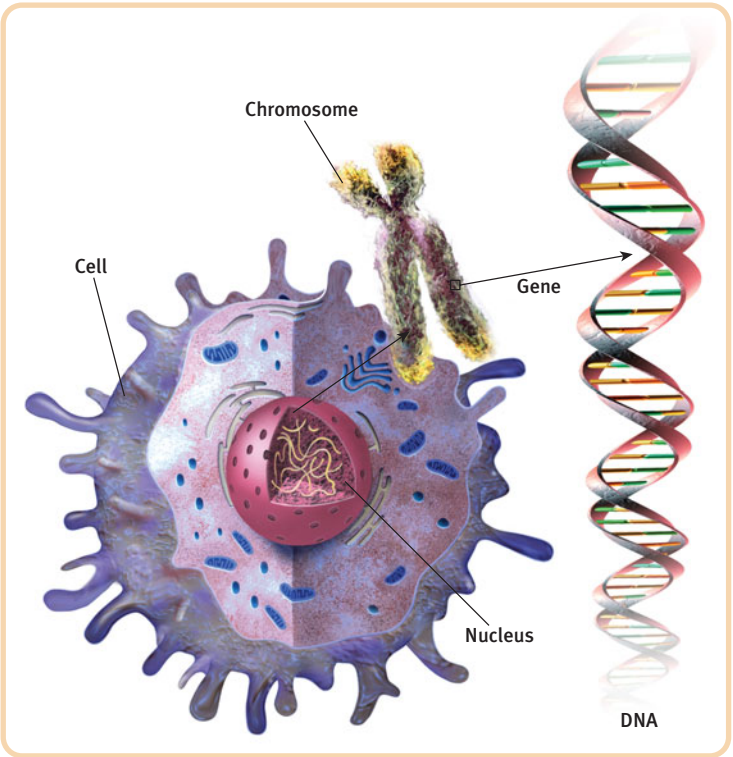


FIGURE 8.1 The human building blocks The nucleus of every human cell contains chromosomes, each of which is made up of two strands of DNA connected in a double helix.

behavior genetics the study of the relative power and limits of genetic and environmental influences on behavior.

environment every nongenetic influence, from prenatal nutrition to the people and things around us.

chromosomes threadlike structures made of DNA molecules that contain the genes.

DNA (deoxyribonucleic acid) a complex molecule containing the genetic information that makes up the chromosomes.

genes the biochemical units of heredity that make up the chromosomes; a segment of DNA capable of synthesizing a protein.

"Thanks for almost everything, Dad."

Geneticists and psychologists are interested in the occasional variations found at particular gene sites in human DNA. Slight person-to-person variations from the common pattern give clues to our uniqueness—why one person has a disease that another does not, why one person is short and another tall, why one is outgoing and another shy. For example, researchers have found that infants nourished with breast milk had significantly higher scores on intelligence tests taken later, at age 8, than did their formula-fed counterparts (Lucas et al., 1992). But this turns out to be true only for the 90 percent of infants with a gene that assists in breaking down fatty acids present in human milk (Caspi et al., 2007). Studies of 1037 New Zealand adults and 2232 English 12- and 13-year olds found no breast-feeding boost among those not carrying the gene.

Most of our traits are influenced by many genes. How tall you are, for example, reflects the size of your face, vertebrae, leg bones, and so forth—each of which may be influenced by different genes interacting with your environment. Complex traits such as intelligence, happiness, and aggressiveness are similarly influenced by groups of genes. Thus, our genetic predispositions—our genetically influenced traits—help explain both our shared human nature and our human diversity.

Twin and Adoption Studies

8-2: How do twin and adoption studies help us understand the relative influences of environment and heredity?

To tease apart the influences of environment and heredity, behavior geneticists would need to design two types of scientific experiments. The first would control the home environment while varying heredity. The second would control heredity while varying the home environment. Such experiments with human infants would be unethical, but happily for our purposes, nature has done this work for us.

Identical Versus Fraternal Twins

identical twins twins who develop from a single fertilized egg that splits in two, creating two genetically identical organisms.

Identical twins develop from a single *(monozygotic)* fertilized egg. Thus they are *genetically* identical—nature's own human clones (**FIGURE 8.2**). Indeed, they are clones who share not only the same genes but the same conception, uterus, birth date, and usually the same cultural history.

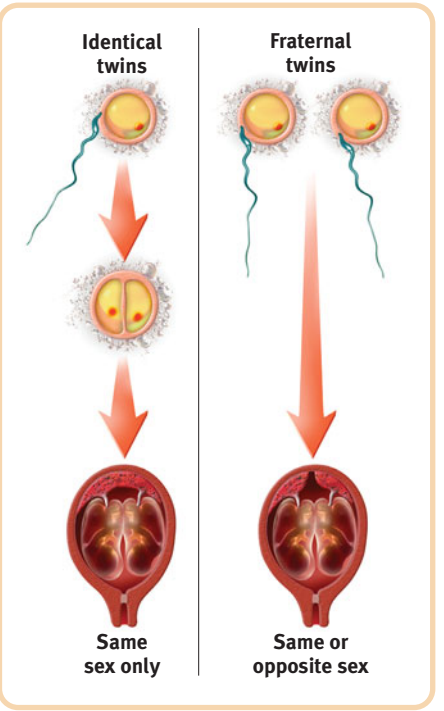


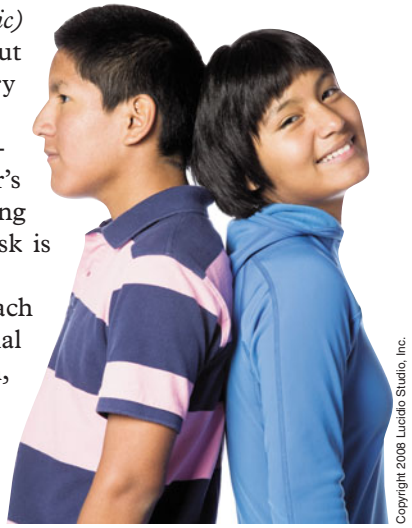
FIGURE 8.2 Same fertilized egg, same genes; different eggs, different genes Identical twins develop from a single fertilized egg, fraternal twins from two.

Fraternal twins develop from separate *(dizygotic)* fertilized eggs. They share a fetal environment, but they are genetically no more similar than ordinary brothers and sisters.

Shared genes can translate into shared experiences. A person whose identical twin has Alzheimer's disease, for example, has a 60 percent risk of getting the disease. If the affected twin is fraternal, the risk is only 30 percent (Plomin et al., 1997).

Are identical twins, being genetic clones of each other, also behaviorally more similar than fraternal twins? Studies of thousands of twin pairs in Sweden, Finland, and Australia provide a consistent answer: On both extraversion (outgoingness) and neuroticism (emotional instability), identical twins are much more similar than fraternal twins.

When John Loehlin and Robert Nichols (1976) gave a battery of questionnaires to 850 U.S. twin pairs, identical twins, more than fraternal twins, also reported being treated alike. So, did their experience rather than their genes account for their similarity? *No,* said Loehlin and Nichols; identical twins whose parents treated them alike were not psychologically more alike than identical twins who were treated less similarly. In explaining individual differences, genes matter.



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Fraternal twins These siblings share a birthday, but not identical genes. Having formed from two separate eggs, they share no more genes than does any other sibling pair.

Ethel Wolvitz/The ImageWorks

ACE Stock Limited/Alamy

Peter Arnold, Inc./Alamy

More twins Curiously, twinning rates vary by race. The rate among Caucasians is roughly twice that of Asians and half that of Africans. In Africa and Asia, most twins are identical. In Western countries, most twins are fraternal, and fraternal twins are increasing with the use of fertility drugs (Hall, 2003; Steinhauer, 1999).

Separated Twins

Imagine the following science fiction experiment: A mad scientist decides to separate identical twins at birth, then rear them in differing environments. Better yet, consider a *true* story:

On a chilly February morning in 1979, some time after divorcing his first wife, Linda, Jim Lewis awoke in his modest home next to his second wife, Betty. Determined that this marriage would work, Jim had a habit of leaving love notes to Betty around the house. As he lay in bed he thought about others he had loved, including his son, James Alan, and his faithful dog, Toy.

Jim was looking forward to spending part of the day in his basement woodworking shop, where he had put in many happy hours building furniture, picture frames, and other items, including a white bench now circling a tree in his front yard. Jim also liked to spend free time driving his Chevy, watching stock-car racing, and drinking Miller Lite beer.

Jim was basically healthy, except for occasional half-day migraine headaches and blood pressure that was a little high, perhaps related to his chain-smoking habit. He had become overweight a while back but had shed some of the pounds. Having undergone a vasectomy, he was done having children.

fraternal twins twins who develop from separate fertilized eggs. They are genetically no closer than brothers and sisters, but they share a fetal environment.

What was extraordinary about Jim Lewis, however, was that at that same moment (I am not making this up) there existed another man—also named Jim—for whom all these things (right down to the dog's name) were also true.[1] This other Jim—Jim Springer—just happened, 38 years earlier, to have been his womb-mate. Thirty-seven days after their birth, these genetically identical twins were separated, adopted by blue-collar families, and reared with no contact or knowledge of each other's whereabouts until the day Jim Lewis received a call from his genetic clone (who, having been told he had a twin, set out to find him).

Bouchard's famous twin research was, appropriately enough, conducted in Minneapolis, the "Twin City" (with St. Paul), and home to the Minnesota Twins baseball team.

One month later, the brothers became the first twin pair tested by University of Minnesota psychologist Thomas Bouchard and his colleagues (1998), beginning a study of separated twins that extends to the present. Given tests measuring their personality, intelligence, heart rate, and brain waves, the Jim twins—despite 38 years of separation—were virtually as alike as the same person tested twice. Their voice intonations and inflections were so similar that, hearing a playback of an earlier interview, Jim Springer guessed "That's me." Wrong—it was his brother.

"In some domains it looks as though our identical twins reared apart are . . . just as similar as identical twins reared together. Now that's an amazing finding and I can assure you none of us would have expected that degree of similarity."
—Thomas Bouchard (1981)

Identical twins Oskar Stohr and Jack Yufe presented equally striking similarities. One was raised by his grandmother in Germany as a Catholic and a Nazi, while the other was raised by his father in the Caribbean as a Jew. Nevertheless, they shared traits and habits galore. They liked spicy foods and sweet liqueurs, fell asleep in front of the television, flushed the toilet before using it, stored rubber bands on their wrists, and dipped buttered toast in their coffee. Stohr was domineering toward women and yelled at his wife, as did Yufe before he and his wife separated. Both married women named Dorothy Jane Scheckelburger. Okay, the last item is a joke. But as Judith Rich Harris (2006) notes, it is hardly weirder than some other reported similarities.

Aided by publicity in magazine and newspaper stories, Bouchard and his colleagues (1990; DiLalla et al., 1996; Segal, 1999) located and studied 80 pairs of identical twins reared apart. They continued to find similarities not only of tastes and physical attributes but also of personality (characteristic patterns of thinking, feeling, and acting), abilities, attitudes, interests, and even fears.

Sweden has the world's largest national twin registry—140,000 living and dead twin pairs—which forms part of a massive registry of 600,000 twins currently being sampled in the world's largest twin study (Wheelwright, 2004; www.genomeutwin.org).

In Sweden, Nancy Pedersen and her co-workers (1988) identified 99 separated identical twin pairs and more than 200 separated fraternal twin pairs. Compared with equivalent samples of identical twins reared together, the separated identical twins had somewhat less identical personalities. Still, separated twins were more alike if genetically identical than if fraternal. And separation shortly after birth (rather than, say, at age 8) did not amplify their personality differences.

Twins Lorraine and Levinia Christmas, driving to deliver Christmas presents to each other near Flitcham, England, collided (Shepherd, 1997).

Stories of startling twin similarities do not impress Bouchard's critics, who remind us that "the plural of *anecdote* is not *data*." They contend that if any two strangers were to spend hours comparing their behaviors and life histories, they

[1] Actually, this description of the two Jims errs in one respect: Jim Lewis named his son James Alan. Jim Springer named his James Allan.

Identical twins are people two Identical twins Jim Lewis and Jim Springer were separated shortly after birth and raised in different homes without awareness of each other. Research has shown remarkable similarities in the life choices of separated identical twins, lending support to the idea that genes influence personality.

would probably discover many coincidental similarities. If researchers created a control group of biologically unrelated pairs of the same age, sex, and ethnicity, who had not grown up together but who were as similar to one another in economic and cultural background as are many of the separated twin pairs, wouldn't these pairs also exhibit striking similarities (Joseph, 2001)? Bouchard replies that separated fraternal twins do not exhibit similarities comparable to those of separated identical twins. Twin researcher Nancy Segal (2000) has noted that *virtual twins*—same-age, biologically unrelated siblings—are also much more dissimilar.

Even the more impressive data from personality assessments are clouded by the reunion of many of the separated twins some years before they were tested. Moreover, identical twins share an appearance, and the responses it evokes, and adoption agencies tend to place separated twins in similar homes. Despite these criticisms, the striking twin-study results helped shift scientific thinking toward a greater appreciation of genetic influences.

If genetic influences help explain individual differences, do they also help explain group differences between men and women, or between people of different races? Not necessarily. Individual differences in height and weight, for example, are highly heritable; yet nutritional rather than genetic influences explain why, as a group, today's adults are taller and heavier than those of a century ago. The two groups differ, but not because human genes have changed in a mere century's eyeblink of time. Ditto aggressiveness, a genetically influenced trait. Today's peaceful Scandinavians differ from their more aggressive Viking ancestors, despite carrying many of the same genes.

Coincidences are not unique to twins. Patricia Kern of Colorado was born March 13, 1941, and named Patricia Ann Campbell. Patricia DiBiasi of Oregon also was born March 13, 1941, and named Patricia Ann Campbell. Both had fathers named Robert, worked as bookkeepers, and at the time of this comparison had children ages 21 and 19. Both studied cosmetology, enjoyed oil painting as a hobby, and married military men, within 11 days of each other. They are not genetically related. (From an AP report, May 2, 1983.)

"We carry to our graves the essence of the zygote that was first us."

—Mary Pipher, *Seeking Peace: Chronicles of the Worst Buddhist in the World*, 2009

Biological Versus Adoptive Relatives

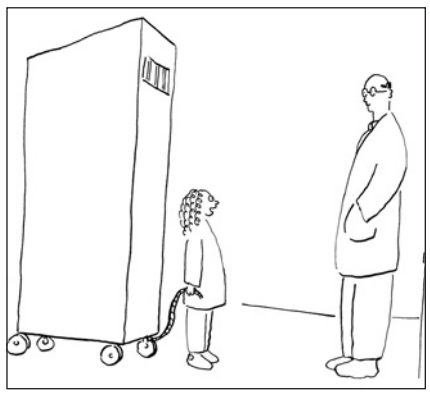
For behavior geneticists, nature's second type of real-life experiment—adoption—creates two groups: *genetic relatives* (biological parents and siblings) and *environmental relatives* (adoptive parents and siblings). For any given trait, we can therefore ask whether adopted children are more like their biological parents, who contributed their genes, or their adoptive parents, who contribute a home environment. While sharing that home environment, do adopted siblings also come to share traits?

The stunning finding from studies of hundreds of adoptive families is that people who grow up together, whether biologically related or not, do not much resemble one another in personality (McGue & Bouchard, 1998; Plomin et al., 1998; Rowe, 1990). In traits such as extraversion and agreeableness, adoptees are more similar to their biological parents than to their caregiving adoptive parents.

The finding is important enough to bear repeating: The environment shared by a family's children has virtually no discernible impact on their personalities. Two adopted children reared in the same home are no more likely to share personality traits with each other than with the child down the block. Heredity shapes other primates' personalities, too. Macaque monkeys raised by foster mothers exhibit social behaviors that resemble their biological, rather than foster, mothers (Maestripieri, 2003). Add all this to the similarity of identical twins, whether they grow up together or apart, and the effect of a shared rearing environment seems shockingly modest.

What we have here is perhaps "the most important puzzle in the history of psychology," contends Steven Pinker (2002): Why are children in the same family so different? Why does shared family environment have so little effect on children's personalities? Is it because each sibling experiences unique peer influences and life events? Because sibling relationships ricochet off each other, amplifying their differences? Because siblings—despite sharing half their genes—have very different combinations of genes and may evoke very different kinds of parenting? Such questions fuel behavior geneticists' curiosity.

The minimal shared-environment effect does not mean that adoptive parenting is a fruitless venture. The genetic leash may limit the family environment's influence on personality, but parents do influence their children's attitudes, values, manners, faith, and politics (Reifman & Cleveland, 2007). A pair of adopted children or identical twins *will*, especially during adolescence, have more similar religious beliefs if reared together (Kelley & De Graaf, 1997; Koenig et al., 2005; Rohan & Zanna, 1996). Parenting matters!



"The title of my science project is 'My Little Brother: Nature or Nurture.'"

"Mom may be holding a full house while Dad has a straight flush, yet when Junior gets a random half of each of their cards his poker hand may be a loser."

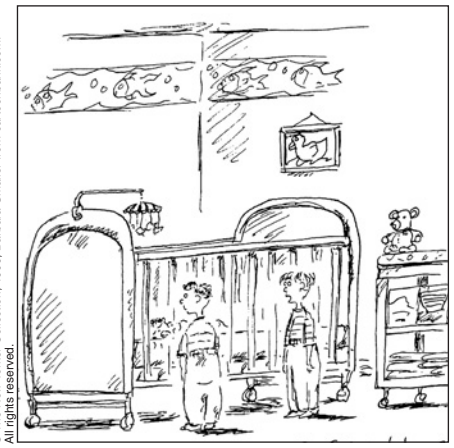
—David Lykken (2001)

The greater uniformity of adoptive homes—mostly healthy, nurturing homes—helps explain the lack of striking differences when comparing child outcomes of different adoptive homes (Stoolmiller, 1999).

Moreover, in adoptive homes, child neglect and abuse and even parental divorce are rare. (Adoptive parents are carefully screened; natural parents are not.) So it is not surprising that, despite a somewhat greater risk of psychological disorder, most adopted children thrive, especially when adopted as infants (Loehlin et al., 2007; van IJzendoorn & Juffer, 2006; Wierzbicki, 1993). Seven in eight report feeling strongly attached to one or both adoptive parents. As children of self-giving parents, they grow up to be more self-giving and altruistic than average (Sharma et al., 1998). Many score higher than their biological parents on intelligence tests, and most grow into happier and more stable adults. In one Swedish study, infant adoptees grew up with fewer problems than were experienced by children whose biological mothers had initially registered them for adoption but then decided to raise the children themselves (Bohman & Sigvardsson, 1990). Regardless of personality differences between parents and their adoptees, children benefit from adoption.

Temperament, Heredity, and Personality

8-3: What is the relationship between temperament and personality?



"Oh, he's cute, all right, but he's got the temperament of a car alarm."

As most parents will tell you after having their second child, babies differ even before gulping their first breath. Heredity predisposes one quickly apparent aspect of personality—**temperament,** or emotional excitability (Rothbart, 2007). From their first weeks of life, some infants are reactive, intense, and fidgety. Others are easygoing, quiet, and placid. *Difficult* babies are more irritable, intense, and unpredictable. *Easy* babies are cheerful, relaxed, and predictable in feeding and sleeping. *Slow-to-warm-up* infants tend to resist or withdraw from new people and situations (Chess & Thomas, 1987; Thomas & Chess, 1977).

Compared with fraternal twins, genetically identical twins have more similar temperaments. The genetic effect appears in one's physiology. Anxious, inhibited infants have high and variable heart rates and a reactive nervous system; when facing new or strange situations they become more physiologically aroused (Kagan & Snidman, 2004). Such temperament differences tend to persist. Consider:

- The most emotionally reactive newborns tend also to be the most reactive 9-month-olds (Wilson & Matheny, 1986; Worobey & Blajda, 1989).
- Exceptionally inhibited and fearful 2-year-olds often are still relatively shy as 8-year-olds; about half will become introverted adolescents (Kagan et al., 1992, 1994).
- The most emotionally intense preschoolers tend to be relatively intense young adults (Larsen & Diener, 1987). In one study of more than 900 New Zealanders, emotionally reactive and impulsive 3-year-olds developed into somewhat more impulsive, aggressive, and conflict-prone 21-year-olds (Caspi, 2000).

Such evidence adds to the emerging conclusion that our biologically rooted temperament provides building blocks for our enduring personality (McCrae et al., 2000, 2007; Rothbart et al., 2000).

Gene-Environment Interactions

8-4: How do genes and environments interact?

"Men's natures are alike; it is their habits that carry them far apart."
—Confucius, *Analects,* 500 B.C.E.

Can we then assume that our personality is merely a product of our genes? No, because genes and environment—nature and nurture—work together like two hands clapping.

Among our similarities, the most important—the behavioral hallmark of our species—is our enormous adaptive capacity. Some human traits, such as having two eyes, develop the same in virtually every environment. But other traits are expressed only in particular environments. Go barefoot for a summer and you will develop toughened, callused feet—a biological adaptation to friction. Meanwhile, your shod neighbor will remain a tenderfoot. The difference between the two of you is, of course, an effect of environment. But it is also the product of a biological mechanism—adaptation. Our shared biology enables our developed diversity (Buss, 1991).

Sean Garnsworthy/Getty Images

Nature or nurture or both? When talent runs in families, as with the Williams sisters, how do heredity and environment together do their work?

Genes are *self-regulating*. Rather than acting as blueprints that lead to the same result no matter the context, genes react. An African butterfly that is green in summer turns brown in fall, thanks to a temperature-controlled genetic switch. The genes that produce brown in one situation produce green in another. So, too, people with identical genes but differing experiences will have similar but not identical minds. One twin may fall in love with someone quite different from the co-twin's love.

Asking whether our personality is more a product of our genes or our environment is like asking whether the area of a field is more the result of its length or its width. We could, however, ask whether the differing areas of various fields are more the result of *differences* in their length or their width, and also whether person-to-person personality differences are influenced more by nature or nurture.

To say that genes and experience are *both* important is true. But more precisely, they **interact.** Imagine two babies, one genetically predisposed to be easygoing, sociable, and attractive, the other less so. Assume further that the first baby elicits more affectionate and stimulating care than the second and so develops into a warmer and more outgoing person. As the two children grow older, the more naturally outgoing child more often seeks activities and friends that encourage further social confidence.

temperament a person's characteristic emotional reactivity and intensity.

interaction the interplay that occurs when the effect of one factor (such as environment) depends on another factor (such as heredity).

What has caused their resulting personality differences? Neither heredity nor experience dances alone. Environments trigger gene activity. (Scientists are now exploring environmental influences on when particular genes generate proteins.) Our genetically influenced traits—the other partner in the dance—also *evoke* significant responses in others. Thus, a child's impulsivity and aggression may evoke an angry response from a teacher who otherwise reacts warmly to the child's model classmates. Parents, too, may treat their own children differently; one child elicits punishment, another does not. In such cases, the child's nature and the parents' nurture interact. Neither operates apart from the other. Gene and scene dance together.

"Heredity deals the cards; environment plays the hand."

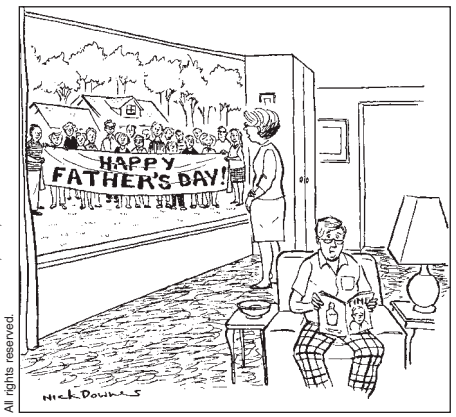
—Psychologist Charles L. Brewer (1990)

Evocative interactions may help explain why identical twins reared in different families recall their parents' warmth as remarkably similar—almost as similar as if they had had the same parents (Plomin et al., 1988, 1991, 1994). Fraternal twins

Jeffrey Mayer/WireImage/Getty Images

AP Photo/Dan Steinberg

Gene-environment interaction People respond differently to Will Ferrell (shown at left) than to fellow actor Zac Efron (right).



"I thought that sperm-bank donors remained anonymous."

have more differing recollections of their early family life—even if reared in the same family! "Children experience us as different parents, depending on their own qualities," noted Sandra Scarr (1990). Moreover, a *selection effect* may be at work. As we grow older we select environments well suited to our natures.

So, from conception onward, we are the product of a cascade of interactions between our genetic predispositions and our surrounding environments. Depending on our traits, we actively select certain environments. And we evoke reactions from our environments. Thus, our genes affect how people react to and influence us. Biological traits have social consequences. So, forget nature *versus* nurture; think nature *via* nurture.

"Genes, by themselves, are like seeds dropped onto pavement: powerless to produce anything."

—Primatologist Frans B. M. de Waal (1999)

Evolutionary Psychology: Understanding Human Nature

8-5: How do evolutionary psychologists use natural selection to explain behavior tendencies?

Behavior geneticists explore the genetic and environmental roots of human differences. **Evolutionary psychologists** instead focus mostly on what makes us so much alike as humans. They use Charles Darwin's principle of **natural selection** to understand the roots of behavior and mental processes. Richard Dawkins (2007) calls natural selection "arguably the most momentous idea ever to occur to a human mind." The idea, simplified, is this:

- Organisms' varied offspring compete for survival.
- Certain biological and behavioral variations increase their reproductive and survival chances in their environment.
- Offspring that survive are more likely to pass their genes to ensuing generations.
- Thus, over time, population characteristics may change.

To see these principles at work, let's consider a straightforward example in foxes.

Natural Selection and Adaptation

A fox is a wild and wary animal. If you capture a fox and try to befriend it, be careful. Stick your hand in the cage and, if the timid fox cannot flee, it may make a snack of your fingers. Dmitry Belyaev, of the Russian Academy of Science's Institute of Cytology and Genetics, wondered how our human ancestors had domesticated dogs from their equally wild wolf forebears. Might he, within a comparatively short stretch of time, accomplish a similar feat by transforming the fearful fox into a friendly fox?

To find out, Belyaev set to work with 30 male and 100 female foxes. From their offspring he selected and mated the tamest 5 percent of males and 20 percent of females. (He measured tameness by the foxes' responses to attempts to feed, handle, and stroke them.) Over more than 30 generations of foxes, Belyaev and his successor, Lyudmila Trut, repeated that simple procedure. Forty years and 45,000 foxes later, they had a new breed of foxes that, in Trut's (1999) words, are "docile, eager to please, and unmistakably domesticated. . . . Before our eyes, 'the Beast' has turned into 'beauty,' as the aggressive behavior of our herd's wild [ancestors] entirely disappeared." So friendly

evolutionary psychology the study of the roots of behavior and mental processes, using the principles of natural selection.

natural selection the principle that, among the range of inherited trait variations, those that lead to increased reproduction and survival will most likely be passed on to succeeding generations.

mutation a random error in gene replication that leads to a change.

and eager for human contact are they, so inclined to whimper to attract attention and to lick people like affectionate dogs, that the cash-strapped institute seized on a way to raise funds—marketing its foxes to people as house pets.

When certain traits are *selected*—by conferring a reproductive advantage to an individual or a species—those traits, over time, will prevail. Dog breeders, as Robert Plomin and his colleagues (1997) remind us, have given us sheepdogs that herd, retrievers that retrieve, trackers that track, and pointers that point. Psychologists, too, have bred dogs, mice, and rats whose genes predispose them to be serene or reactive, quick learners or slow.

Does natural selection also explain our human tendencies? Nature has indeed selected advantageous variations from among the new gene combinations produced at each human conception and the **mutations** (random errors in gene replication) that sometimes result. But the tight genetic leash that predisposes a dog's retrieving, a cat's pouncing, or an ant's nest building is looser on humans. The genes selected during our ancestral history provide more than a long leash; they endow us with a great capacity to learn and therefore to *adapt* to life in varied environments, from the tundra to the jungle. Genes and experience together wire the brain. Our adaptive flexibility in responding to different environments contributes to our *fitness*—our ability to survive and reproduce.

L. N. Trut, *American Scientist* (1999) 87: 160–169

From wary to winsome More than 40 years into the fox-breeding experiment, most of the offspring are devoted, affectionate, and capable of forming strong bonds with people.

Evolutionary Success Helps Explain Similarities

Although human differences grab our attention, our deep similarities also demand explanation. And in the big picture, our lives are remarkably alike. Visit the international arrivals area at Amsterdam's Schipol Airport, a world hub where arriving passengers meet their excited loved ones. There you will see the same delighted joy in the faces of Indonesian grandmothers, Chinese children, and homecoming Dutch. Evolutionary psychologist Steven Pinker (2002, p. 73) believes it is no wonder that our emotions, drives, and reasoning "have a common logic across cultures." Our shared human traits "were shaped by natural selection acting over the course of human evolution."

Our Genetic Legacy

Our behavioral and biological similarities arise from our shared human *genome*, our common genetic profile. No more than 5 percent of the genetic differences among humans arise from population group differences. Some 95 percent of genetic variation exists *within* populations (Rosenberg et al., 2002). The typical genetic difference between two Icelandic villagers or between two Kenyans is much greater than the *average* difference between the two groups. Thus, noted geneticist Richard Lewontin (1982), if after a worldwide catastrophe only Icelanders or Kenyans survived, the human species would suffer only "a trivial reduction" in its genetic diversity.

Despite high infant mortality and rampant disease in past millennia, not one of your countless ancestors died childless.

And how did we develop this shared human genome? At the dawn of human history, our ancestors faced certain questions: Who is my ally, who my foe? What food should I eat? With whom should I mate? Some individuals answered those questions more successfully than others. For example, women who experienced nausea in the critical first three months of pregnancy were predisposed to avoid certain bitter, strongly flavored, and novel foods. Avoiding such foods has survival value, since they are the very foods most often toxic to embryonic development (Schmitt & Pilcher, 2004). Early humans disposed to eat nourishing rather than poisonous foods survived to contribute their genes to later generations. Those who deemed leopards "nice to pet" often did not.

Similarly successful were those whose mating helped them produce and nurture offspring. Over generations, the genes of individuals not so disposed tended to be lost from the human gene pool. As genes contributing to success continued to be selected, behavioral tendencies and thinking and learning capacities emerged that prepared our Stone Age ancestors to survive, reproduce, and send their genes into the future.

As inheritors of this prehistoric genetic legacy, we are predisposed to behave in ways that promoted our ancestors' surviving and reproducing. We love the taste of sweets and fats, which once were hard to come by but which prepared our ancestors to survive famines. With famine now rare in Western cultures, and sweets and fats beckoning us from store shelves, fast-food outlets, and vending machines, obesity has become a growing problem. Our natural dispositions, rooted deep in history, are mismatched with today's junk-food environment (Colarelli & Dettman, 2003). We are, in some ways, biologically prepared for a world that no longer exists.

Evolutionary Psychology Today

Those who are troubled by an apparent conflict between scientific and religious accounts of human origins may find it helpful to recall that different perspectives of life can be complementary. For example, the scientific account attempts to tell us when *and* how*; religious creation stories usually aim to tell about an ultimate* who *and* why. *As Galileo explained to the Grand Duchess Christina, "The Bible teaches how to go to heaven, not how the heavens go."*

Darwin's theory of evolution has been an organizing principle for biology for a long time. As Jared Diamond (2001) noted, "Virtually no contemporary scientists believe that Darwin was basically wrong." Today, Darwin's theory lives on in the *second Darwinian revolution*: the application of evolutionary principles to psychology. In concluding *On the Origin of Species*, Darwin (1859, p. 346) anticipated this revolution, foreseeing "open fields for far more important researches. Psychology will be based on a new foundation."

Evolutionary psychologists have addressed questions such as these:

- Why do infants start to fear strangers about the time they become mobile?
- Why are biological fathers so much less likely than unrelated boyfriends to abuse and murder the children with whom they share a home?
- Why do so many more people have phobias about spiders, snakes, and heights than about more dangerous threats, such as guns and electricity?
- Why do humans share some universal moral ideas?
- How are men and women alike? How and why do men's and women's sexuality differ?

To see how evolutionary psychologists think and reason, let's pause now to explore that last question.

An Evolutionary Explanation of Human Sexuality

8-6: How might an evolutionary psychologist explain gender differences in mating preferences?

Having faced many similar challenges throughout history, men and women have adapted in similar ways. Whether male or female, we eat the same foods, avoid the same predators, and perceive, learn, and remember similarly. It is only in those domains where we have faced differing adaptive challenges—most obviously in behaviors related to reproduction—that we differ, say evolutionary psychologists.

Gender Differences in Sexuality

"Not tonight, hon, I have a concussion."

And differ we do. Psychologists Roy Baumeister, Kathleen Catanese, and Kathleen Vohs (2001) invite us to consider who desires more frequent sex, thinks more about sex, masturbates more often, initiates more sex, and sacrifices more to gain sex? The answers, they report, are *men, men, men, men,* and *men.* No surprise, then, that in one BBC survey of more than 200,000 people in 53 nations, men everywhere more strongly agreed that "I have a strong sex drive" and "It doesn't take much to get me sexually excited" (Lippa, 2008).

Indeed, "with few exceptions anywhere in the world," reported cross-cultural psychologist Marshall Segall and his colleagues (1990, p. 244), "males are more likely than females to initiate sexual activity." This is among the largest of **gender** differences in sexuality (Regan & Atkins, 2007). Consider:

- In a survey of 289,452 entering U.S. college students, 58 percent of men but only 34 percent of women agreed that "if two people really like each other, it's all right for them to have sex even if they've known each other for

a very short time" (Pryor et al., 2005). "I can imagine myself being comfortable and enjoying 'casual' sex with different partners," agreed 48 percent of men and 12 percent of women in a survey of 4901 Australians (Bailey et al., 2000).

- In another survey of 3432 U.S. 18- to 59-year-olds, 48 percent of the women but only 25 percent of the men cited affection as a reason for first intercourse. And how often do they think about sex? "Every day" or "Several times a day," acknowledged 19 percent of the women and 54 percent of the men (Laumann et al., 1994). Ditto for the sexual thoughts of Canadians: "Several times a day," agreed 11 percent of women and 46 percent of men (Fischtein et al., 2007).
- In surveys, gay men (like straight men) report more interest in uncommitted sex, more responsiveness to visual sexual stimuli, and more concern with their partner's physical attractiveness than do lesbian women (Bailey et al., 1994; Doyle, 2005; Schmitt, 2007).

gender in psychology, the biologically and socially influenced characteristics by which people define *male* and *female*.

"It's not that gay men are oversexed; they are simply men whose male desires bounce off other male desires rather than off female desires."

—Steven Pinker, *How the Mind Works*, 1997

Natural Selection and Mating Preferences

Evolutionary psychologists use natural selection to explain why—worldwide—women's approach to sex is usually more relational, and men's more recreational (Schmitt, 2005, 2007). Their explanation goes like this: While a woman usually incubates and nurses one infant at a time, a man can spread his genes through other females. Our natural yearnings are our genes' way of reproducing themselves. In our ancestral history, women most often sent their genes into the future by pairing wisely, men by pairing widely. "Humans are living fossils—collections of mechanisms produced by prior selection pressures," said evolutionary psychologist David Buss (1995).

And what do heterosexual men and women find attractive in a mate? Some desired traits, such as a woman's youthful appearance (**FIGURE 8.3**), cross place and time (Buss, 1994). Evolutionary psychologists say that men who were drawn to healthy, fertile-appearing women—women with smooth skin and a youthful shape suggesting many childbearing years to come—stood a better chance of sending their genes into the future. Moreover, men are most attracted to women who, in the ancestral past (when ovulation began later than today), were at ages associated with peak fertility (Kenrick et al., in press). Thus, teen boys are most excited by a woman several years older than themselves. Mid-twenties men prefer women around their own age. And older men prefer younger women. This pattern consistently appears across European singles ads, Indian marital ads, and marriage records from North and South America, Africa, and the Philippines (Singh, 1993; Singh & Randall, 2007).

"What about you, Walter—how do you feel about same-age marriage?"

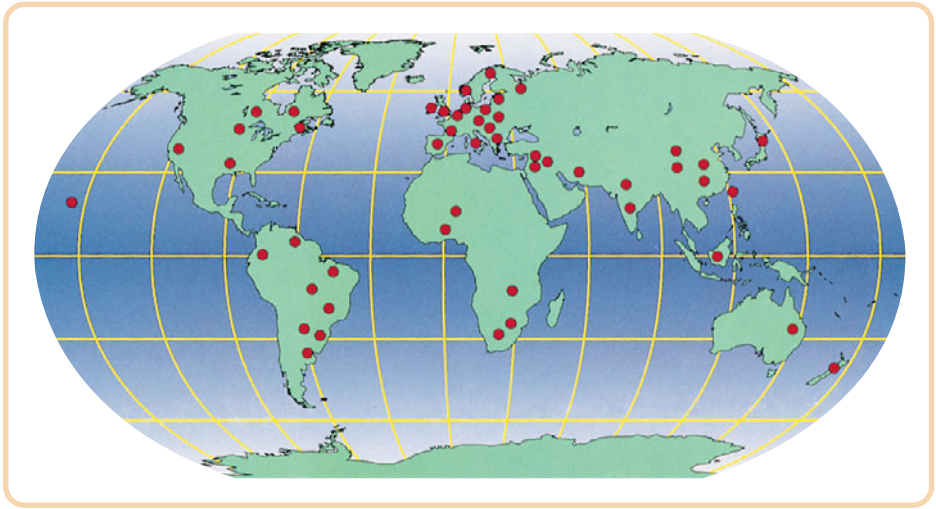
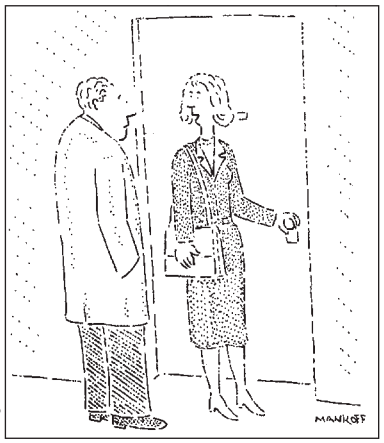


FIGURE 8.3 Worldwide mating preferences In a wide range of cultures studied (indicated by the red dots), men more than women preferred physical features suggesting youth and health—and reproductive potential. Women more than men preferred mates with resources and social status. Researchers credit (or blame) natural selection (Buss, 1994).



"I had a nice time, Steve. Would you like to come in, settle down, and raise a family?"

Women, in turn, prefer stick-around dads over likely cads. They are attracted to men who seem mature, dominant, bold, and affluent, with a potential for long-term mating and investment in their joint offspring (Gangestad & Simpson, 2000; Singh, 1995). From an evolutionary perspective, such attributes connote a capacity to support and protect (Buss, 1996, 2000; Geary, 1998).

There is a principle at work here, say evolutionary psychologists: Nature selects behaviors that increase the likelihood of sending one's genes into the future. As mobile gene machines, we are designed to prefer whatever worked for our ancestors in their environments. They were predisposed to act in ways that would leave grandchildren—had they not been, we wouldn't be here. And as carriers of their genetic legacy, we are similarly predisposed.

Without disputing nature's selection of traits that enhance gene survival, critics see problems with this explanation of human sexuality. They believe that the evolutionary perspective overlooks some important influences on human sexuality (see Thinking Critically About: The Evolutionary Perspective on Human Sexuality).

Thinking Critically About:

The Evolutionary Perspective on Human Sexuality

8-7: What are the key criticisms of the evolutionary perspective on human sexuality?

Evolutionary psychology, say some critics, starts with an effect (such as the gender sexuality difference) and works backward to propose an explanation. They invite us to imagine a different result and reason backward. If men were uniformly loyal to their mates, might we not reason that the children of these committed, supportive fathers would more often survive to perpetuate their genes? Might not men also be better off bonded to one woman—both to increase their odds of impregnation and to keep her from the advances of competing men? Might not a ritualized bond—a marriage—also spare women from chronic male harassment? Such suggestions are, in fact, evolutionary explanations for why humans tend to pair off monogamously. One can hardly lose at hindsight explanation, which is, said paleontologist Stephen Jay Gould (1997), mere "speculation [and] guesswork in the cocktail party mode."

Some also worry about the social consequences of evolutionary psychology. Does it suggest a genetic determinism that strikes at the heart of progressive efforts to remake society (Rose, 1999)? Does it undercut moral responsibility? Could it be used to rationalize "high-status men marrying a series of young, fertile women" (Looy, 2001)?

Others argue that evolutionary explanations blur the line between genetic legacy and social-cultural traditions relating to mate preferences. Show Wendy Wood and Alice Eagly (2002, 2007) a culture with gender inequality—where men are providers and women are homemakers—and they will show you a culture where men strongly desire youth and domestic skill in their potential mates, and where women seek status and earning potential in their mates. Show Wood and Eagly a culture with gender equality, and they will show you a culture with smaller gender differences in mate preferences.

Much of who we are is not hard-wired, agree evolutionary psychologists. They reassure us that men and women, having faced similar adaptive problems, are far more alike than different, and that humans have a great capacity for learning and social progress. (We come equipped to adapt and survive, whether living in igloos or tree houses.) Further, they agree that what's considered attractive does vary somewhat with time and place. The voluptuous Marilyn Monroe ideal of the 1950s has been replaced by a leaner (yet still curvy) athletic image in the twenty-first–century. Cultural expectations can bend the genders. If socialized to value lifelong commitment, men may sexually bond with one partner; if socialized to accept casual sex, women may willingly have sex with many partners.

Even granting all that, the evolutionary psychologists point to the coherence and explanatory power of evolutionary principles, especially those offering testable predictions (for example, that we will favor others to the extent that they share our genes or can later reciprocate our favors). Moreover, they remind us that the study of how we came to be need not dictate how we ought to be. Understanding our propensities sometimes helps us overcome them.

Behavior Genetics and Evolutionary Psychology

Module Review

8-1: Our genes predispose our biology. Does this mean they determine our behavior? Our heredity and our experiences interact to create our individual and social differences. *Behavior geneticists* seek to quantify genetic and *environmental* influences on our traits. *Chromosomes* are coils of *DNA* containing *gene* segments that, when "turned on" (expressed), code for the proteins that form our body's building blocks. Most human traits are influenced by many genes acting together.

8-2: How do twin and adoption studies help us understand the relative influences of environment and heredity? Studies of *identical twins, fraternal twins,* and adoptive families help clarify the influence of genetic nature and of environmental nurture.

8-3: What is the relationship between temperament and personality? *Temperament,* or emotional reactivity, is one aspect of personality (characteristic patterns of thinking, feeling, and acting).

8-4: How do genes and environments interact? The stability of temperament suggests a genetic predisposition. To say that genes and environments *interact* means that our genes influence our abilities and the ways others react to us, but our environments also trigger gene activity.

8-5: How do evolutionary psychologists use natural selection to explain behavior tendencies? *Evolutionary psychologists* seek to understand how *natural selection* has shaped our traits and behavior tendencies. The principle of *natural selection* states that variations increasing the odds of reproducing and surviving are most likely to be passed on to future generations. Some variations arise from new gene combinations at conception, others from *mutations* (random errors in gene replication). Charles Darwin, whose theory of evolution has for a long time been an organizing principle in biology, anticipated the contemporary application of evolutionary principles in psychology.

8-6: How might an evolutionary psychologist explain gender differences in mating preferences? Applying principles of natural selection, evolutionary psychologists reason that men's attraction to multiple healthy, fertile-appearing partners increases their chances of spreading their genes widely. Women usually incubate and nurse one baby at a time. They can increase their own and their children's chances of survival by searching for mates with a long-term capacity to support and protect their joint offspring.

8-7: What are the key criticisms of the evolutionary perspective on human sexuality? Critics argue that the evolutionary perspective on human sexuality (1) starts with an effect and works backward to an explanation, (2) underemphasizes social influences, and (3) could absolve people from taking responsibility for their sexual behavior. Evolutionary psychologists cite the value of testable predictions based on evolutionary principles, as well as the coherence and explanatory power of those principles. They also remind us that understanding our predispositions can help us overcome them.

Rehearse It!

1. The threadlike structures made largely of DNA molecules are called
   a. gene complexes.
   b. nuclei.
   c. chromosomes.
   d. cells.

2. When the mother's egg and the father's sperm unite, each contributes
   a. one chromosome pair.
   b. 23 chromosomes.
   c. 23 chromosome pairs.
   d. 30,000 chromosomes.

3. Fraternal twins result when
   a. a single egg is fertilized by a single sperm and then splits.
   b. a single egg is fertilized by two sperm and then splits.
   c. two eggs are fertilized by two sperm.
   d. two eggs are fertilized by a single sperm.

4. Adoption studies seek to understand genetic influences on personality. They do this mainly by
   a. comparing adopted children with nonadopted children.
   b. evaluating whether adopted children's personalities more closely resemble those of their adoptive parents or their biological parents.
   c. studying the effect of prior neglect on adopted children.
   d. studying the effect of children's age at adoption.

5. Personality tends to be stable over time. For example,
   a. temperament is a product of learning and can therefore be unlearned.
   b. temperament seems to be biologically based and tends to remain stable throughout life.
   c. temperament changes significantly during adolescence.
   d. fraternal twins tend to have more similar temperaments than do identical twins.

6. Evolutionary psychologists are most likely to focus on
   a. how we differ from one another.
   b. the links between social expectations and behavior.
   c. natural selection of the fittest adaptations.
   d. random assignment of genes over several generations.

Answers: 1. c, 2. b, 3. c, 4. b, 5. b, 6. c.

Terms and Concepts to Remember

behavior genetics, p. 109
environment, p. 109
chromosomes, p. 109
DNA (deoxyribonucleic acid), p. 109
genes, p. 109
identical twins, p. 110
fraternal twins, p. 111
temperament, p. 114
interaction, p. 115
evolutionary psychology, p. 116
natural selection, p. 116
mutation, p. 117
gender, p. 118

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. If heredity is a primary influence on personality, how can we explain why some siblings, who have different combinations of their parents' genes, have very similar personalities?
2. It's been said that our female ancestors most often sent their genes into the future by pairing wisely, and our male ancestors by pairing widely. How does the evolutionary psychology perspective explain why these adaptive patterns are still seen in the behaviors and priorities of contemporary men and women who have more choices about when and whether they will have children?
3. Primatologist Frans B. M. de Waal (1999) observed that "genes, by themselves, are like seeds dropped onto pavement: powerless to produce anything." Explain what this means, in terms of our human characteristics.

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 9

Environmental Influences on Behavior

Parents and Peers

9-1: To what extent are our lives shaped by early stimulation, by parents, and by peers?

Our genes, expressed in specific environments, influence our developmental differences. We are not "blank slates," note Douglas Kenrick and his colleagues (in press). We are more like coloring books, with certain lines predisposed and experience filling in our picture. We are formed by nature and nurture. But what are the most influential components of our nurture? How do our early experiences, our family and peer relationships, and all our other experiences guide our development and contribute to our diversity?

Parents and Early Experiences

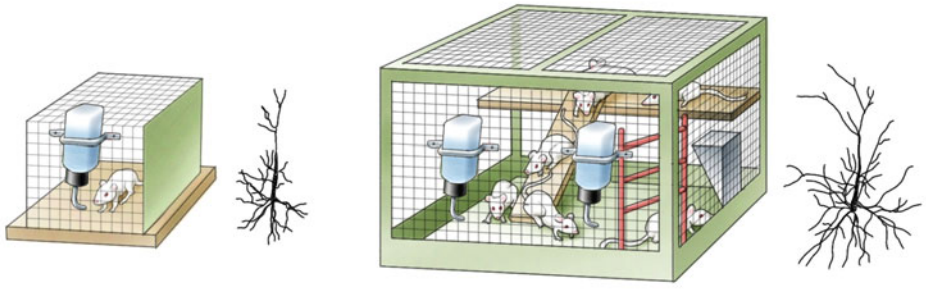
The formative nurture that conspires with nature begins at conception, with the prenatal environment in the womb, as embryos receive differing nutrition and varying levels of exposure to toxic agents. Nurture then continues outside the womb, where our early experiences foster brain development.

Experience and Brain Development

Our genes dictate our overall brain architecture, but experience fills in the details, developing neural connections and preparing our brain for thought and language and other later experiences. So how do early experiences leave their "marks" in the brain? Mark Rosenzweig and David Krech opened a window on that process when they raised some young rats in solitary confinement and others in a communal playground. When they later analyzed the rats' brains, those who died with the most toys had won. The rats living in the enriched environment, which simulated a natural environment, usually developed a heavier and thicker brain cortex (**FIGURE 9.1**).

Rosenzweig was so surprised by this discovery that he repeated the experiment several times before publishing his findings (Renner & Rosenzweig, 1987; Rosenzweig, 1984). So great are the effects that, shown brief video clips of rats, you could tell from their activity and curiosity whether their environment had been impoverished or enriched (Renner & Renner, 1993). Bryan Kolb and Ian Whishaw (1998) noted extraordinary changes after 60 days in the enriched environment; the rats' brain weights increased 7 to 10 percent and the number of synapses mushroomed by about 20 percent.

Such results have motivated improvements in environments for laboratory, farm, and zoo animals—and for children in institutions. Stimulation by touch or massage also benefits infant rats and premature babies (Field et al., 2007). "Handled" infants of both species develop faster neurologically and gain weight more rapidly.



(From "Brain changes in response to experience" by M. R. Rosenzweig, E. L. Bennett, and M. C. Diamond. Copyright © 1972 Scientific American, Inc. All rights reserved.)

FIGURE 9.1 Experience affects brain development Mark Rosenzweig and David Krech raised rats either alone in an environment without playthings, or with other rats in an environment enriched with playthings changed daily. In 14 of 16 repetitions of this basic experiment, rats in the enriched environment developed significantly more cerebral cortex (relative to the rest of the brain's tissue) than did those in the impoverished environment.

Courtesy of C. Brune

Stringing the circuits young String musicians who started playing before age 12 have larger and more complex neural circuits controlling the note-making left-hand fingers than do string musicians whose training started later (Elbert et al., 1995).

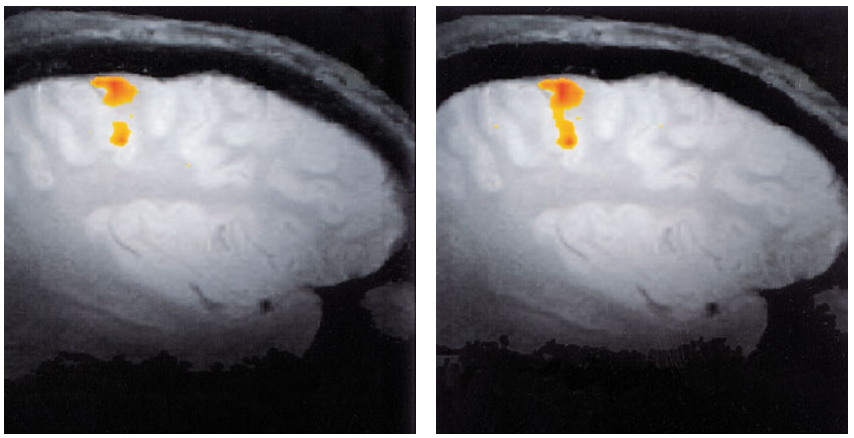


FIGURE 9.2 A trained brain A well-learned finger-tapping task activates more motor cortex neurons (orange area, right) than were active in the same brain before training (left). (From Karni et al., 1998.)

By giving preemies massage therapy, neonatal intensive care units now help them to go home sooner (Field et al., 2006).

Both nature and nurture sculpt our synapses. After brain maturation provides us with an abundance of neural connections, our experiences trigger a *pruning process.* Sights and smells, touches and tugs activate connections and strengthen them. Unused neural pathways weaken and degenerate. Similar to pathways through a forest, popular paths are broadened and less-traveled paths gradually disappear. The result by puberty is a massive loss of unemployed connections.

Here at the juncture of nurture and nature is the biological reality of early childhood learning. During early childhood—while excess connections are still on call—youngsters can most easily master such skills as the grammar and accent of another language. Lacking any exposure to language before adolescence, a person will never master any language.

Likewise, lacking visual experience during the early years, people whose vision is later restored by cataract removal never achieve normal perceptions. The brain cells normally assigned to vision have died or been diverted to other uses. The brain's rule: Use it or lose it.

Although normal stimulation during the early years is critical, our brain's development does not end with childhood. Neural tissue is ever changing. If a monkey is trained to push a lever with a finger several thousand times a day, the brain tissue controlling that finger will change to reflect the experience. Human brains work similarly (**FIGURE 9.2**). Whether learning to keyboard or skateboard, we perform with increasing skill as our brain incorporates the learning.

"Genes and experiences are just two ways of doing the same thing—wiring synapses."

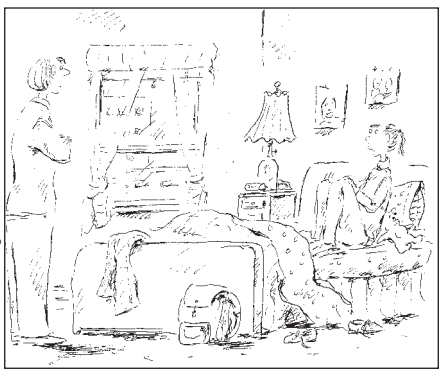
—Joseph LeDoux, *The Synaptic Self,* 2002

How Much Credit (or Blame) Do Parents Deserve?

In procreation, a woman and a man shuffle their gene decks and deal a life-forming hand to their child-to-be, who is then subjected to countless influences beyond their control. Parents, nonetheless, feel enormous satisfaction in their children's successes, and feel guilt or shame over their failures. They beam over the child who wins an award. They wonder where they went wrong with the child who is repeatedly called into the principal's office. Freudian psychiatry and psychology have been among the sources of such ideas, by blaming problems from asthma to schizophrenia on "bad mothering." Society reinforces such parent blaming: Believing that parents shape their offspring as a potter molds clay, people readily praise parents for their children's virtues and blame them for their children's vices. Popular culture endlessly proclaims the psychological harm toxic parenting inflicts on fragile children. No wonder having and raising children can seem so risky.

Even among chimpanzees, when one infant is hurt by another, the victim's mother will often attack the offender's mother (Goodall, 1968).

But do parents really produce future adults with an inner wounded child by being (take your pick from the toxic-parenting lists) overbearing—or uninvolved? Pushy—or ineffectual? Overprotective—or distant? Are children really so easily wounded? If so, should we then blame our parents for our failings, and ourselves for our children's failings? Or does all the talk of wounding fragile children through normal parental mistakes trivialize the brutality of real abuse?



"So I blame you for everything—whose fault is that?"

Parents do matter. The power of parenting to shape our differences is clearest at the extremes—the abused who become abusive, the neglected who become neglectful, the loved but firmly handled children who become self-confident and socially competent. The power of the family environment frequently shows up in children's political attitudes, religious beliefs, and personal manners as well. It appears in the remarkable academic and vocational successes of children of the refugee "boat people" who fled Vietnam and Cambodia—successes attributed to close-knit, supportive, even demanding families (Caplan et al., 1992).

Yet in personality measures, shared environmental influences—including the home influences siblings share—typically account for less than 10 percent of children's differences. In the words of behavior geneticists Robert Plomin and Denise Daniels (1987), "Two children in the same family [are on average] as different from one another as are pairs of children selected randomly from the population." To developmental psychologist Sandra Scarr (1993), this implied that "parents should be given less credit for kids who turn out great and blamed less for kids who don't." Knowing children are not easily sculpted by parental nurture, perhaps parents can relax a bit more and love their children for who they are.

"If you want to blame your parents for your own adult problems, you are entitled to blame the genes they gave you, but you are not entitled—by any facts I know—to blame the way they treated you. . . . We are not prisoners of our past."

—Martin Seligman, *What You Can Change and What You Can't*, 1994

Peer Influence

As children mature, what other experiences do the work of nurturing? At all ages, but especially during childhood and adolescence, we seek to fit in with groups and are subject to group influences. Consider the power of peers (Harris, 1998, 2000):

- Preschoolers who disdain a certain food often will eat that food if put at a table with a group of children who like it.
- Children who hear English spoken with one accent at home and another in the neighborhood and at school will invariably adopt the accent of their peers, not that of their parents. Accents (and slang) reflect culture, "and children get their culture from their peers," notes Judith Rich Harris (2007).
- Teens who start smoking typically have friends who model smoking, suggest its pleasures, and offer cigarettes (Rose et al., 1999, 2003). Part of this peer similarity may result from a selection effect, as kids seek out peers with similar attitudes and interests. Those who smoke (or don't) may select as friends those who also smoke (or don't).

"Men resemble the times more than they resemble their fathers."

—Ancient Arab proverb

Howard Gardner (1998) has concluded that parents and peers are complementary:

> Parents are more important when it comes to education, discipline, responsibility, orderliness, charitableness, and ways of interacting with authority figures. Peers are more important for learning cooperation, for finding the road to popularity, for inventing styles of interaction among people of the same age. Youngsters may find their peers more interesting, but they will look to their parents when contemplating their own futures. Moreover, parents [often] choose the neighborhoods and schools that supply the peers.

As Gardner points out, parents can influence the culture that shapes the peer group, by helping to select their children's neighborhood and schools. And because neighborhood influences matter, parents may want to become involved in youth intervention programs aiming at a whole school or neighborhood. If the vapors of a toxic climate are seeping into a child's life, that climate—not just the child—needs reforming. Even so, peers are but one medium of cultural influence.

"It takes a village to raise a child."

—African proverb

Ole Graf/zefa/Corbis

Peer power As we develop, we play, mate, and partner with peers. No wonder children and youths are so sensitive and responsive to peer influences.

Cultural Influences

9-2: How do cultural norms affect our behavior?

Compared with the narrow path taken by flies, fish, and foxes, the road along which environment drives us is wider. The mark of our species—nature's great gift to us—is our ability to learn and adapt. We come equipped with a huge cerebral hard drive ready to receive many gigabytes of cultural software.

Culture is the behaviors, ideas, attitudes, values, and traditions shared by a group of people and transmitted from one generation to the next (Brislin, 1988). Human nature, notes Roy Baumeister (2005), seems designed for culture. We are social animals, but more. Wolves are social animals; they live and hunt in packs. Ants are incessantly social, never alone. But "culture is a better way of being social," notes Baumeister. Wolves function pretty much as they did 10,000 years ago. You and I enjoy things unknown to most of our century-ago ancestors, including electricity, indoor plumbing, antibiotics, and the Internet. Culture works.

Other primates exhibit the rudiments of culture, with local customs of tool use, grooming, and courtship. Younger chimpanzees and macaque monkeys sometimes invent local customs (potato washing, in one famous example) and pass them on to their peers and offspring. But human culture does more. It supports our species' survival and reproduction by enabling social, educational, and economic systems that give us an edge. Having learned economic lessons from the 1930s Great Depression, governments worked to avoid another in 2009.

Thanks to our mastery of language, we humans enjoy the *preservation of innovation.* Within the span of this day, I have, thanks to my culture, made good use of Post-it Notes, Google, and a single-shot skinny latte. On a grander scale, we have culture's accumulated knowledge to thank for the last century's 30-year extension of the average life expectancy in most countries where this book is being read. Moreover, culture enables an efficient *division of labor.* Although one lucky person gets his name on this book's cover, the product actually results from the coordination and commitment of a team of women and men, no one of whom could produce it alone.

Across cultures, we differ in our language, our monetary systems, our sports, which fork—if any—we eat with, even which side of the road we drive on. But beneath these differences is our great similarity—our capacity for culture. Culture provides the shared and transmitted customs and beliefs that enable us to communicate, to exchange money for things, to play, to eat, and to drive with agreed-upon rules and without crashing into one another. This shared capacity for culture enables our striking group differences. Human nature manifests human diversity.

If we all lived in homogeneous ethnic groups in separate regions of the world, as some people still do, cultural diversity would be less relevant. In Japan, almost 99 percent of the country's 127 million people are of Japanese descent. Internal cultural differences are therefore minimal compared with those found in Los Angeles, where the public schools recently taught 82 different languages, or in Toronto or Vancouver, where minorities are one-third of the population and many are immigrants (as are 13.4 percent of all Canadians and 23 percent of Australians) (Axiss, 2007; Statistics Canada, 2002). I am ever mindful that the readers of this book are culturally diverse. You and your ancestors reach from Australia to Africa and from Singapore to Sweden.

Variation Across Cultures

We see our adaptability in cultural variations among our beliefs and our values, in how we raise our children and bury our dead, and in what we wear (or whether we wear anything at all). Riding along with a unified culture is like biking with the wind: As it carries us along, we hardly notice it's there. When we try riding *against* the wind we feel its force. Face to face with a different culture, we become aware of the cultural winds. Visiting Europe, most North Americans notice the smaller cars,

culture the enduring behaviors, ideas, attitudes, values, and traditions shared by a group of people and transmitted from one generation to the next.

the left-handed use of the fork, the uninhibited attire on the beaches. Stationed in Iraq, Afghanistan, and Kuwait, American and European soldiers alike realized how liberal their home cultures were. Arriving in North America, visitors from Japan and India struggle to understand why so many people wear their dirty *street* shoes in the house.

Each cultural group evolves its own **norms**—rules for accepted and expected behavior. Many South Asians have a norm for eating only with the right hand's fingers. The British have a norm for orderly waiting in line. Sometimes social expectations seem oppressive: "Why should it matter how I dress?" Yet, norms grease the social machinery and free us from self-preoccupation. Knowing when to clap or bow, which fork to pick up first at a dinner party, and what sorts of gestures and compliments are appropriate—whether to greet people by shaking hands or kissing each cheek, for example—we can relax and enjoy one another without fear of embarrassment or insult.

When cultures collide, their differing norms often befuddle. For example, if someone invades our **personal space**—the portable buffer zone we like to maintain around our bodies—we feel uncomfortable. Scandinavians, North Americans, and the British have traditionally preferred more personal space than do Latin Americans, Arabs, and the French (Sommer, 1969). At a social gathering, a Mexican seeking a comfortable conversation distance may end up walking around a room with a backpedaling Canadian. (You can experience this at a party by playing Space Invader as you talk with someone.) To the Canadian, the Mexican may seem intrusive; to the Mexican, the Canadian may seem standoffish.

Cultures also vary in their expressiveness. Those with roots in northern European culture have perceived people from Mediterranean cultures as warm and charming but inefficient. The Mediterraneans, in turn, have seen northern Europeans as efficient but cold and preoccupied with punctuality (Triandis, 1981).

Cultures vary in their pace of life, too. People from time-conscious Japan—where bank clocks keep exact time, pedestrians walk briskly, and postal clerks fill requests speedily—may find themselves growing impatient when visiting Indonesia, where clocks keep less accurate time and the pace of life is more leisurely (Levine & Norenzayan, 1999). In adjusting to their host countries, the first wave of U.S. Peace Corps volunteers reported that two of their greatest culture shocks, after the language differences, were the differing pace of life and the people's differing sense of punctuality (Spradley & Phillips, 1972).

Annie Griffiths Belt/Corbis

Cultures differ Behavior seen as appropriate in one culture may violate the norms of another group. In Arab societies, but not in Western cultures, heterosexual men often greet one another with a kiss.

Variation Over Time

Consider, too, how rapidly cultures may change over time. English poet Geoffrey Chaucer (1342–1400) is separated from a modern Briton by only 20 generations, but the two would converse with great difficulty. In the thin slice of history since 1960, most Western cultures have changed with remarkable speed. Many people fly to places they once only read about, work in air-conditioned comfort where they once sweltered, and enjoy the convenience of anywhere-anytime electronic communication with those they once snail-mailed. With greater economic independence, today's women are more likely to marry for love and less likely to endure abusive relationships out of economic need.

But some changes seem not so wonderfully positive. Had you fallen asleep in the United States in 1960 and awakened today, you would open your eyes to a culture with more divorce, delinquency, and depression. You would also find North Americans—like their counterparts in Britain, Australia, and New Zealand—spending more hours at work, fewer hours sleeping, and fewer hours with friends and family (Frank, 1999; Putnam, 2000).

Whether we love or loathe these changes, we cannot fail to be impressed by their breathtaking speed. And we cannot explain them by changes in the human gene pool, which evolves far too slowly to account for high-speed cultural transformations. Cultures vary. Cultures change. And cultures shape our lives.

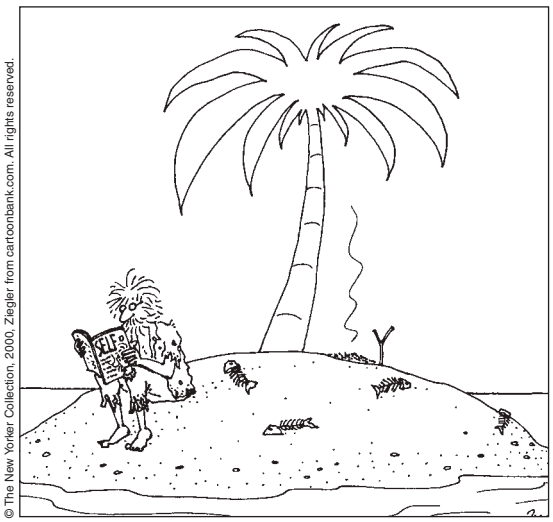
norm an understood rule for accepted and expected behavior. Norms prescribe "proper" behavior.

personal space the buffer zone we like to maintain around our bodies.

Culture and the Self

9-3: How do individualist and collectivist cultural influences affect people?

Cultures vary in the extent to which they give priority to the nurturing and expression of personal identity or group identity. To grasp the difference, imagine that someone were to rip away your social connections, making you a solitary refugee in a foreign land. How much of your identity would remain intact?



If as our solitary traveler you pride yourself on your **individualism,** a great deal of your identity would remain intact—the very core of your being, the sense of "me," the awareness of your personal convictions and values. Individualists (often people from North America, Western Europe, Australia, or New Zealand) give relatively greater priority to personal goals and define their identity mostly in terms of personal attributes (Schimmack et al., 2005). They strive for personal control and individual achievement. In American culture, with its relatively big "I" and small "we," 85 percent of people say it is possible "to pretty much be who you want to be" (Sampson, 2000).

Individualists share the human need to belong. They join groups, but they are less focused on group harmony and doing their duty to the group (Brewer & Chen, 2007). And being more self-contained, they more easily move in and out of groups. They feel relatively free to switch places of worship, leave one job for another, or even leave their extended families and migrate to a new place. Marriage is often for as long as they both shall love.

If set adrift in a foreign land as a **collectivist,** you might experience a greater loss of identity. Cut off from family, groups, and loyal friends, you would lose the connections that have defined who you are. In a collectivist culture, group identifications provide a sense of belonging, a set of values, a network of caring individuals, an assurance of security. In return, collectivists have deeper, more stable attachments to their groups, often their family, clan, or company. In South Korea, for example, people place less value on expressing a consistent, unique self-concept, and more on tradition and shared practices (Choi & Choi, 2002).

Valuing communal solidarity, people in collectivist cultures place a premium on preserving group spirit and making sure others never lose face. What people say reflects not only what they feel (their inner attitudes) but what they presume others feel (Kashima et al., 1992). Avoiding direct confrontation, blunt honesty, and uncomfortable topics, people often defer to others' wishes and display a polite, self-effacing humility (Markus & Kitayama, 1991). Elders and superiors receive respect, and duty to family may trump personal career preferences. In new groups, collectivists may be shy and more easily embarrassed than are individualist Westerners (Singelis et al., 1995, 1999). People in Japanese and Chinese cultures, for example, exhibit greater shyness toward strangers and greater concern for social harmony and loyalty (Bond, 1988; Cheek & Melchior, 1990; Triandis, 1994). When the priority is "we," not "me," that individualized latte—"decaf, single shot, skinny, extra hot"—that feels so good to a North American coffee shop patron might sound more like a selfish demand in Seoul (Kim & Markus, 1999).

"One needs to cultivate the spirit of sacrificing the *little me* to achieve the benefits of the *big me.*"
—Chinese saying

Kevin R. Morris/Corbis

Uniform requirements
People in individualist Western cultures sometimes see traditional Japanese culture as confining. But from the Japanese perspective, the same tradition may express a "serenity that comes to people who know exactly what to expect from each other" (Weisz et al., 1984).

TABLE 9.1 Value Contrasts Between Individualism and Collectivism

Concept	Individualism	Collectivism
Self	Independent (identity from individual traits)	Interdependent (identity from belonging)
Life task	Discover and express one's uniqueness	Maintain connections, fit in, perform role
What matters	Me—personal achievement and fulfillment; rights and liberties; self-esteem	Us—group goals and solidarity; social responsibilities and relationships; family duty
Coping method	Change reality	Accommodate to reality
Morality	Defined by individuals (self-based)	Defined by social networks (duty-based)
Relationships	Many, often temporary or casual; confrontation acceptable	Few, close, and enduring; harmony valued
Attributing behavior	Behavior reflects one's personality and attitudes	Behavior reflects social norms and roles

Sources: Adapted from Thomas Schoeneman (1994) and Harry Triandis (1994).

To be sure, there is diversity within cultures. Even in the most individualistic countries, some people manifest collectivist values. But in general, people (especially men) in competitive, individualist cultures have more personal freedom, are less geographically bound to their families, enjoy more privacy, and take more pride in personal achievements (**TABLE 9.1**). During the 2000 and 2002 Olympic games, U.S. gold medal winners and the U.S. media covering them attributed the achievements mostly to the athletes themselves (Markus et al., 2006). "I think I just stayed focused," explained swimming gold medalist Misty Hyman. "It was time to show the world what I could do. I am just glad I was able to do it." Japan's gold medalist in the women's marathon, Naoko Takahashi, had a different explanation: "Here is the best coach in the world, the best manager in the world, and all of the people who support me—all of these things were getting together and became a gold medal." Even in describing friends, Westerners tend to use trait-describing adjectives ("she is helpful"), whereas East Asians more often use verbs that describe behaviors in context ("she helps her friends") (Maass et al., 2006).

Individualism's benefits can come at the cost of more loneliness, more divorce, more homicide, and more stress-related disease (Popenoe, 1993; Triandis et al., 1988). Demands for more romance and personal fulfillment in marriage can subject relationships to more pressure (Dion & Dion, 1993). In one survey, "keeping romance alive" was rated as important to a good marriage by 78 percent of U.S. women but only 29 percent of Japanese women (*American Enterprise*, 1992). In China, love songs often express enduring commitment and friendship (Rothbaum & Tsang, 1998). As one song put it, "We will be together from now on. . . . I will never change from now to forever."

individualism giving priority to one's own goals over group goals and defining one's identity in terms of personal attributes rather than group identifications.

collectivism giving priority to group goals (often those of the extended family or work group) and defining one's identity accordingly.

Culture and Child-Rearing

Child-rearing practices reflect cultural values that vary across time and place. Do you prefer children who are independent or children who comply? If you live in a Westernized culture, the odds are you prefer independence. "You are responsible for yourself," Western families and schools tell their children. "Follow your conscience. Be true to yourself. Discover your gifts. Think through your personal needs." A half-century and more ago, Western cultural values placed greater priority on obedience, respect, and sensitivity to others (Alwin, 1990; Remley, 1988). "Be true to your traditions," parents then taught their children. "Be loyal to your heritage and country. Show respect toward your parents and other superiors." Cultures can change.

Many Asians and Africans live in cultures that value emotional closeness. Rather than being given their own bedrooms and entrusted to day care, infants and toddlers may sleep with their mothers and spend their days close to a family member (Morelli et al., 1992; Whiting & Edwards, 1988). These cultures encourage a strong sense of *family self*—a feeling that what shames the child shames the family, and what brings honor to the family brings honor to the self.

Cultures vary In Scotland's Orkney Islands' town of Stromness, social trust has enabled parents to park their toddlers outside of shops.

José Luis Pelaez, Inc./Corbis

Parental involvement promotes development Parents in every culture facilitate their children's discovery of their world, but cultures differ in what they deem important. Asian cultures place more emphasis on school and hard work than do North American cultures. This may help explain why Japanese and Taiwanese children get higher scores on mathematics achievement tests.

Children across place and time have thrived under various child-rearing systems. Upper-class British parents traditionally handed off routine caregiving to nannies, then sent their children off to boarding school at about age 10. These children and their boarding-school peers generally grew up to be pillars of British society, as had their parents before them. In the African Gusii society, babies nurse freely but spend most of the day on their mother's back—with lots of body contact but little face-to-face and language interaction. When the mother becomes pregnant, the toddler is weaned and handed over to someone else, often an older sibling. Westerners may wonder about the negative effects of this lack of verbal interaction, but then the African Gusii would in turn wonder about Western mothers pushing their babies around in strollers and leaving them in playpens and car seats (Small, 1997). Such diversity in child-rearing cautions us against presuming that our culture's way is the only way to rear children successfully.

Developmental Similarities Across Groups

Mindful of how others differ from us, we often fail to notice the similarities predisposed by our shared biology. One 49-country study revealed that nation-to-nation differences in personality traits such as conscientiousness and extraversion are smaller than most people suppose (Terracciano et al., 2005). Australians see themselves as outgoing, German-speaking Swiss see themselves as conscientious, and Canadians see themselves as agreeable. Actually, these national stereotypes exaggerate differences that, although real, are modest. Compared with the person-to-person differences within groups, the differences between groups are small. Regardless of our culture, we humans are more alike than different. We share the same life cycle. We speak to our infants in similar ways and respond similarly to their coos and cries (Bornstein et al., 1992a,b). All over the world, the children of warm and supportive parents feel better about themselves and are less hostile than are the children of punitive and rejecting parents (Rohner, 1986; Scott et al., 1991).

Even differences *within* a culture, such as those sometimes attributed to race, are often easily explained by an interaction between our biology and our culture. David Rowe and his colleagues (1994, 1995) illustrated this with an analogy: Black men tend to have higher blood pressure than White men. Suppose that (1) in both groups salt consumption correlates with blood pressure, and (2) salt consumption is higher among Black men than among White men. The blood pressure "race difference" might then actually be, at least partly, a *diet* difference—a cultural preference for certain foods.

And that, said Rowe and his colleagues, parallels psychological findings. Although Latino, Asian, Black, White, and Native Americans differ in school achievement and delinquency, the differences are "no more than skin deep." To the extent that family structure, peer influences, and parental education predict behavior in one of these ethnic groups, they do so for the others as well.

So, as members of different ethnic and cultural groups, we may differ in surface ways, but as members of one species we seem subject to the same psychological forces. Our languages vary, yet they reflect universal principles of grammar. Our tastes vary, yet they reflect common principles of hunger. Our social behaviors vary, yet they reflect pervasive principles of human influence. Cross-cultural research can help us appreciate both our cultural diversity *and* our human likeness.

"When [someone] has discovered why men in Bond Street wear black hats he will at the same moment have discovered why men in Timbuctoo wear red feathers."

—G. K. Chesterton, *Heretics,* 1905

Gender Development

We humans share an irresistible urge to organize our worlds into simple categories. Among the ways we classify people—as tall or short, fat or slim, smart or dull—one stands out: At your birth, everyone wanted to know, "Boy or girl?" Our biological sex in turn helps define our *gender,* the biological and social characteristics by which people define *male* or *female*. In considering how nature and nurture together create social diversity, gender is the prime case example. Let's recap one of psychology's main themes—that nature and nurture together create our differences and commonalities—by considering some gender variations.

Gender Similarities and Differences

9-4: What are some ways in which males and females tend to be alike and to differ?

Having faced similar adaptive challenges, we are in most ways alike. Men and women are not from different planets—Mars and Venus—but from the same planet Earth. Tell me whether you are male or female and you give me virtually no clues to your vocabulary, intelligence, and happiness, or to the mechanisms by which you see, hear, learn, and remember. Your "opposite" sex is, in reality, your very similar sex. And should we be surprised? Among your 46 chromosomes, 45 are unisex.

But males and females also differ, and differences command attention. Some much talked-about differences are actually quite modest, as Janet Hyde (2005) illustrated by graphically representing the gender difference in self-esteem scores, across many studies (**FIGURE 9.3**). Some differences are more striking. Compared with the average man, the average woman enters puberty two years sooner, lives five years longer, carries 70 percent more fat, has 40 percent less muscle, and is 5 inches shorter. Other gender differences appear throughout this book. Women can become sexually re-aroused immediately after orgasm. They smell fainter odors, express emotions more freely, and are offered help more often. They are doubly vulnerable to depression and anxiety, and their risk of developing eating disorders is 10 times greater. But, then, men are some four times more likely to commit suicide or suffer alcohol dependence. They are far more often diagnosed with autism, color-blindness, attention-deficit hyperactivity disorder (as children), and antisocial personality disorder (as adults). Choose your gender and pick your vulnerability.

How much does biology bend the genders? What portion of our differences are socially constructed—by the gender roles our culture assigns us, and by how we are socialized as children? To answer those questions, let's look more closely at some average gender differences in aggression, social power, and social connectedness.

Gender and Aggression

In surveys, men admit to more **aggression** than do women, and experiments confirm that men tend to behave more aggressively, such as by administering what they believe are more painful electric shocks (Bettencourt & Kernahan, 1997). The aggression gender gap pertains to *physical* aggression (such as hitting) rather than *relational* aggression (such as excluding someone). The gender gap in physical aggression appears in everyday life at various ages and in various cultures, especially those with gender inequality (Archer, 2004, 2006). Violent crime rates most strikingly illustrate the gender difference. The male-to-female arrest ratio for murder, for example, is 10 to 1 in the United States and almost 7 to 1 in Canada (FBI, 2007; Statistics Canada, 2007).

aggression physical or verbal behavior intended to hurt someone.

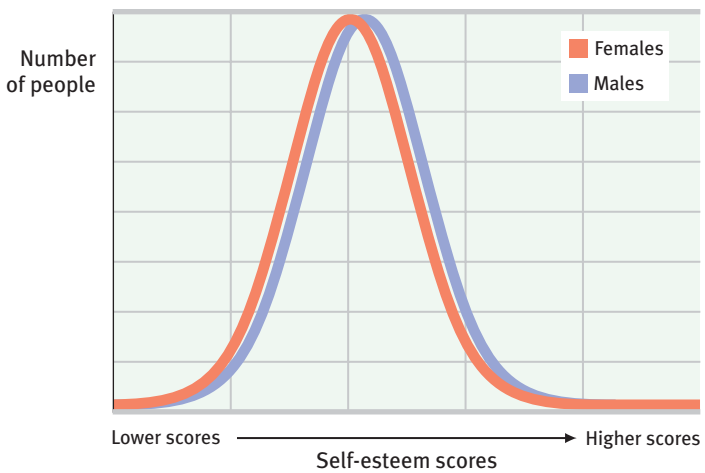


FIGURE 9.3 Much ado about a small difference Janet Hyde (2005) shows us two normal distributions that differ by the approximate magnitude of the gender difference in self-esteem, averaged over all available samples. Moreover, though we can identify gender differences, the variation among individual women and among individual men greatly exceeds the difference between the average woman and man.

Around the world, hunting, fighting, and warring are primarily men's activities (Wood & Eagly, 2002, 2007). Men also express more support for war. The Iraq war, for example, has consistently been supported more by American men than by American women (Newport et al., 2007).

Gender and Social Power

From Nigeria to New Zealand, people worldwide have perceived men as more dominant, forceful, and independent, women as more deferential, nurturing, and affiliative (Williams & Best, 1990). Indeed, in most societies men *are* socially dominant, and they place more importance on power and achievement (Schwartz & Rubel, 2005). When groups form, whether as juries or companies, leadership tends to go to males (Colarelli et al., 2006). As leaders, men tend to be more directive, even autocratic; women tend to be more democratic, more welcoming of subordinates' participation in decision making (Eagly & Carli, 2007; van Engen & Willemsen, 2004). When people interact, men are more likely to utter opinions, women to express support (Aries, 1987; Wood, 1987). These differences carry into everyday behavior, where men are more likely to act as powerful people often do—talking assertively, interrupting, initiating touches, staring more, and smiling less (Hall, 1987; Leaper & Ayres, 2007; Major et al., 1990).

Such behaviors help sustain social power inequities. When political leaders are elected, they usually are men, who held 82 percent of the seats in the world's governing parliaments in 2009 (IPU, 2009). When salaries are paid, those in traditionally male occupations receive more.

Women's 2009 representations in national parliaments ranged from 10 percent in the Arab States to 41 percent in Scandinavia, with 17 percent in the United States and 22 percent in Canada (IPU, 2009).

Gender and Social Connectedness

To Carol Gilligan and her colleagues (1982, 1990), the "normal" struggle to create a separate identity describes Western individualist males more than relationship-oriented females. Gilligan believes females tend to differ from males both in being less concerned with viewing themselves as separate individuals and in being more concerned with "making connections."

These gender differences in connectedness surface early in children's play, and they continue with age. Boys typically play in large groups with an activity focus and little intimate discussion (Rose & Rudolph, 2006). Girls usually play in smaller groups, often with one friend. Their play tends to be less competitive than boys' and more imitative of social relationships. Both in play and other settings, females are more open and responsive to feedback than are males (Maccoby, 1990; Roberts, 1991).

Females tend to be more *interdependent* than males. As teens, girls spend more time with friends and less time alone (Wong & Csikszentmihalyi, 1991). As late adolescents, they spend more time on social-networking Internet sites (Pryor et al., 2007).

Dex Image/Getty Images

Oliver Eltinger/zefa/Corbis

Every man for himself, or tend and befriend? Gender differences in the way we interact with others begin to appear at a very young age.

As adults, women take more pleasure in talking face to face, and they tend to use conversation more to explore relationships. Men enjoy doing activities side by side, and they tend to use conversation to communicate solutions (Tannen, 1990; Wright, 1989). The communication difference is apparent even in student e-mails, from which people in one New Zealand study could correctly guess the author's gender two-thirds of the time (Thomson & Murachver, 2001).

These gender differences are sometimes reflected in patterns of phone communication. In France, women make 63 percent of phone calls and, when talking to a woman, stay connected longer (7.2 minutes) than men do when talking to other men (4.6 minutes) (Smoreda & Licoppe, 2000). So, does this confirm the idea that women are just more talkative? When researchers counted the number of words 396 college students spoke in an average day, they found that talkativeness varied enormously—by 45,000 words between their most and least talkative participants (Mehl et al., 2007). (How many words would you guess you speak each day?) Contrary to stereotypes of jabbering women, both men and women averaged about 16,000 words daily.

Women worldwide orient their interests and vocations more to people and less to things (Lippa, 2005, 2006, 2008). In the workplace, they are less often driven by money and status and more apt to opt for reduced work hours (Pinker, 2008). In the home, they provide most of the care to the very young and the very old. In the greeting card aisles, they make 85 percent of the purchases (*Time,* 1997). Women's emphasis on caring helps explain another interesting finding: Although 69 percent of people have said they have a close relationship with their father, 90 percent said they feel close to their mother (Hugick, 1989). When wanting understanding and someone with whom to share worries and hurts, both men and women usually turn to women, and both have reported their friendships with women to be more intimate, enjoyable, and nurturing (Rubin, 1985; Sapadin, 1988). And when they themselves must cope with stress, women more than men turn to others for support—they *tend and befriend* (Tamres et al., 2002; Taylor, 2002).

Gender differences in power, connectedness, and other traits peak in late adolescence and early adulthood—the very years most commonly studied (also the years of dating and mating). As teenagers, girls become progressively less assertive and more flirtatious; boys become more domineering and unexpressive. But by age 50, these differences have diminished. Men become more empathic and less domineering and women, especially if working, become more assertive and self-confident (Kasen et al., 2006; Maccoby, 1998).

"In the long years liker must they grow; The man be more of woman, she of man."

—Alfred Lord Tennyson, *The Princess,* 1847

The Nature of Gender

9-5: How do nature and nurture together form our gender?

What explains our gender diversity? Is biology destiny? Are we shaped by our cultures? A biopsychosocial view suggests it is both, thanks to the interplay among our biological dispositions, our developmental experiences, and our current situations (Wood & Eagly, 2002, 2007).

In domains where men and women have faced similar challenges—regulating heat with sweat, developing tastes that nourish, growing calluses where the skin meets friction—the sexes are similar. Even when describing the ideal mate, both men and women put traits such as "kind," "honest," and "intelligent" at the top of their lists. But in domains pertinent to mating, evolutionary psychologists contend, guys act like guys whether they are elephants or elephant seals, rural peasants or corporate presidents. Such gender differences may be influenced genetically, by our differing *sex chromosomes* and, physiologically, from our differing concentrations of *sex hormones.*

Males and females are variations on a single form. Seven weeks after conception, you were anatomically indistinguishable from someone of the other sex. Then your genes activated your biological sex, which was determined by your twenty-third pair of chromosomes, the two sex chromosomes. From your mother,

Courtesy of Nick Downes.

X chromosome the sex chromosome found in both men and women. Females have two X chromosomes; males have one. An X chromosome from each parent produces a female child.

Y chromosome the sex chromosome found only in males. When paired with an X chromosome from the mother, it produces a male child.

testosterone the most important of the male sex hormones. Both males and females have it, but the additional testosterone in males stimulates the growth of the male sex organs in the fetus and the development of the male sex characteristics during puberty.

role a set of expectations (norms) about a social position, defining how those in the position ought to behave.

gender role a set of expected behaviors for males or for females.

you received an **X chromosome.** From your father, you received the one chromosome out of 46 that is not unisex—either another X chromosome, making you a girl, or a **Y chromosome,** making you a boy. The Y chromosome includes a single gene that throws a master switch triggering the testes to develop and produce the principal male hormone, **testosterone.** Females also have testosterone, but less of it. The male's greater testosterone output starts the development of external male sex organs at about the seventh week.

Another key period for sexual differentiation falls during the fourth and fifth prenatal months, when sex hormones bathe the fetal brain and influence its wiring. Different patterns for males and females develop under the influence of the male's greater testosterone and the female's ovarian hormones (Hines, 2004; Udry, 2000). Recent research confirms male-female differences during development in brain areas with abundant sex hormone receptors (Cahill, 2005).

In adulthood, parts of the frontal lobes, an area involved in verbal fluency, are reportedly thicker in women. Part of the parietal cortex, a key area for space perception, is thicker in men. Gender differences also appear in the hippocampus, the amygdala, and the volume of brain *gray matter* (the neural bodies) versus *white matter* (the axons and dendrites).

Further evidence of biology's influence on gender development comes from studies of genetic males who, despite normal male hormones and testes, are born without penises or with very small ones. A study of 14 boys who had undergone early sex-reassignment surgery (which is now controversial) and were raised as girls found that 6 later declared themselves as males, 5 were living as females, and 3 had an unclear sexual identity (Reiner & Gearhart, 2004). In one famous case, the parents of a Canadian boy who lost his penis to a botched circumcision followed advice to raise him as a girl rather than as a damaged boy. Alas, "Brenda" Reimer was not like most other girls. "She" didn't like dolls. She tore her dresses with rough-and-tumble play. At puberty she wanted no part of kissing boys. Finally, Brenda's parents explained what had happened, whereupon this young person immediately rejected the assigned female identity, got a haircut, and chose a male name, David. He ended up marrying a woman, becoming a stepfather, and, sadly, later committing suicide (Colapinto, 2000).

"Sex matters," concludes the National Academy of Sciences (2001). In combination with the environment, sex-related genes and physiology "result in behavioral and cognitive differences between males and females."

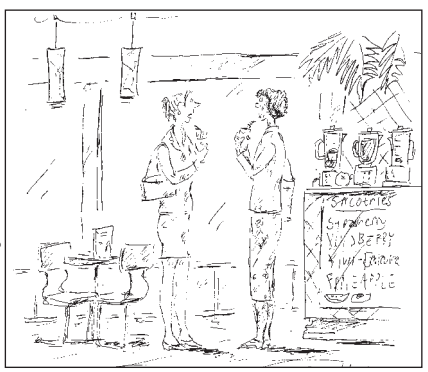
The Nurture of Gender

Although biologically influenced, gender is also socially constructed. What biology initiates, culture accentuates.

Gender Roles

Sex indeed matters. But from a biopsychosocial perspective, culture and the immediate situation matter, too. *Culture,* as we noted earlier, is everything shared by a group and transmitted across generations. We can see culture's shaping power in the social expectations that guide men's and women's behavior. In psychology, as in the theater, a **role** refers to a cluster of prescribed actions—the behaviors we expect of those who occupy a particular social position. One set of norms defines our culture's **gender roles**—our expectations about the way men and women should behave. In the United States 30 years ago, it was standard for men to initiate dates, drive the car, and pick up the check, and for women to decorate the home, buy and care for the children's clothes, and select the wedding gifts.

Gender roles exist outside the home, too. Compared with employed women, employed men in the United States spend about an hour and a half more on the job each day and about one hour less on household activities and caregiving (Amato et al., 2007; Bureau of Labor Statistics, 2004; Fisher et al., 2006). I do not have to tell you which parent, about 90 percent of the time in two-parent U.S. families, has stayed



"Sex brought us together, but gender drove us apart."

The gendered tsunami In Sri Lanka, Indonesia, and India, the gendered division of labor helped explain the excess of female deaths from the 2004 tsunami. In some villages, 80 percent of those killed were women, who were mostly at home while the men were more likely to be at sea fishing or doing out-of-the-home chores (Oxfam, 2005).

home with a sick child, arranged for the baby-sitter, or called the doctor (Maccoby, 1995). In Australia, women devote 54 percent more time to unpaid household work and 71 percent more time to child care than do men (Trewin, 2001).

Gender roles can smooth social relations, saving awkward decisions about who does the laundry this week and who mows the lawn. But they often do so at a cost: If we deviate from such conventions, we may feel anxious.

Do gender roles reflect what is biologically natural for men and women? Or do cultures construct them? Gender-role diversity over time and space indicates that culture has a big influence. Nomadic societies of food-gathering people have only a minimal division of labor by sex. Boys and girls receive much the same upbringing. In agricultural societies, where women work in the fields close to home, and men roam more freely herding livestock, children typically socialize into more distinct gender roles (Segall et al., 1990; Van Leeuwen, 1978).

Among industrialized countries, gender roles and attitudes vary widely (UNICEF, 2006). Australia and the Scandinavian countries offer the greatest gender equity, Middle Eastern and North African countries the least (Social Watch, 2006). And consider: Would you say life is more satisfying when both spouses work for pay and share child care? If so, you would agree with most people in 41 of 44 countries, according to a Pew Global Attitudes survey (2003). Even so, the culture-to-culture differences were huge, ranging from Egypt, where people disagreed 2 to 1, to Vietnam, where people agreed 11 to 1.

Attitudes about gender roles also vary over time. In the late 1960s and early 1970s, with the flick of an apron, the number of U.S. college women hoping to be full-time homemakers had plunged. In the three decades after 1976, the percentage of women in medical, law, and psychology programs roughly doubled.

Gender ideas vary not only across cultures and over time, but also across generations. When families emigrate from Asia to Canada and the United States, their children tend to grow up with peers from a new culture. Many immigrant children, especially girls, feel torn between the competing sets of gender-role norms presented by peers and parents (Dion & Dion, 2001).

Gender and Child-Rearing

As society assigns each of us to a gender, the social category of male or female, the inevitable result is our strong **gender identity,** our sense of *being* male or female. To varying extents, we also become **gender typed.** That is, some boys more than others exhibit traditionally masculine traits and interests, and some girls more than others become distinctly feminine.

gender identity our sense of being male or female.

gender typing the acquisition of a traditional masculine or feminine role.

Social learning theory assumes that children learn gender-linked behaviors by observing and imitating and by being rewarded or punished. "Nicole, you're such a good mommy to your dolls"; "Big boys don't cry, Alex." But parental modeling and

social learning theory the theory that we learn social behavior by observing and imitating and by being rewarded or punished.

rewarding of male-female differences aren't enough to explain gender typing (Lytton & Romney, 1991). In fact, even when their families discourage traditional gender typing, children usually organize themselves into "boy worlds" and "girl worlds," each guided by rules for what boys and girls do.

Cognition (thinking) also matters. In your own childhood, as you struggled to comprehend the world, you—like other children—formed *schemas,* or concepts that helped you make sense of your world. One of these was a schema for your own gender (Bem, 1987, 1993). Your *gender schema* then became a lens through which you viewed your experiences. Social learning shapes gender schemas. Before age 1, children begin to discriminate male and female voices and faces (Martin et al., 2002). After age 2, language forces children to begin organizing their worlds on the basis of gender. English, for example, uses the pronouns *he* and *she;* other languages classify objects as masculine ("*le* train") or feminine ("*la* table").

Young children are "gender detectives," explain Carol Lynn Martin and Diane Ruble (2004). Once they grasp that two sorts of people exist—and that they are of one sort—they search for clues about gender, and they find them in language, dress, toys, and songs. Girls, they may decide, are the ones with long hair. Having divided the human world in half, 3-year-olds will then like their own sex better and seek out their own kind for play. And having compared themselves with their concept of gender, they will adjust their behavior accordingly ("I am male—thus, masculine, strong, aggressive," or "I am female—therefore, feminine, sweet, and helpful"). The rigidity of boy-girl stereotypes peaks at about age 5 or 6. If the new neighbor is a boy, a 6-year-old girl may just assume he cannot share her interests. For young children, gender looms large.

Reflections on Nature and Nurture

"There are trivial truths and great truths," reflected the physicist Niels Bohr on some of the paradoxes of modern science. "The opposite of a trivial truth is plainly false. The opposite of a great truth is also true." It appears true that our ancestral history helped form us as a species. Where there is variation, natural selection, and heredity, there will be evolution. The unique gene combination created when our mother's egg engulfed our father's sperm predisposed both our shared humanity and our individual differences. This is a great truth about human nature. Genes form us.

But it also is true that our experiences form us. In our families and in our peer relationships, we learn ways of thinking and acting. Differences initiated by our nature may be amplified by our nurture. If their genes and hormones predispose males to be more physically aggressive than females, culture may magnify this gender difference through norms that encourage males to be macho and females to be the kinder, gentler sex. If men are encouraged toward roles that demand physical power, and women toward more nurturing roles, each may then exhibit the actions expected of them and find themselves shaped accordingly. Roles remake their players. Presidents in time become more presidential, servants more servile. Gender roles similarly shape us.

But gender roles are converging. Brute strength has become increasingly irrelevant to power and status (think Bill Gates and Oprah Winfrey). Thus both women and men are now seen as "fully capable of effectively carrying out organizational roles at all levels," note Wendy Wood and Alice Eagly (2002). And as women's employment in formerly male occupations has increased, gender differences in traditional masculinity or femininity and in what one seeks in a mate have diminished (Twenge, 1997). As the roles we play change over time, we change with them.

* * *

If nature and nurture jointly form us, are we "nothing but" the product of nature and nurture? Are we rigidly determined?

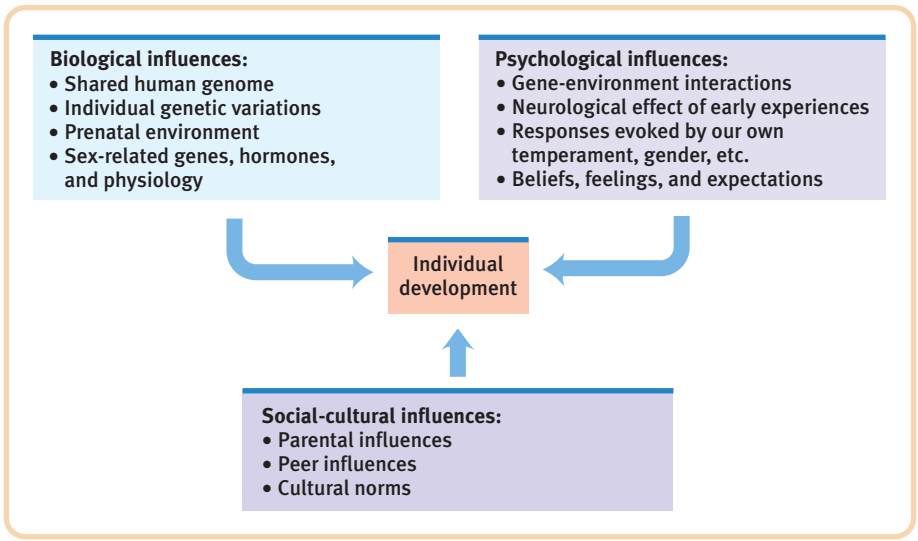


FIGURE 9.4 The biopsychosocial approach to development

We *are* the product of nature and nurture (**FIGURE 9.4**), but we are also an open system. Genes are all-pervasive but not all-powerful; people may defy their genetic bent to reproduce, by electing celibacy. Culture, too, is all-pervasive but not all-powerful; people may defy peer pressures and do the opposite of the expected. To excuse our failings by blaming our nature and nurture is what philosopher-novelist Jean-Paul Sartre called "bad faith"—attributing responsibility for one's fate to bad genes or bad influences.

In reality, we are both the creatures and the creators of our worlds. We are—it is a great truth—the products of our genes and environments. Nevertheless (another great truth) the stream of causation that shapes the future runs through our present choices. Our decisions today design our environments tomorrow. Mind matters. The human environment is not like the weather—something that just happens. We are its architects. Our hopes, goals, and expectations influence our future. And that is what enables cultures to vary and to change so quickly.

* * *

I know from my mail and from public opinion surveys that some readers feel troubled by the naturalism and evolutionism of contemporary science. Readers from other nations bear with me, but in the United States there is a wide gulf between scientific and lay thinking about evolution. "The idea that human minds are the product of evolution is . . . unassailable fact," declared a 2007 editorial in *Nature*, a leading science magazine. That sentiment concurs with a 2006 statement of "evidence-based facts" about evolution jointly issued by the national science academies of 66 nations (IAP, 2006). In *The Language of God*, Human Genome Project director Francis Collins (2006, pp. 141, 146), a self-described evangelical Christian, compiles the "utterly compelling" evidence that leads him to conclude that Darwin's big idea is "unquestionably correct." Yet a Gallup poll reports that half of U.S. adults do not believe in evolution's role in "how human beings came to exist on Earth" (Newport, 2007). Many of those who dispute the scientific story worry that a science of behavior (and evolutionary science in particular) will destroy our sense of the beauty, mystery, and spiritual significance of the human creature. For those concerned, I offer some reassuring thoughts.

"Let's hope that it's not true; but if it is true, let's hope that it doesn't become widely known."

—Lady Ashley, commenting on Darwin's theory

When Isaac Newton explained the rainbow in terms of light of differing wavelengths, the poet Keats feared that Newton had destroyed the rainbow's mysterious beauty. Yet, noted Richard Dawkins (1998) in *Unweaving the Rainbow*, Newton's analysis led to an even deeper mystery—Einstein's theory of special relativity. Moreover, nothing about Newton's optics need diminish our appreciation for the dramatic elegance of a rainbow arching across a brightening sky.

"Is it not stirring to understand how the world actually works—that white light is made of colors, that color measures light waves, that transparent air reflects light . . . ? It does no harm to the romance of the sunset to know a little about it."

—Carl Sagan, *Skies of Other Worlds*, 1988

When Galileo assembled evidence that the Earth revolved around the Sun, not vice versa, he did not offer irrefutable proof for his theory. Rather, he offered a coherent explanation for a variety of observations, such as the changing shadows cast by the Moon's mountains. His explanation eventually won the day because it described and explained things in a way that made sense, that hung together. Darwin's theory of evolution likewise is a coherent view of natural history. It offers an organizing principle that unifies various observations.

Collins is not the only person of faith to find the scientific idea of human origins congenial with his spirituality. In the fifth century, St. Augustine (quoted by Wilford, 1999) wrote, "The universe was brought into being in a less than fully formed state, but was gifted with the capacity to transform itself from unformed matter into a truly marvelous array of structures and life forms." Some 1600 years later, Pope John Paul II in 1996 welcomed a science-religion dialogue, finding it noteworthy that evolutionary theory "has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge."

Meanwhile, many people of science are awestruck at the emerging understanding of the universe and the human creature. It boggles the mind—the entire universe popping out of a point some 14 billion years ago, and instantly inflating to cosmological size. Had the energy of this Big Bang been the tiniest bit less, the universe would have collapsed back on itself. Had it been the tiniest bit more, the result would have been a soup too thin to support life. Astronomer Sir Martin Rees has described *Just Six Numbers* (1999), any one of which, if changed ever so slightly, would produce a cosmos in which life could not exist. Had gravity been a tad bit stronger or weaker, or had the weight of a carbon proton been a wee bit different, our universe just wouldn't have worked.

What caused this almost-too-good-to-be-true, finely tuned universe? Why is there something rather than nothing? How did it come to be, in the words of Harvard-Smithsonian astrophysicist Owen Gingerich (1999), "so extraordinarily right, that it seemed the universe had been expressly designed to produce intelligent, sentient beings"? Is there a benevolent superintelligence behind it all? Have there instead been an infinite number of universes born and we just happen to be the lucky inhabitants of one that, by chance, was exquisitely fine-tuned to give birth to us? Or does that idea violate *Occam's razor,* the principle that we should prefer the simplest of competing explanations? On such matters, a humble, awed, scientific silence is appropriate, suggested philosopher Ludwig Wittgenstein: "Whereof one cannot speak, thereof one must be silent."

Rather than fearing science, we can welcome its enlarging our understanding and awakening our sense of awe. In *The Fragile Species,* Lewis Thomas (1992) described his utter amazement that the Earth in time gave rise to bacteria and eventually to Bach's *Mass in B-Minor.* In a short 4 billion years, life on Earth has come from nothing to structures as complex as a 6-billion-unit strand of DNA and the incomprehensible intricacy of the human brain. Atoms no different from those in a rock somehow formed dynamic entities that became conscious. Nature, says cosmologist Paul Davies (2007), seems cunningly and ingeniously devised to produce extraordinary, self-replicating, information-processing systems—us. Although we appear to have been created from dust, over eons of time, the end result is a priceless creature, one rich with potential beyond our imagining.

"The causes of life's history [cannot] resolve the riddle of life's meaning."

—Stephen Jay Gould, *Rocks of Ages: Science and Religion in the Fullness of Life,* 1999

Environmental Influences on Behavior

Module Review

9-1: To what extent are our lives shaped by early stimulation, by parents, and by peers? A developing child's brain changes as neural connections increase in areas associated with stimulating activity, and unused synapses degenerate. Parents influence their children in areas such as manners and political and religious beliefs, but not in other areas, such as personality. Language and other behaviors are shaped by peer groups, as children adjust to fit in. Parents' decisions about children's neighborhoods and schools can moderate the influence of peer group culture.

9-2: How do cultural norms affect our behavior? Cultural *norms* are rules for accepted and expected behaviors. Across places and over time *cultures* differ in their behaviors, attitudes, ideas, values, and traditions. Despite cultural variations, many common forces influence human behavior.

9-3: How do individualist and collectivist cultural influences affect people? *Individualist* cultures (mostly Western) value personal independence and individual achievement and define identity in terms of self-esteem, personal goals and attributes, and personal rights and liberties. *Collectivist* cultures, like those of many parts of Asia and Africa, value interdependence, tradition, and harmony, and they define identity in terms of group goals, memberships, and commitments. Within any culture, the degree of individualism or collectivism varies from person to person.

9-4: What are some ways in which males and females tend to be alike and to differ? Human males and females are more alike than different, thanks to their similar genetic inheritance and physical abilities. Males and females do differ in body fat, muscle, height, age of onset of puberty, and life expectancy. They also vary in their vulnerability to certain disorders, and in such areas as *aggression,* social power, and social connectedness.

9-5: How do nature and nurture together form our gender? Biological sex is determined by the twenty-third pair of chromosomes. The mother always contributes an *X chromosome;* the father gives either an X (producing a female) or a *Y chromosome* (which triggers additional *testosterone* release and male sex organs). Gender is the set of biological and social characteristics by which people define male and female. Sex-related genes and hormones interact with developmental experiences to produce gender differences in behavior. *Gender roles,* expected behaviors for males and females, vary with culture, across place and time. *Social learning theory* proposes that we learn *gender identity* as we learn other things—through reinforcement, punishment, and observation.

Rehearse It!

1. Normal levels of stimulation are important during infancy and early childhood because during these years,
   a. a rich environment can override a child's genetic limits.
   b. experience stimulates the growth of billions of new brain cells.
   c. experience activates and preserves neural connections that might otherwise die from disuse.
   d. experience triggers the rapid development and production of human growth hormones.

2. Children and youth are particularly responsive to influences of their
   a. peers.
   b. fathers.
   c. teachers and caretakers.
   d. mothers.

3. *Personal space,* the portable buffer zone people like to maintain around their bodies, differs from culture to culture. These differences are examples of
   a. genetic variation.
   b. individual influences.
   c. cultural norms.
   d. collectivist influences.

4. Individualist cultures tend to value _____; collectivist cultures tend to value _____.
   a. interdependence; independence
   b. independence; interdependence
   c. group solidarity; uniqueness
   d. duty to family; personal fulfillment

5. Human developmental processes tend to _____ from one group to another because we are members of _____.
   a. be the same; the same ethnic group
   b. be the same; the same species
   c. differ; different species
   d. differ; different ethnic groups

6. A fertilized egg will develop into a boy if it receives
   a. an X chromosome from its mother.
   b. an X chromosome from its father.
   c. a Y chromosome from its mother.
   d. a Y chromosome from its father.

7. "Gender role" refers to our
   a. sense of being male or female.
   b. expectations about the way males and females should behave.
   c. biological sex.
   d. hormonally influenced differences in brain development.

8. As a consequence of the gender assigned to us by society, we develop a gender identity, which means that we
   a. exhibit traditional masculine or feminine roles.
   b. are socially categorized as male or female.
   c. have a sense of being male or female.
   d. have an ambiguous biological sex.

Answers: 1. c, 2. a, 3. c, 4. b, 5. b, 6. d, 7. b, 8. c.

Terms and Concepts to Remember

culture, p. 126
norm, p. 127
personal space, p. 127
individualism, p. 128
collectivism, p. 128
aggression, p. 131
X chromosome, p. 134
Y chromosome, p. 134
testosterone, p. 134
role, p. 134
gender role, p. 134
gender identity, p. 135
gender typing, p. 135
social learning theory, p. 135

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. "Use it or lose it" is a phrase often used when discussing strategies to stave off brain aging and decline in adulthood. In reality, this rule is just as critical during infancy. Explain why.
2. Consider the Chinese saying, "One needs to cultivate the spirit of sacrificing the *little me* to achieve the benefits of the *big me*." What is the *little me?* The *big me?* How might a staunch individualist react to this saying?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Developing Through the Life Span

Developing Through the Life Span

As we journey through life—from womb to tomb—when and how do we develop? Virtually all of us began walking around age 1 and talking by age 2. As children, we engaged in social play in preparation for life's work. As adults, we all smile and cry, love and loathe, and occasionally ponder the fact that someday we will die. *Developmental psychology* examines how people are continually developing—physically, cognitively, and socially—from infancy through old age. Much of its research centers on three major issues:

1. ***Nature/nurture:*** How do genetic inheritance *(our nature)* and experience *(the nurture we receive)* influence our development?
2. ***Continuity/stages:*** Is development a gradual, continuous process like riding an escalator, or does it proceed through a sequence of separate stages, like climbing rungs on a ladder?
3. ***Stability/change:*** Do our early personality traits persist through life, or do we become different persons as we age?

In other modules, we engage the nature / nurture issue. In Modules 10 through 13, we reflect on the continuity and stability issues throughout the life span.

MODULE 10

Developmental Issues, Prenatal Development, and the Newborn

From the union of sperm and egg to the birth of the newborn, development progresses in an orderly, though fragile, sequence. By birth, infants are equipped with perceptual and behavioral abilities that facilitate their survival. In this module, we look at what developmental biologists have learned about life before birth. We will also consider some of the findings of **developmental psychology**—the study of our lifelong physical, mental, and social development—about the newborn. But first let's focus on a couple of issues that preoccupy developmental psychologists.

developmental psychology a branch of psychology that studies physical, cognitive, and social change throughout the life span.

Two Major Developmental Issues

10-1: What conclusions can we draw from research on the issues of continuity versus stages and of stability versus change in lifelong development?

Any survey of developmental psychology must consider three pervasive issues. The first—how development is steered by the interaction of *nature* (our genes) and *nurture* (our experiences)—recurs throughout this text. Here we consider the second issue, whether development is a gradual, continuous process or a series of discrete stages, and the third, whether development is characterized over time more by stability or by change.

"Nature is all that a man brings with him into the world; nurture is every influence that affects him after his birth."

—Francis Galton, *English Men of Science,* 1874

Continuity and Stages

Do adults differ from infants as a giant redwood differs from its seedling—a difference created by gradual, cumulative growth? Or do they differ as a butterfly differs from a caterpillar—a difference of distinct stages?

Generally speaking, researchers who emphasize experience and learning see development as a slow, continuous shaping process. Those who emphasize biological maturation tend to see development as a sequence of genetically predisposed stages or steps: Although progress through the various stages may be quick or slow, everyone passes through the stages in the same order.

Are there clear-cut stages of psychological development, as there are physical stages such as walking before running? Several *stages theories* of development have been proposed and tested over the years. For example, developmental psychologist Jean Piaget (pronounced Pee-ah-ZHAY) proposed that all children pass through four discrete, age-linked stages of cognitive development, each stage with its own specific conceptual (thinking) abilities. Similarly, Lawrence Kohlberg proposed a series of stages of moral development, and Erik Erikson, of psychosocial development (see **FIGURE 10.1** on the next page). But subsequent research has suggested that young children have some abilities Piaget attributed to later stages. Kohlberg's work reflected a worldview characteristic of educated people in individualistic cultures and emphasized thinking over acting. Adult life does not progress through the fixed, predictable series of steps Erikson envisioned.

Stages of the life cycle

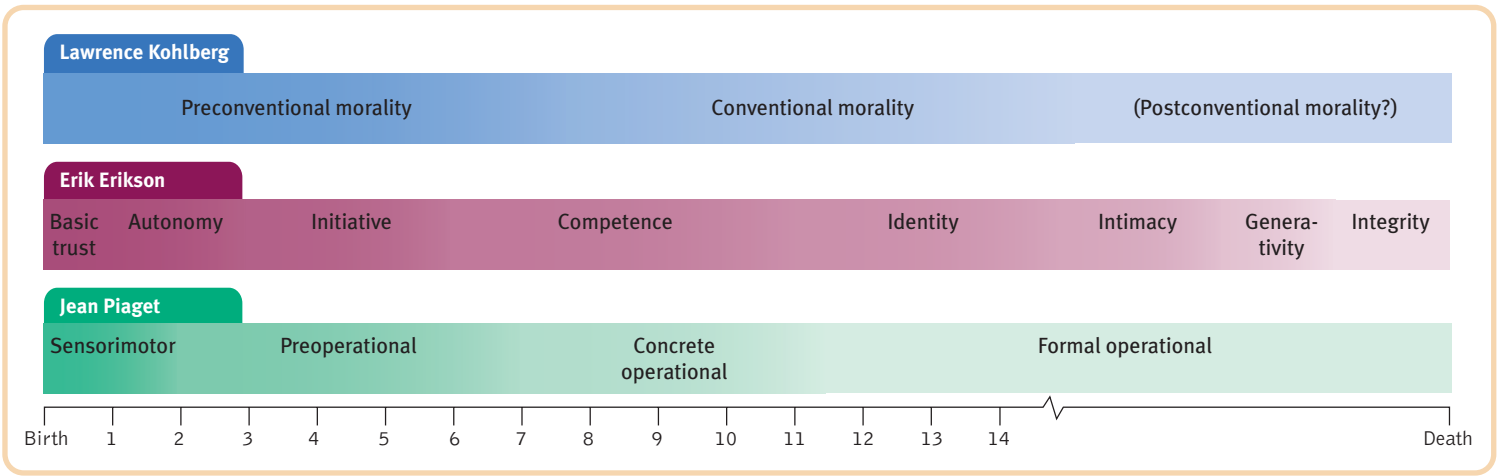
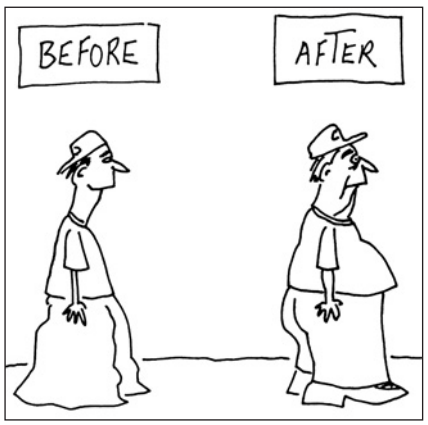


FIGURE 10.1 Three stage theories

Although research casts doubt on the idea that life proceeds through neatly defined, age-linked stages, the stage concept remains useful. The human brain does experience growth spurts during childhood and puberty that correspond roughly to Piaget's stages (Thatcher et al., 1987). And stage theories contribute a developmental perspective on the whole life span, by suggesting how people of one age think and act differently when they arrive at a later age.



As adults grow older, there is continuity of self.

Stability and Change

This leads us to the final question: Over time, are people's personalities consistent, or do they change? If reunited with a long-lost grade school friend, would you instantly recognize that "it's the same old Andy"? Or does a person befriended during one period of life seem like a different person at a later period? (That was the experience of a friend of mine who failed to recognize his former classmate at their 40-year college reunion. The aghast "unknown" classmate was his long-ago ex-wife.)

Researchers who have followed lives through time have found evidence for both stability and change. There is continuity to personality and yet, happily for troubled children and adolescents, life is a process of becoming: The struggles of the present may be laying a foundation for a happier tomorrow. More specifically, researchers generally agree on the following points:

1. The first two years of life provide a poor basis for predicting a person's eventual traits (Kagan et al., 1978, 1998). Older children and adolescents also change. Although delinquent children have elevated rates of later work problems, substance abuse, and crime, many confused and troubled children have blossomed into mature, successful adults (Moffitt et al., 2002; Roberts et al., 2001; Thomas & Chess, 1986).
2. As people grow older, personality gradually stabilizes (Hampson & Goldberg, 2006; Johnson et al., 2005; Terracciano et al., 2006). Some characteristics, such as temperament, are more stable than others, such as social attitudes (Moss & Susman, 1980). When a research team led by Avshalom Caspi (2003) studied 1000 New Zealanders from age 3 to 26, they were struck by the consistency of temperament and emotionality across time.
3. In some ways, we all change with age. Most shy, fearful toddlers begin opening up by age 4, and most people become more self-disciplined, stable, agreeable, and self-confident in the years after adolescence (McCrae & Costa, 1994; Roberts et al., 2003, 2006, 2008). Many irresponsible 18-year-olds have matured into 40-year-old business or cultural leaders. (If you are the former, you aren't done yet.) Such changes can occur without changing a person's position *relative to others* of the same age. The hard-driving young adult may mellow by later life, yet still be a relatively hard-driving senior citizen.

"As at 7, so at 70."
—Jewish proverb

"At 70, I would say the advantage is that you take life more calmly. You know that 'this, too, shall pass!'"
—Eleanor Roosevelt, 1954

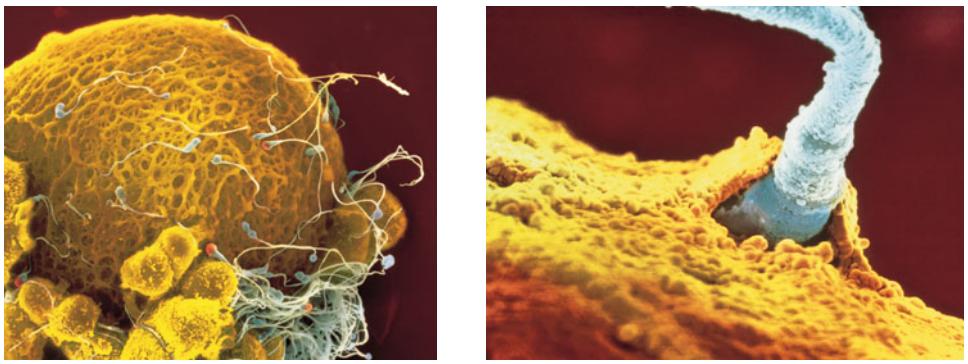
Finally, we should remember that life requires *both* stability and change. Stability enables us to depend on others, provides our identity, and motivates our concern for the healthy development of children. Change motivates our concern about present influences, sustains our hope for a brighter future, and lets us adapt and grow with experience.

Conception

10-2: How does life develop before birth?

Nothing is more natural than a species reproducing itself. Yet nothing is more wondrous. With humans, the process starts when a woman's ovary releases a mature egg—a cell roughly the size of the period at the end of this sentence. Like space voyagers approaching a huge planet, the 200 million or more deposited sperm begin their race upstream, approaching a cell 85,000 times their own size. The relatively few reaching the egg release digestive enzymes that eat away its protective coating (**FIGURE 10.2**). As soon as one sperm begins to penetrate and is welcomed in, the egg's surface blocks out the others. Before half a day elapses, the egg nucleus and the sperm nucleus fuse. The two have become one. Consider it your most fortunate of moments. Among 200 million sperm, the one needed to make you, in combination with that one particular egg, won the race.

zygote the fertilized egg; it enters a 2-week period of rapid cell division and develops into an embryo.



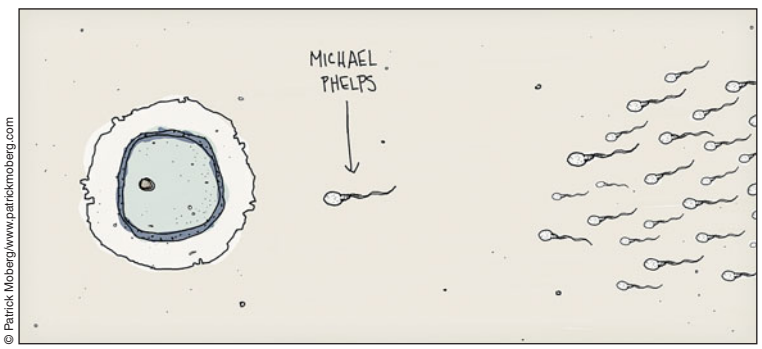
Both photos Lennart Nilsson/Albert Bonniers Publishing Company

(a) (b)

FIGURE 10.2 Life is sexually transmitted (a) Sperm cells surround an ovum. (b) As one sperm penetrates the egg's jellylike outer coating, a series of chemical events begins that will cause sperm and egg to fuse into a single cell. If all goes well, that cell will subdivide again and again to emerge 9 months later as a 100-trillion-cell human being.

Prenatal Development

Fewer than half of all fertilized eggs, called **zygotes,** survive beyond the first 2 weeks (Grobstein, 1979; Hall, 2004). But for you and me, good fortune prevailed. One cell became 2, then 4—each just like the first—until this cell division produced a zygote of some 100 cells within the first week. Then the cells began to differentiate—to specialize in structure and function. How identical cells do this—as if one decides "I'll become a brain, you become intestines!"—is a puzzle that scientists are just beginning to solve.



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First known photo of Olympic swimming champion, Michael Phelps

If the playful cartoonist were to convey literal truth, a second arrow would also point to the egg that contributed the other half of Michael Phelps' genes.

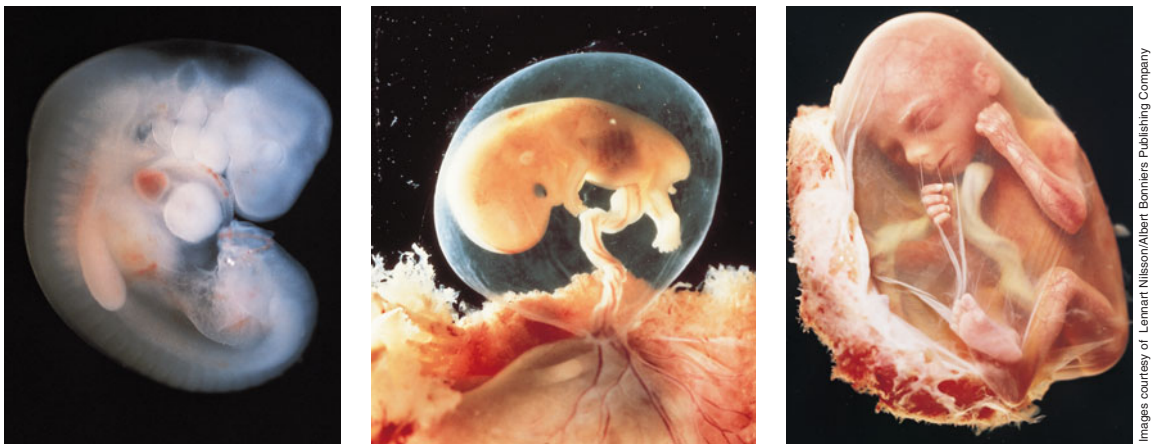

FIGURE 10.3 Prenatal development (a) The embryo grows and develops rapidly. At 40 days, the spine is visible and the arms and legs are beginning to grow. (b) By the end of the second month, when the fetal period begins, facial features, hands, and feet have formed. (c) As the fetus enters the fourth month, its 3 ounces could fit in the palm of your hand.

About 10 days after conception, the zygote attaches to the mother's uterine wall, beginning approximately 37 weeks of the closest human relationship. The zygote's inner cells become the **embryo** (**FIGURE 10.3a**). Over the next 6 weeks, organs begin to form and function. The heart begins to beat.

By 9 weeks after conception, the embryo looks unmistakably human (**FIGURE 10.3b**). It is now a **fetus** (Latin for "offspring" or "young one"). During the sixth month, organs such as the stomach have developed enough to allow a prematurely born fetus a chance of survival.

Prenatal development

zygote:	*conception to 2 weeks*
embryo:	*2 weeks through 8 weeks*
fetus:	*9 weeks to birth*

At each prenatal stage, genetic and environmental factors affect our development. The *placenta,* which formed as the zygote's outer cells attached to the uterine wall, transfers nutrients and oxygen from mother to fetus. The placenta also screens out many potentially harmful substances. But some substances slip by, including **teratogens,** which are harmful agents such as viruses and drugs. If the mother carries the HIV virus, her baby may also. If she is a heroin addict, her baby will be born a heroin addict. If she smokes, she will not smoke alone; both she and her fetus will experience reduced blood oxygen and a shot of nicotine. If she is a heavy smoker, her fetus may receive fewer nutrients and be born underweight and at risk for various problems (Pringle et al., 2005).

There is no known safe amount of alcohol during pregnancy. Alcohol enters the woman's bloodstream—and her fetus'—and depresses activity in both their central nervous systems. A pregnant mother's alcohol use may prime her offspring to like alcohol. In experiments, when pregnant rats drink alcohol, their young offspring later display a liking for alcohol's odor (Youngentob et al., 2007). Teens whose mothers drank when pregnant are at risk for heavy drinking and alcohol dependence. Even light drinking can affect the fetal brain (Braun, 1996; Ikonomidou et al., 2000), and persistent heavy drinking will put the fetus at risk for birth defects and later intellectual or developmental disabilities. For 1 in about 800 infants, the effects are visible as **fetal alcohol syndrome (FAS),** marked by a small, misproportioned head and lifelong brain abnormalities (May & Gossage, 2001).

"You shall conceive and bear a son. So then drink no wine or strong drink."
—Judges 13:7

The Competent Newborn

10-3: What are some newborn abilities?

"I felt like a man trapped in a woman's body. Then I was born."
—Comedian Chris Bliss

Having survived prenatal hazards, we as newborns came equipped with automatic responses ideally suited for our survival. We withdrew our limbs to escape pain. If a cloth over our face interfered with our breathing, we turned our head from side to side and swiped at it.

New parents are often in awe of the coordinated sequence of *reflexes* by which their baby gets food. When something touches their cheek, babies turn toward that


Lightscapes Photography, Inc. Corbis


Carl and Ann Purcell/Corbis

Prepared to feed and eat Animals are predisposed to respond to their offsprings' cries for nourishment.

touch, open their mouth, and vigorously *root* for a nipple. Finding one, they automatically close on it and begin sucking—which itself requires a coordinated sequence of reflexive *tonguing*, *swallowing*, and *breathing*. Failing to find satisfaction, the hungry baby may cry—a behavior parents find highly unpleasant and very rewarding to relieve.

Moreover, psychologists have discovered that we are born preferring sights and sounds that facilitate social responsiveness. As newborns, we turn our heads in the direction of human voices. We gaze longer at a drawing of a facelike image (**FIGURE 10.4**) than at a bull's-eye pattern; yet we gaze more at a bull's-eye pattern—which has contrasts much like those of the human eye—than at a solid disk (Fantz, 1961). We prefer to look at objects 8 to 12 inches away. Wonder of wonders, that just happens to be the approximate distance between a nursing infant's eyes and its mother's (Maurer & Maurer, 1988).

Within days after birth, our brain's neural networks were stamped with the smell of our mother's body. Thus, a week-old nursing baby, placed between a gauze pad from its mother's bra and one from another nursing mother, will usually turn toward the smell of its own mother's pad (MacFarlane, 1978). At 3 weeks, if given a pacifier that sometimes turns on recordings of its mother's voice and sometimes that of a female stranger's, an infant will suck more vigorously when it hears its now-familiar mother's voice (Mills & Melhuish, 1974). So not only could we as young infants see what we needed to see, and smell and hear well, we were already using our sensory equipment to learn.

FIGURE 10.4 Newborns' preference for faces When shown these two stimuli with the same elements, Italian newborns spent nearly twice as many seconds looking at the facelike image (Johnson & Morton, 1991). Canadian newborns—average age 53 minutes in one study—displayed the same apparently inborn preference to look toward faces (Mondloch et al., 1999).

embryo the developing human organism from about 2 weeks after fertilization through the second month.

fetus the developing human organism from 9 weeks after conception to birth.

teratogens agents, such as chemicals and viruses, that can reach the embryo or fetus during prenatal development and cause harm.

fetal alcohol syndrome (FAS) physical and cognitive abnormalities in children caused by a pregnant woman's heavy drinking. In severe cases, symptoms include noticeable facial misproportions.

Developmental Issues, Prenatal Development, and the Newborn

Module Review

10-1: What conclusions can we draw from research on the issues of continuity versus stages and of stability versus change in lifelong development? Later studies have modified some of the stage theories, but the concept of stages in development usefully alerts us to differences among people of different ages. The discovery that people's traits continue to change in later life has intensified interest in lifelong development. Nevertheless, there is also an underlying consistency to most people's temperament and personality traits.

10-2: How does life develop before birth? *Developmental psychologists* study physical, cognitive, and social changes throughout the life span. At conception, one sperm cell unites with an egg to form a *zygote*. During weeks 2 through 8, the developing *embryo's* body organs begin to form and function. By 9 weeks, the *fetus* is recognizably human. *Teratogens*, potentially harmful agents, can pass through the placental screen and harm the developing embryo or fetus, as happens with *fetal alcohol syndrome*.

10-3: What are some newborn abilities? Newborns are born with sensory equipment and reflexes that facilitate their survival and their social interactions with adults. For example, they quickly learn to discriminate their mother's smell and sound.

Rehearse It!

1. Which of the following is NOT one of the three major issues that interest developmental psychologists?
   a. Nature/nurture
   b. Reflexes/unlearned behaviors
   c. Stability/change
   d. Continuity/stages

2. Developmental researchers who emphasize learning and experience tend to believe in _____; those who emphasize biological maturation tend to believe in _____.
   a. nature; nurture
   b. continuity; stages
   c. stability; change
   d. randomness; predictability

3. Although development is lifelong, there is stability of personality over time. For example,
   a. most personality traits emerge in infancy and persist throughout life.
   b. temperament tends to remain stable throughout life.
   c. few people change significantly after adolescence.
   d. people tend to undergo greater personality changes as they age.

4. Body organs first begin to form and function during the period of the _____; within 6 months, during the period of the _____, the organs are sufficiently functional to allow a chance of survival.
   a. zygote; embryo
   b. zygote; fetus
   c. embryo; fetus
   d. placenta; fetus

5. Teratogens are chemicals that pass through the placenta's screen and may harm an embryo or fetus. Which of the following is NOT a teratogen?
   a. Oxygen
   b. Heroin
   c. Alcohol
   d. Nicotine

6. Stroke a newborn's cheek and the infant will root for a nipple. This illustrates
   a. a reflex.
   b. nurture.
   c. differentiation.
   d. continuity.

Answers: 1. b, 2. b, 3. b, 4. c, 5. a, 6. a.

Terms and Concepts to Remember

developmental psychology, p. 143
zygote, p. 145
embryo, p. 146
fetus, p. 146
teratogens, p. 146
fetal alcohol syndrome (FAS), p. 146

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. "Nature is all that a man brings with him into the world; nurture is every influence that affects him after his birth," said Francis Galton (*English Men of Science*, 1874). What part of this quote would need to be updated to reflect current research?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 11

Infancy and Childhood

During infancy, a baby grows from newborn to toddler, and during childhood from toddler to teenager. We all traveled this path, developing physically, cognitively, and socially. From infancy on, brain and mind—neural hardware and cognitive software—develop together.

Physical Development

11-1: During infancy and childhood, how do the brain and motor skills develop?

Brain Development

In your mother's womb, your developing brain formed nerve cells at the explosive rate of nearly one-quarter million per minute. On the day you were born, you had most of the brain cells you would ever have. However, your nervous system was immature: After birth, the branching neural networks that eventually enabled you to walk, talk, and remember had a wild growth spurt (FIGURE 11.1). From ages 3 to 6, the most rapid growth was in your frontal lobes, which enable rational planning. This helps explain why preschoolers display a rapidly developing ability to control their attention and behavior (Garon et al., 2008).

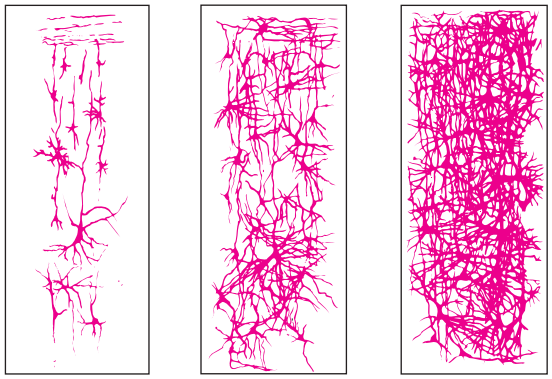

FIGURE 11.1 Drawings of human cerebral cortex sections In humans, the brain is immature at birth. As the child matures, the neural networks grow increasingly more complex.

The association areas—those linked with thinking, memory, and language—are the last cortical areas to develop. As they do, mental abilities surge (Chugani & Phelps, 1986; Thatcher et al., 1987). Fiber pathways supporting language and agility proliferate into puberty, after which a pruning process shuts down excess connections and strengthens others (Paus et al., 1999; Thompson et al., 2000).

As a flower unfolds in accord with its genetic instructions, so do we, in the orderly sequence of biological growth processes called **maturation.** Maturation decrees many of our commonalities—from standing before walking, to using nouns before adjectives. Severe deprivation or abuse can retard development, and ample experiences of talking and reading with parents will help sculpt neural connections. Yet the genetic growth tendencies are inborn. Maturation sets the basic course of development; experience adjusts it.

"This is the path to adulthood. You're here."

Motor Development

The developing brain enables physical coordination. As an infant's muscles and nervous system mature, more complicated skills emerge. With occasional exceptions, the sequence of

"It is a rare privilege to watch the birth, growth, and first feeble struggles of a living human mind."

—Annie Sullivan, in Helen Keller's *The Story of My Life,* 1903

maturation biological growth processes that enable orderly changes in behavior, relatively uninfluenced by experience.


Renee Altier for Worth Publishers


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Phototake Inc./Alamy Images


Profimedia.CZ s.r.o./Alamy

FIGURE 11.2 Triumphant toddlers Sit, crawl, walk, run—the sequence of these motor development milestones is the same the world around, though babies reach them at varying ages.

physical (motor) development is universal. Babies roll over before they sit unsupported, and they usually creep on all fours before they walk (**FIGURE 11.2**). These behaviors reflect not imitation but a maturing nervous system; blind children, too, crawl before they walk.

There are, however, individual differences in timing. In the United States, for example, 25 percent of all babies walk by age 11 months, 50 percent within a week after their first birthday, and 90 percent by age 15 months (Frankenburg et al., 1992). The recommended infant *back-to-sleep position* (putting babies to sleep on their back to reduce the risk of a smothering crib death) has been associated with somewhat later crawling but not with later walking (Davis et al., 1998; Lipsitt, 2003).

In the eight years following the 1994 launch of a U.S. "Back to Sleep" educational campaign, the number of infants sleeping on their stomach dropped from 70 to 11 percent—and SIDS (Sudden Infant Death Syndrome) deaths fell by half (Braiker, 2005).

Genes play a major role in motor development. Identical twins typically begin sitting up and walking on nearly the same day (Wilson, 1979). Maturation—including the rapid development of the cerebellum at the back of the brain—creates our readiness to learn walking at about age 1. Experience before that time has a limited effect. This is true for other physical skills, including bowel and bladder control. Before necessary muscular and neural maturation, neither pleading nor punishment will produce successful toilet training.

Maturation and Infant Memory

Our earliest memories seldom predate our third birthday. We see this *infantile amnesia* in the memories of some preschoolers who experienced an emergency fire evacuation caused by a burning popcorn maker. Seven years later, they were able to recall the alarm and what caused it—*if* they were 4 to 5 years old at the time. Those experiencing the event as 3-year-olds could not remember the cause and usually misrecalled being already outside when the alarm sounded (Pillemer, 1995). Other studies confirm that the average age of earliest conscious memory is 3.5 years (Bauer, 2002). By 4 to 5 years, childhood amnesia is giving way to remembered experiences (Bruce et al., 2000). But even into adolescence, the brain areas underlying memory continue to mature (Bauer, 2007).

Can you recall your first day of preschool (or your third birthday party)?

Although we *consciously* recall little from before age 4, our memory was processing information during those early years. In 1965, while finishing her doctoral work, Carolyn Rovee-Collier observed an infant memory. She was also a new mom, whose colicky 2-month-old, Benjamin, could be calmed by moving a crib mobile. Weary of bonking the mobile, she strung a cloth ribbon connecting the mobile to Benjamin's foot. Soon, he was kicking his foot to move the mobile. Thinking about her unintended home experiment, Rovee-Collier realized that,

contrary to popular opinion at that time, babies are capable of learning. To know for sure that little Benjamin wasn't just a whiz kid, Rovee-Collier had to repeat the experiment with other infants (Rovee-Collier, 1989, 1999). Sure enough, they, too, soon kicked more when linked to a mobile, both on the day of the experiment and the day after. They had learned the link between moving legs and moving mobile. If, however, she hitched them to a different mobile the next day, the infants showed no learning. Their actions indicated that they remembered the original mobile and recognized the difference. Moreover, if tethered to the familiar mobile a month later, they remembered the association and again began kicking (**FIGURE 11.3**).

Michael Newman/PhotoEdit

FIGURE 11.3 Infant at work Babies only 3 months old can learn that kicking moves a mobile, and they can retain that learning for a month. (From Rovee-Collier, 1989, 1997.)

Evidence of early processing also appeared in a study in which 10-year-olds were shown photos of preschoolers and asked to spot their former classmates. Although they consciously recognized only 1 in 5 of their onetime compatriots, their physiological responses (measured as skin perspiration) were greater to their former classmates whether or not they consciously recognized them (Newcombe et al., 2000). What the conscious mind does not know and cannot express in words, the nervous system somehow remembers.

Cognitive Development

11-2: From the perspectives of Piaget and of today's researchers, how does a child's mind develop?

Cognition refers to all the mental activities associated with thinking, knowing, remembering, and communicating. Somewhere on your life journey you became conscious. When was that, and how did your mind unfold from there? Developmental psychologist Jean Piaget (pronounced Pee-ah-ZHAY) spent his life searching for the answers to such questions. His interest began in 1920, when he was in Paris developing questions for children's intelligence tests. While administering the tests, Piaget became intrigued by children's *wrong* answers, which, he noted, were often strikingly similar among children of a given age. Where others saw childish mistakes, Piaget saw intelligence at work.

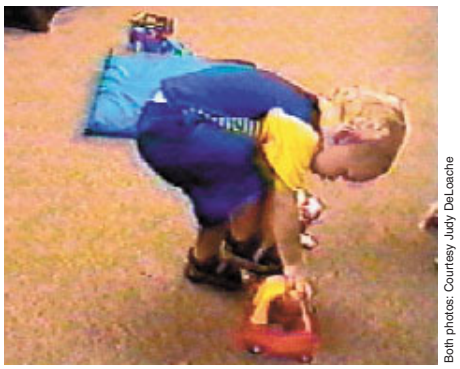
"Who knows the thoughts of a child?"
—Poet Nora Perry

A half-century spent with children convinced Piaget that a child's mind is not a miniature model of an adult's. Thanks partly to his work, we now understand that children reason *differently*, in "wildly illogical ways about problems whose solutions are self-evident to adults" (Brainerd, 1996).

"Childhood has its own way of seeing, thinking, and feeling, and there is nothing more foolish than the attempt to put ours in its place."
—Philosopher Jean-Jacques Rousseau, 1798

Piaget's studies led him to believe that a child's mind develops through a series of stages, in an upward march from the newborn's simple reflexes to the adult's abstract reasoning power. Thus, an 8-year-old can comprehend things a toddler cannot, such as the analogy that "getting an idea is like having a light turn on in your head," or that a miniature slide is too small for sliding, and a miniature car is much too small to get into (**FIGURE 11.4** on the next page). But our adult minds likewise engage in reasoning uncomprehended by 8-year-olds.

cognition all the mental activities associated with thinking, knowing, remembering, and communicating.



Both photos: Courtesy Judy DeLoache

FIGURE 11.4 Scale errors Psychologists Judy DeLoache, David Uttal, and Karl Rosengren (2004) report that 18- to 30-month-old children may fail to take the size of an object into account when trying to perform impossible actions with it. At left, a 21-month-old attempts to slide down a miniature slide. At right, a 24-month-old opens the door to a miniature car and tries to step inside.

Piaget's core idea is that the driving force behind our intellectual progression is an unceasing struggle to make sense of our experiences: "Children are active thinkers, constantly trying to construct more advanced understandings of the world" (Siegler & Ellis, 1996). To this end, the maturing brain builds **schemas,** concepts or mental molds into which we pour our experiences (**FIGURE 11.5**). By adulthood we have built countless schemas, ranging from *cats* and *dogs* to our concepts of *gender* and *love*.

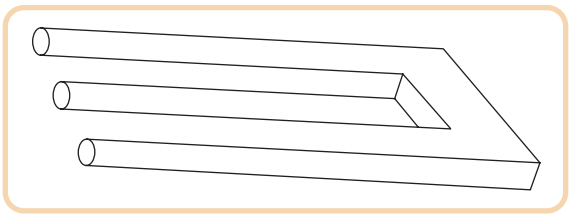


FIGURE 11.5 An impossible object Look carefully at the "devil's tuning fork" (right). Now look away—no, better first study it some more—and then look away and draw it. . . . Not so easy, is it? Because this tuning fork is an impossible object, you have no schema for such an image.

To explain how we use and adjust our schemas, Piaget proposed two more concepts. First, we **assimilate** new experiences—we interpret them in terms of our current understandings (schemas). Having a simple schema for *cow,* for example, a toddler may call all four-legged animals *cows.* But as we interact with the world, we also adjust, or **accommodate,** our schemas to incorporate information provided by new experiences. Thus, the child soon learns that the original *cow* schema is too broad and accommodates by refining the category.

Piaget believed that as children construct their understandings, they experience spurts of change, followed by greater stability as they move from one cognitive plateau to the next. Let's consider these stages, as Piaget viewed them, in the light of current thinking.

schema a concept or framework that organizes and interprets information.

assimilation interpreting our new experiences in terms of our existing schemas.

accommodation adapting our current understandings (schemas) to incorporate new information.

sensorimotor stage in Piaget's theory, the stage (from birth to about 2 years of age) during which infants know the world mostly in terms of their sensory impressions and motor activities.

object permanence the awareness that things continue to exist even when not perceived.

Piaget's Theory and Current Thinking

Piaget proposed that children progress through four stages of cognitive development, each with distinctive characteristics that permit specific kinds of thinking (**TABLE 11.1**).

Jean Piaget (1896–1980) "If we examine the intellectual development of the individual or of the whole of humanity, we shall find that the human spirit goes through a certain number of stages, each different from the other" (1930).

Bill Anderson/Photo Researchers, Inc.

Sensorimotor Stage

In the **sensorimotor stage,** from birth to nearly age 2, babies take in the world through their senses and actions—through looking, hearing, touching, mouthing, and grasping.

Very young babies seem to live in the present: Out of sight is out of mind. In one test, Piaget showed an infant an appealing toy and then flopped his beret over it. Before the age of 6 months, the infant acted as if the toy ceased to exist. Young infants lack **object permanence**—the awareness that objects continue to exist when not

TABLE 11.1 Piaget's Stages of Cognitive Development

Typical Age Range	Description of Stage	Developmental Phenomena
Birth to nearly 2 years	*Sensorimotor* Experiencing the world through senses and actions (looking, hearing, touching, mouthing, and grasping)	• Object permanence • Stranger anxiety
2 to about 6 or 7 years	*Preoperational* Representing things with words and images; using intuitive rather than logical reasoning	• Pretend play • Egocentrism
About 7 to 11 years	*Concrete operational* Thinking logically about concrete events; grasping concrete analogies and performing arithmetical operations	• Conservation • Mathematical transformations
About 12 through adulthood	*Formal operational* Abstract reasoning	• Abstract logic • Potential for mature moral reasoning

Milt and Patti Putnam/Corbis

perceived. By 8 months, infants begin exhibiting memory for things no longer seen. If you hide a toy, the infant will momentarily look for it (**FIGURE 11.6**). Within another month or two, the infant will look for it even after being restrained for several seconds.

But does object permanence in fact blossom at 8 months, much as tulips blossom in spring? Today's researchers see development as more continuous than Piaget did, and they believe object permanence unfolds gradually. Even young infants will at least momentarily look for a toy where they saw it hidden a second before (Moore & Meltzoff, 2008; Wang et al., 2004).

Doug Goodman

FIGURE 11.6 Object permanence Infants younger than 6 months seldom understand that things continue to exist when they are out of sight. But for this infant, out of sight is definitely not out of mind.

Researchers also believe Piaget and his followers underestimated young children's competence. Like adults staring in disbelief at a magic trick (the "Whoa!" look), infants look longer at an unexpected and unfamiliar scene of a car seeming to pass through a solid object, a ball stopping in midair, or an object violating object permanence by magically disappearing (Baillargeon, 1995, 2008; Wellman & Gelman, 1992). Babies, it seems, have a more intuitive grasp of simple laws of physics than Piaget realized.

Preoperational Stage

Piaget believed that until about age 6 or 7, children are in a **preoperational stage**—too young to perform mental operations. For a 5-year-old, the milk that seems "too much" in a tall, narrow glass may become an acceptable amount if poured into a short, wide glass. Focusing only on the height dimension, this child

preoperational stage in Piaget's theory, the stage (from about 2 to 6 or 7 years of age) during which a child learns to use language but does not yet comprehend the mental operations of concrete logic.

FIGURE 11.7 Piaget's test of conservation This preoperational child does not yet understand the principle of conservation of substance. When the milk is poured into a tall, narrow glass, it suddenly seems like "more" than when it was in the shorter, wider glass. In another year or so, she will understand that volume stays the same.

cannot perform the operation of mentally pouring the milk back, because she lacks the concept of **conservation**—the principle that quantity remains the same despite changes in shape (**FIGURE 11.7**).

Piaget did not view the stage transitions as abrupt. Even so, symbolic thinking appears at an earlier age than he supposed. Judy DeLoache (1987) discovered this when she showed children a model of a room and hid a model toy in it (a miniature stuffed dog behind a miniature couch). The 2½-year-olds easily remembered where to find the miniature toy, but they could not use the model to locate an actual stuffed dog behind a couch in a real room. Three-year-olds—only 6 months older—usually went right to the actual stuffed animal in the real room, showing they *could* think of the model as a symbol for the room. Piaget probably would have been surprised.

Question: If most 2½-year-olds do not understand how miniature toys can symbolize real objects, should anatomically correct dolls be used when questioning such children about alleged physical or sexual abuse? Judy DeLoache (1995) reports that "very young children do not find it natural or easy to use a doll as a representation of themselves."

Egocentrism Piaget contended that preschool children are **egocentric:** They have difficulty perceiving things from another's point of view. Asked to "show Mommy your picture," 2-year-old Gabriella holds the picture up facing her own eyes. Three-year-old Gray makes himself "invisible" by putting his hands over his eyes, assuming that if he can't see his grandparents, they can't see him. Children's conversations also reveal their egocentrism, as one young boy demonstrated (Phillips, 1969, p. 61):

"Do you have a brother?"
"Yes."
"What's his name?"
"Jim."
"Does Jim have a brother?"
"No."

"It's too late, Roger—they've seen us."

Roger has not outgrown his early childhood egocentrism.

Like Gabriella, TV-watching preschoolers who block your view of the TV assume that you see what they see. They simply have not yet developed the ability to take another's viewpoint. Even as adults, we often overestimate the extent to which others share our opinions and perspectives, as when we assume that something will be clear to others if it is clear to us, or that e-mail recipients will "hear" our "just kidding" intent (Epley et al., 2004; Kruger et al., 2005). Children, however, are even more susceptible to this *curse of knowledge*.

Use your finger to trace a capital E on your forehead. When Adam Galinsky and his colleagues (2006) invited people to do that, they were more egocentric—less likely to draw it from the perspective of someone looking at them—if they were first made to feel powerful. Other studies confirm that feeling powerful reduces people's sensitivity to how others see, think, and feel.

Theory of Mind When Little Red Riding Hood realizes her "grandmother" is really a wolf, she swiftly revises her ideas about the creature's intentions and races away. Preschoolers, although still egocentric, develop this ability to infer others' mental states when they begin forming a **theory of mind** (a term first coined by psychologists David Premack and Guy Woodruff, to describe chimpanzees' seeming ability to read intentions). As research with Chinese preschoolers illustrates,

talking about others enhances a child's developing ability to infer their states of mind (Lu et al., 2008).

As children's ability to take another's perspective develops, they seek to understand what made a playmate angry, when a sibling will share, and what might make a parent buy a toy. And they begin to tease, empathize, and persuade. Between about 3½ and 4½, children worldwide come to realize that others may hold false beliefs (Callaghan et al., 2005; Sabbagh et al., 2006). Jennifer Jenkins and Janet Astington (1996) showed Toronto children a Band-Aids box and asked them what was inside. Expecting Band-Aids, the children were surprised to discover that the box actually contained pencils. Asked what a child who had never seen the box would think was inside, 3-year-olds typically answered "pencils." By age 4 to 5, the children's theory of mind had leapt forward, and they anticipated their friends' false belief that the box would hold Band-Aids. Children with autism have difficulty understanding that another's state of mind differs from their own (see Close-Up: Autism and "Mind-Blindness," next page).

Family Circus ® Bil Keane

"Don't you remember, Grandma? You were in it with me."

Concrete Operational Stage

By about 6 or 7 years of age, said Piaget, children enter the **concrete operational stage.** Given concrete materials, they begin to grasp conservation. Understanding that change in form does not mean change in quantity, they can mentally pour milk back and forth between glasses of different shapes. They also enjoy jokes that allow them to use this new understanding:

> Mr. Jones went into a restaurant and ordered a whole pizza for his dinner. When the waiter asked if he wanted it cut into 6 or 8 pieces, Mr. Jones said, "Oh, you'd better make it 6, I could never eat 8 pieces!" (McGhee, 1976).

Piaget believed that during the concrete operational stage, children fully gain the mental ability to comprehend mathematical transformations and conservation. When my daughter Laura was 6, I was astonished at her inability to reverse simple arithmetic. Asked, "What is 8 plus 4?" she required 5 seconds to compute "12," and another 5 seconds to then compute 12 minus 4. By age 8, she could answer a reversed question instantly.

Formal Operational Stage

By age 12, our reasoning expands from the purely concrete (involving actual experience) to encompass abstract thinking (involving imagined realities and symbols). As children approach adolescence, said Piaget, many become capable of solving hypothetical propositions and deducing consequences: *If* this, *then* that. Systematic reasoning, what Piaget called **formal operational** thinking, is now within their grasp.

Although full-blown logic and reasoning await adolescence, the rudiments of formal operational thinking begin earlier than Piaget realized. Consider this simple problem:

> If John is in school, then Mary is in school. John is in school. What can you say about Mary?

Formal operational thinkers have no trouble answering correctly. But neither do most 7-year-olds (Suppes, 1982).

conservation the principle (which Piaget believed to be a part of concrete operational reasoning) that properties such as mass, volume, and number remain the same despite changes in the forms of objects.

egocentrism in Piaget's theory, the preoperational child's difficulty taking another's point of view.

theory of mind people's ideas about their own and others' mental states—about their feelings, perceptions, and thoughts, and the behaviors these might predict.

concrete operational stage in Piaget's theory, the stage of cognitive development (from about 6 or 7 to 11 years of age) during which children gain the mental operations that enable them to think logically about concrete events.

formal operational stage in Piaget's theory, the stage of cognitive development (normally beginning about age 12) during which people begin to think logically about abstract concepts.

Close-Up:

Autism and "Mind-Blindness"

Diagnoses of **autism,** a disorder marked by communication and social deficiencies and repetitive behaviors, have been increasing. Once believed to affect 1 in 2500 children, autism or a related disorder will now afflict 1 in 150 American children and, in Britain's London area, 1 in 86 children (Baird et al., 2006; CDC, 2007; Lilienfeld & Arkowitz, 2007). The increase in autism diagnoses may reflect a relabeling of children's disorders (Gernsbacher et al., 2005; Grinker, 2007; Shattuck, 2006). As autism diagnoses have increased, the number of children considered "cognitively disabled" or "learning disabled" has decreased.

The underlying source of autism's symptoms seems to be poor communication among brain regions that normally work together to let us take another's viewpoint. People with autism are therefore said to have an *impaired theory of mind* (Rajendran & Mitchell, 2007). They have difficulty inferring others' thoughts and feelings. They do not appreciate that playmates and parents might view things differently. Mindreading that most find intuitive *(Is that face conveying a happy smile, a self-satisfied smirk, or a contemptuous sneer?)* is difficult for those with autism. Most children learn that another child's pouting mouth signals sadness, and that twinkling eyes mean happiness or mischief. A child with autism fails to understand these signals (Frith & Frith, 2001).

autism a disorder that appears in childhood and is marked by deficient communication, social interaction, and understanding of others' states of mind.

Ozier Muhammad/The New York Times/Redux

Autism This speech-language pathologist is helping a boy with autism learn to form sounds and words. Autism, which afflicts four boys for every girl, is marked by deficient social and communication skills and difficulty in grasping others' states of mind.

To encompass the variations in autism, today's researchers refer to *autism spectrum disorder.* One variation in this spectrum is *Asperger syndrome,* a "high-functioning" form of autism. Asperger syndrome is marked by normal intelligence, often accompanied by exceptional skill or talent in a specific area, but deficient social and communication skills (and thus an inability to form normal peer relationships).

Psychologist Simon Baron-Cohen (2008) proposes that autism, which afflicts four boys for every girl, represents an "extreme male brain." Girls are naturally predisposed to be "empathizers," he contends. They are better at reading facial expressions and gestures—a challenging task for those with autism. And, although the sexes overlap, boys are, he believes, better "systemizers"—understanding things according to rules or laws, as in mathematical and mechanical systems.

"If two 'systemizers' have a child, this will increase the risk of the child having autism," Baron-Cohen theorizes. And because of *assortative mating*—people's tendency to seek spouses who share their interests—two systemizers will indeed often mate. "I do not discount environmental factors," he notes. "I'm just saying, don't forget about biology."

Sibling and twin studies provide some evidence of biology's influence. A younger sibling of a child with autism is at a heightened risk of 15 percent or so (Sutcliffe, 2008). In identical twins, if one twin is diagnosed with autism, the chances are 70 percent that the co-twin also will have autism (Sebat et al., 2007). Random genetic mutations in sperm-producing cells may play a role. As men age, these mutations become more frequent, which may help explain why an over-40 man has a much higher risk of fathering a child with autism than does a man under 30 (Reichenberg et al., 2007).

Reflecting on Piaget's Theory

"Assessing the impact of Piaget on developmental psychology is like assessing the impact of Shakespeare on English literature."

—Developmental psychologist Harry Beilin (1992)

What remains of Piaget's ideas about the child's mind? Plenty—enough to merit his being singled out by *Time* magazine as one of the twentieth century's 20 most influential scientists and thinkers and rated in a survey of British psychologists as the greatest psychologist of that century (*Psychologist,* 2003). Piaget identified significant cognitive milestones and stimulated worldwide interest in how the mind develops. His emphasis was less on the ages at which children typically reach specific milestones than on their sequence. Studies around the globe, from aboriginal

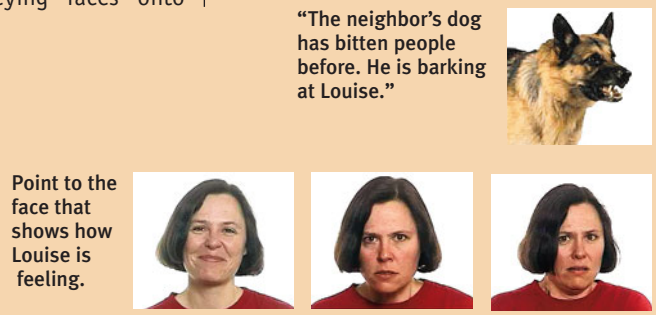
Genetic influences appear to do their damage by altering brain synapses (Crawley, 2007; Garber, 2007).

Biology's role in autism also appears in brain-function studies. People without autism often yawn after seeing others yawn. And as they view and imitate another's smiling or frowning, they feel something of what the other is feeling, thanks to their brain's *mirror neurons*. Not so among those with autism, who are less imitative and show much less activity in brain areas involved in mirroring others' actions (Dapretto et al., 2006; Perra et al., 2008; Senju et al., 2007). When people with autism watch another person's hand movements, for example, their brain displays less than normal mirroring activity (Oberman & Ramachandran, 2007; Théoret et al., 2005).

Such discoveries have launched explorations of treatments that might alleviate some of autism's symptoms by triggering mirror neuron activity (Ramachandran & Oberman, 2006). For example, seeking to "systemize empathy," Baron-Cohen and his Cambridge University colleagues (2007; Golan et al., 2007) collaborated with Britain's National Autistic Society and a film production company. Knowing that television shows with vehicles have been most popular for kids with autism, they created a series of animations that grafted emotion-conveying faces onto toy tram, train, and tractor characters in a pretend boy's bedroom (**FIGURE 11.8**). After the boy leaves for school, the characters come to life and have experiences that lead them to display various emotions (which I predict you would enjoy viewing at www.thetransporters.com). The children expressed a surprising ability to generalize what they had learned to a new, real context. By the end of the intervention, their previously deficient ability to recognize emotions on real faces equaled that of children without autism.

FIGURE 11.8 Transported into a world of emotion (a) A research team at Cambridge University's Autism Research Centre introduced children with autism to emotions experienced and displayed by toy vehicles. (b) After four weeks of viewing animations, the children displayed a markedly increased ability to recognize emotions in human as well as the toy faces.

(a) Emotion-conveying faces grafted onto toy trains



(b) Matching new scenes and faces (and data for two trials)

Australia to Algeria to North America, have confirmed that human cognition unfolds basically in the sequence Piaget described (Lourenco & Machado, 1996; Segall et al., 1990).

However, today's researchers see development as more continuous than did Piaget. By detecting the beginnings of each type of thinking at earlier ages, they have revealed conceptual abilities Piaget missed. Moreover, they see formal logic as a smaller part of cognition than he did. Piaget would not be surprised that today, as part of our own cognitive development, we are adapting his ideas to accommodate new findings.

James V. Wertsch/Washington University

Lev Vygotsky (1895–1934) Vygotsky, a Russian developmental psychologist, pictured here with his daughter, studied how a child's mind feeds on the language of social interaction.

Piaget's emphasis on how the child's mind grows through interaction with the physical environment is complemented by the Russian psychologist Lev Vygotsky's emphasis on how the child's mind grows through interaction with the *social* environment. If Piaget's child was a young scientist, Vygotsky's was a young apprentice. By mentoring children and giving them new words, parents and others provide a temporary *scaffold* from which children can step to higher levels of thinking (Renninger & Granott, 2005). Language, an important ingredient of social mentoring, provides the building blocks for thinking, noted Vygotsky (who was born the same year as Piaget, but died prematurely of tuberculosis).

Implications for Parents and Teachers

Future parents and teachers remember: Young children are incapable of adult logic. Preschoolers who stand in the way when others are trying to watch TV simply have not learned to take another's viewpoint. What seems simple and obvious to us—getting off a teeter-totter will cause a friend on the other end to crash—may be incomprehensible to a 3-year-old. Also remember that children are not passive receptacles waiting to be filled with knowledge. Better to build on what they already know, engaging them in concrete demonstrations and stimulating them to think for themselves. And, finally, accept children's cognitive immaturity as adaptive. It is nature's strategy for keeping children close to protective adults and providing time for learning and socialization (Bjorklund & Green, 1992).

Christina Kennedy/Alamy

Stranger anxiety A newly emerging ability to evaluate people as unfamiliar and possibly threatening helps protect babies 8 months and older.

Social Development

11-3: How do parent-infant attachment bonds form?

From birth, babies in all cultures are social creatures, developing an intense bond with their caregivers. Infants come to prefer familiar faces and voices, then to coo and gurgle when given a parent's attention. At about 8 months, soon after object permanence emerges and children become mobile, a curious thing happens: They develop **stranger anxiety.** They may greet strangers by crying and reaching for familiar caregivers. "No! Don't leave me!" their distress seems to say. Children this age have schemas for familiar faces; when they cannot assimilate the new face into these remembered schemas, they become distressed (Kagan, 1984). Once again, we see an important principle: *The brain, mind, and social-emotional behavior develop together.*

Origins of Attachment

One-year-olds typically cling tightly to a parent when they are frightened or expect separation. Reunited after being separated, they shower the parent with smiles and hugs. No social behavior is more striking than this intense and mutual infant-parent bond. This **attachment** bond is a powerful survival impulse that keeps infants close to their caregivers. Infants become attached to those—typically their parents—who are comfortable and familiar. For many years, developmental psychologists reasoned that infants became attached to those who satisfied their need for nourishment. It made sense. But an accidental finding overturned this explanation.

Body Contact

During the 1950s, University of Wisconsin psychologists Harry Harlow and Margaret Harlow bred monkeys for their learning studies. To equalize experiences and to isolate any disease, they separated the infant monkeys from their mothers shortly after birth and raised them in sanitary individual cages, which included a cheesecloth baby blanket (Harlow et al., 1971). Then came a surprise: When their blankets were taken to be laundered, the monkeys became distressed.

The Harlows recognized that this intense attachment to the blanket contradicted the idea that attachment derives from an association with nourishment. But how could

stranger anxiety the fear of strangers that infants commonly display, beginning by about 8 months of age.

attachment an emotional tie with another person; shown in young children by their seeking closeness to the caregiver and showing distress on separation.

they show this more convincingly? To pit the drawing power of a food source against the contact comfort of the blanket, they created two artificial mothers. One was a bare wire cylinder with a wooden head and an attached feeding bottle, the other a cylinder wrapped with terry cloth.

When raised with both, the monkeys overwhelmingly preferred the comfy cloth mother (**FIGURE 11.9**). Like human infants clinging to their mothers, the monkeys would cling to their cloth mothers when anxious. When venturing into the environment, they used her as a secure base, as if attached to her by an invisible elastic band that stretched only so far before pulling them back. Researchers soon learned that other qualities—rocking, warmth, and feeding—made the cloth mother even more appealing.

Harlow Primate Laboratory, University of Wisconsin

FIGURE 11.9 The Harlows' mothers Psychologists Harry Harlow and Margaret Harlow raised monkeys with two artificial mothers—one a bare wire cylinder with a wooden head and an attached feeding bottle, the other a cylinder with no bottle but covered with foam rubber and wrapped with terry cloth. The Harlows' discovery surprised many psychologists: The infants much preferred contact with the comfortable cloth mother, even while feeding from the nourishing mother.

Human infants, too, become attached to parents who are soft and warm and who rock, feed, and pat. Much parent-infant emotional communication occurs via touch (Hertenstein et al., 2006), which can be either soothing (snuggles) or arousing (tickles). Human attachment also consists of one person providing another with a secure base from which to explore and a safe haven when distressed. As we mature, our secure base and safe haven shift—from parents to peers and partners (Cassidy & Shaver, 1999). But at all ages we are social creatures. We gain strength when someone offers, by words and actions, a safe haven: "I will be here. I am interested in you. Come what may, I will actively support you" (Crowell & Waters, 1994).

Lee Kirkpatrick (1999) reports that for some people a perceived relationship with God functions as do other attachments, by providing a secure base for exploration and a safe haven when threatened.

Familiarity

Contact is one key to attachment. Another is familiarity. In many animals, attachments based on familiarity likewise form during a **critical period**—an optimal period when certain events must take place to facilitate proper development (Bornstein, 1989). For goslings, ducklings, or chicks, that period falls in the hours shortly after hatching, when the first moving object they see is normally their mother. From then on, the young fowl follow her, and her alone.

Konrad Lorenz (1937) explored this rigid attachment process, called **imprinting.** He wondered: What would ducklings do if he was the first moving creature they observed? What they did was follow him around: Everywhere that Konrad went, the ducks were sure to go. Further tests revealed that although baby birds imprint best to their own species, they also will imprint to a variety of moving objects—an animal of another species, a box on wheels, a bouncing ball (Colombo, 1982; Johnson, 1992). And, once formed, this attachment is difficult to reverse.

critical period an optimal period shortly after birth when an organism's exposure to certain stimuli or experiences produces proper development.

imprinting the process by which certain animals form attachments during a critical period very early in life.

Alastair Miller

Attachment When French pilot Christian Moullec took off in his microlight plane, his imprinted geese, which he had raised since their hatching, followed closely. The same imprinting procedure has been used to guide endangered whooping cranes to their winter nesting grounds (Mooallem, 2009).

Children—unlike ducklings—do not imprint. However, they do become attached to what they've known. *Mere exposure* to people and things fosters fondness. Children like to reread the same books, rewatch the same movies, reenact family traditions. They prefer to eat familiar foods, live in the same familiar neighborhood, attend school with the same old friends. Familiarity is a safety signal. Familiarity breeds content.

Attachment Differences

11-4: How have psychologists studied children's differing attachments, and what have they learned?

What accounts for children's attachment differences? Placed in a *strange situation* (usually a laboratory playroom), about 60 percent of infants display *secure attachment.* In their mother's presence they play comfortably, happily exploring their new environment. When she leaves, they are distressed; when she returns, they seek contact with her. Other infants avoid attachment or show *insecure attachment.* They are less likely to explore their surroundings; they may even cling to their mother. When she leaves, they either cry loudly and remain upset or seem indifferent to her departure and return (Ainsworth, 1973, 1989; Kagan, 1995; van IJzendoorn & Kroonenberg, 1988).

Mary Ainsworth (1979), who designed the strange situation experiments, studied attachment differences by observing mother-infant pairs at home during their first six months. Later she observed the 1-year-old infants in a strange situation without their mothers. Sensitive, responsive mothers—those who noticed what their babies were doing and responded appropriately—had infants who exhibited secure attachment. Insensitive, unresponsive mothers—mothers who attended to their babies when they felt like doing so but ignored them at other times—had infants who often became insecurely attached. The Harlows' monkey studies, with unresponsive artificial mothers, produced even more striking effects. When put in strange situations without their artificial mothers, the deprived infants were terrified (**FIGURE 11.10**).

Harlow Primate Laboratory, University of Wisconsin

FIGURE 11.10 Social deprivation and fear Monkeys raised with artificial mothers were terror-stricken when placed in strange situations without their surrogate mothers. (Today's climate of greater respect for animal welfare prevents such primate studies.)

But is attachment style the *result* of parenting? Or is attachment style the result of genetically influenced *temperament*—a person's characteristic emotional reactivity and intensity? Shortly after birth, some babies are noticeably *difficult*—irritable, intense, and unpredictable. Others are *easy*—cheerful, relaxed, and feeding and sleeping on predictable schedules (Chess & Thomas, 1987). By neglecting such inborn differences, the parenting studies, Judith Harris (1998) noted, are like "comparing foxhounds reared in kennels with poodles reared in apartments." To separate nature and nurture, Dutch researcher Dymphna van den Boom (1990, 1995) varied parenting while controlling temperament. (Pause and think: If you were the researcher, how might you have done this?)

Van den Boom's solution was to randomly assign one hundred 6- to 9-month-old temperamentally difficult infants to either an experimental group, in which mothers received personal training in sensitive responding, or to a control group, in which they did not. At 12 months of age, 68 percent of the infants in the experimental group were rated securely attached, as were only 28 percent of those in the control group. Other studies have also found that intervention programs can increase parental sensitivity and, to a lesser extent, infant attachment security (Bakermans-Kranenburg et al., 2003; Van Zeijl et al., 2006).

"We need fathers to realize that responsibility does not end at conception. We need them to realize that what makes you a man is not the ability to have a child—it's the courage to raise one."

—Barack Obama, Father's Day sermon, 2008

As these examples indicate, researchers have more often studied mother care than father care. Infants who lack a caring mother are said to suffer "maternal deprivation"; those lacking a father's care merely experience "father absence." This reflects a wider attitude in which "fathering a child" has meant impregnating, and "mothering" has meant nurturing. But fathers are more than just mobile sperm banks. Across nearly 100 studies worldwide, a father's love and acceptance have been comparable to a mother's love in predicting their offspring's health and

Fantastic father Among the Aka people of Central Africa, fathers form an especially close bond with their infants, even suckling the babies with their own nipples when hunger makes the child impatient for Mother's return. According to anthropologist Barry Hewlett (1991), fathers in this culture are holding or within reach of their babies 47 percent of the time.

basic trust according to Erik Erikson, a sense that the world is predictable and trustworthy; said to be formed during infancy by appropriate experiences with responsive caregivers.

well-being (Rohner & Veneziano, 2001). In one mammoth British study following 7259 children from birth to adulthood, those whose fathers were most involved in parenting (through outings, reading to them, and taking an interest in their education) tended to achieve more in school, even after controlling for many other factors, such as parental education and family wealth (Flouri & Buchanan, 2004).

Whether children live with one parent or two, are cared for at home or in a day-care center, live in North America, Guatemala, or the Kalahari Desert, their anxiety over separation from parents peaks at around 13 months, then gradually declines (**FIGURE 11.11**). Does this mean our need for and love of others also fades away? Hardly. Our capacity for love grows, and our pleasure in touching and holding those we love never ceases. The power of early attachment does nonetheless gradually relax, allowing us to move out into a wider range of situations, communicate with strangers more freely, and stay emotionally attached to loved ones despite distance.

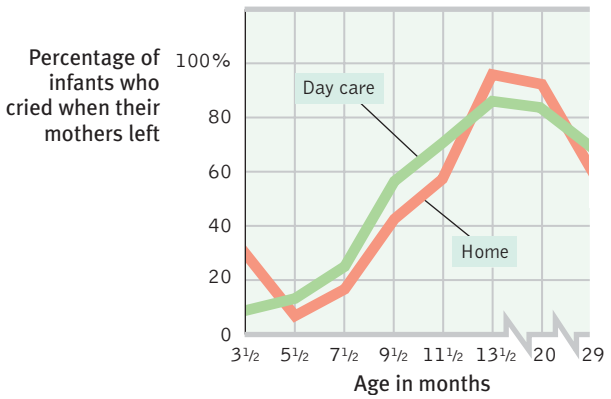


FIGURE 11.11 Infants' distress over separation from parents In an experiment, groups of infants were left by their mothers in an unfamiliar room. In both groups, the percentage who cried when the mother left peaked at about 13 months. Whether the infant had experienced day care made little difference. (From Kagan, 1976.)

Attachment and Adult Relationships

Developmental theorist Erik Erikson (1902–1994), working in collaboration with his wife, Joan Erikson, said that securely attached children approach life with a sense of **basic trust**—a sense that the world is predictable and reliable. He attributed basic trust not to environment or inborn temperament, but to early parenting. He theorized that infants blessed with sensitive, loving caregivers form a lifelong attitude of trust rather than fear.

Although debate continues, many researchers now believe that our early attachments form the foundation for our adult relationships and our comfort with affection and intimacy (Birnbaum et al., 2006; Fraley, 2002). Adult styles of romantic love do tend to exhibit secure, trusting attachment; insecure, anxious attachment; or the avoidance of attachment (Feeney & Noller, 1990; Rholes & Simpson, 2004; Shaver & Mikulincer, 2007). Moreover, these adult attachment styles in turn affect relationships with our children, as avoidant people find parenting more stressful and unsatisfying (Rholes et al., 2006).

"Out of the conflict between trust and mistrust, the infant develops hope, which is the earliest form of what gradually becomes faith in adults."
—Erik Erikson (1983)

Deprivation of Attachment

"What is learned in the cradle, lasts to the grave."
—French proverb

If secure attachment nurtures social competence, what happens when circumstances prevent a child from forming attachments? In all of psychology, there is no sadder research literature. Babies reared in institutions without the stimulation and attention of a regular caregiver, or locked away at home under conditions of abuse or extreme neglect, are often withdrawn, frightened, even speechless. Those abandoned in Romanian orphanages during the 1980s looked "frighteningly like [the Harlows'] monkeys" (Carlson, 1995). If institutionalized more than eight months, they often bore lasting emotional scars (Chisholm, 1998; Malinosky-Rummell & Hansen, 1993; Rutter et al., 1998).

The Harlows' monkeys bore similar scars if reared in total isolation, without even an artificial mother. As adults, when placed with other monkeys their age, they either cowered in fright or lashed out in aggression. When they reached sexual maturity, most were incapable of mating. If artificially impregnated, females often were neglectful, abusive, even murderous toward their first-born. A more recent primate study confirms the abuse-breeds-abuse phenomenon. Whether reared by biological or adoptive mothers, 9 of 16 females who were abused by their mothers became abusive parents, as did no female reared by a nonabusive mother (Maestripieri, 2005).

In humans, too, the unloved sometimes become the unloving. Most abusive parents—and many condemned murderers—report having been neglected or battered as children (Kempe & Kempe, 1978; Lewis et al., 1988). But does this mean that today's victim is predictably tomorrow's victimizer? No. Though most abusers were indeed abused, most abused children do *not* later become violent criminals or abusive parents. Most children growing up under adversity (as did the surviving children of the Holocaust) are *resilient;* they become normal adults (Helmreich, 1992; Masten, 2001).

But others, especially those who experience no sharp break from their abusive past, don't bounce back so readily. Some 30 percent of people who have been abused do abuse their children—a rate lower than that found in the primate study, but four times the U.S. national rate of child abuse (Dumont et al., 2007; Kaufman & Zigler, 1987; Widom, 1989a,b).

Extreme early trauma seems to leave footprints on the brain. If repeatedly threatened and attacked while young, normally placid golden hamsters grow up to be cowards when caged with same-sized hamsters, or bullies when caged with weaker ones (Ferris, 1996). Such animals show changes in the brain's serotonin system, a neurotransmitter that calms aggressive impulses. A similarly sluggish serotonin response has been found in abused children who become aggressive teens and adults. "Stress can set off a ripple of hormonal changes that permanently wire a child's brain to cope with a malevolent world," concludes abuse researcher Martin Teicher (2002).

Such findings help explain why young children terrorized through physical abuse or wartime atrocities (being beaten, witnessing torture, and living in constant fear) may suffer other lasting wounds—often nightmares, depression, and an adolescence troubled by substance abuse, binge eating, or aggression (Kendall-Tackett et al., 1993, 2004; Polusny & Follette, 1995; Trickett & McBride-Chang, 1995). Childhood sexual abuse, especially if severe and prolonged, places children at increased risk for health problems, psychological disorders, substance abuse, and criminality (Freyd et al., 2005; Tyler, 2002). Abuse victims are at considerable risk for depression *if* they carry a gene variation that spurs stress-hormone production (Bradley et al., 2008). As we will see again and again, behavior and emotion arise from a particular environment interacting with particular genes.

Parenting Styles

11-5: What are the three primary parenting styles, and what outcomes are associated with them?

Some parents spank, some reason. Some are strict, some are lax. Some show little affection, some liberally hug and kiss. Do such differences in parenting styles affect children?

The most heavily researched aspect of parenting has been how, and to what extent, parents seek to control their children. Investigators have identified three parenting styles:

1. ***Authoritarian*** parents impose rules and expect obedience: "Don't interrupt." "Keep your room clean." "Don't stay out late or you'll be grounded." "Why? Because I said so."
2. ***Permissive*** parents submit to their children's desires. They make few demands and use little punishment.
3. ***Authoritative*** parents are both demanding and responsive. They exert control by setting rules and enforcing them, but they also explain the reasons for rules. And, especially with older children, they encourage open discussion and allow some exceptions to rules.

Too hard, too soft, and just right, these styles have been called. Research indicates that children with the highest self-esteem, self-reliance, and social competence usually have warm, concerned, *authoritative* parents (Baumrind, 1996; Buri et al., 1988; Coopersmith, 1967). Those with authoritarian parents tend to have less social skill and self-esteem, and those with permissive parents tend to be more aggressive and immature. The participants in most studies have been middle-class White families, and some critics suggest that effective parenting may vary by culture. Yet studies with families of other races and in more than 200 cultures worldwide confirm the social and academic correlates of loving and authoritative parenting (Rohner & Veneziano, 2001; Sorkhabi, 2005; Steinberg & Morris, 2001).

A word of caution: The association between certain parenting styles (being firm but open) and certain childhood outcomes (social competence) is correlational. *Correlation is not causation.* (Perhaps you can imagine possible explanations for this parenting-competence link.)

Parents struggling with conflicting advice and with the stresses of child rearing should remember that *all advice reflects the advice giver's values.* For those who prize unquestioning obedience from a child, an authoritarian style may have the desired effect. For those who value children's sociability and self-reliance, authoritative firm-but-open parenting is advisable.

The investment in raising a child buys many years not only of joy and love but of worry and irritation. Yet for most people who become parents, a child is one's biological and social legacy—one's personal investment in the human future. Remind young adults of their mortality and they will express increased desire for children (Wisman & Goldenberg, 2005). To paraphrase psychiatrist Carl Jung, we reach backward into our parents and forward into our children, and through their children into a future we will never see, but about which we must therefore care.

"You are the bows from which your children as living arrows are sent forth."

—Kahlil Gibran, *The Prophet,* 1923

Infancy and Childhood

Module Review

11-1: During infancy and childhood, how do the brain and motor skills develop? Both heredity and experience sculpt the brain's nerve cells; their interconnections multiply rapidly after birth. Our complex motor skills—sitting, crawling, walking, running—develop in a predictable sequence, though timing is a function of individual *maturation* and culture. We have no conscious memories of events we experience before about age 3½, but physiological responses show that very young children have processed information they cannot verbally express.

11-2: From the perspectives of Piaget and of today's researchers, how does a child's mind develop? Piaget proposed that, through the processes of *assimilation* and *accommodation*, children actively construct and modify their understanding of the world while interacting with the world. They form *schemas* that help them organize their experiences. Progressing from the simplicity of the *sensorimotor stage* of the first two years, in which they develop *object permanence*, children move to more complex ways of thinking. In the *preoperational stage* they develop a *theory of mind* (absent in children with *autism*), but they are *egocentric* and unable to perform simple logical operations. At about age 6 or 7, children enter the *concrete operational stage* and can perform concrete operations, such as those required to comprehend the principle of *conservation* of substance. By about age 12, many enter the *formal operational stage* and can think logically about abstract ideas. Research supports the sequence Piaget proposed for human *cognition*. But young children's abilities develop earlier and more continuously than Piaget believed. The child's mind also grows through social interaction, as Vygotsky emphasized.

11-3: How do parent-infant attachment bonds form? At about 8 months, infants begin to display *stranger anxiety*. *Attachments* form not simply because parents gratify biological needs but, more important, because they are comfortable, familiar, and responsive. Humans do not experience the rigid attachment process, called *imprinting*, that occurs in ducks and other animals during a *critical period*.

11-4: How have psychologists studied children's differing attachments, and what have they learned? Strange situation experiments show that some children are securely attached and others are insecurely attached. Sensitive, responsive parents tend to have securely attached children. The attachment styles of early childhood may reappear in later relationships with loved ones. This lends support to Erikson's idea that *basic trust* is formed in infancy by our experiences with responsive caregivers. Children are very resilient. But those who are severely neglected by their parents and caregivers may be at risk for attachment problems.

11-5: What are the three primary parenting styles, and what outcomes are associated with them? Authoritarian parenting has been linked with lower social skills and self-esteem. Permissive parenting has been linked with aggressive and immature behaviors in children. Authoritative parenting is associated with high self-esteem, self-reliance, and social competence. But these findings are correlational and may reflect social and ethical differences rather than cause-effect.

Rehearse It!

1. Maturation, the orderly sequence of biological growth, explains why
   a. children with autism have difficulty inferring others' thoughts and feelings.
   b. most children have begun walking by about 12 months.
   c. early experiences have no effect on brain tissue.
   d. object permanence is present at birth.

2. Between ages 3 and 6, the human brain experiences the greatest growth in the _____ lobes, which we use for rational planning, and which continue developing at least into adolescence.
   a. parietal
   b. temporal
   c. frontal
   d. occipital

3. Which of the following is true of motor-skill development?
   a. It is determined solely by genetic factors.
   b. The sequence, but not the timing, is universal.
   c. The timing, but not the sequence, is universal.
   d. It is determined solely by environmental factors.

4. During the preoperational stage, a young child's thinking is
   a. abstract.
   b. negative.
   c. conservative.
   d. egocentric.

5. Children acquire the mental operations necessary to understand conservation during the
   a. sensorimotor stage.
   b. preoperational stage.
   c. concrete operational stage.
   d. formal operational stage.

6. Although Piaget's stage theory continues to inform our understanding of children's thinking, many researchers believe that
   a. Piaget's "stages" begin earlier and development is more continuous than he realized.
   b. children do not progress as rapidly as Piaget predicted.
   c. few children really progress to the concrete operational stage.
   d. there is no way of testing much of Piaget's theoretical work.

7. Faced with a new babysitter, an 8-month-old infant often shows distress, a behavior referred to as
   a. conservation.
   b. stranger anxiety.
   c. imprinting.
   d. maturation.

8. In a series of experiments, the Harlows found that monkeys raised with artificial mothers tended, when afraid, to cling to

a. the wire mother.
b. the cloth mother.
c. whichever mother held the feeding bottle.
d. other infant monkeys.

9. From the very first weeks of life, infants differ in their characteristic emotional reactions, with some infants being intense and anxious, while others are easygoing and relaxed. These differences are usually explained as differences in

a. attachment.
b. imprinting.
c. temperament.
d. parental responsiveness.

Answers: 1. b, 2. c, 3. b, 4. d, 5. c, 6. a, 7. b, 8. b, 9. c.

Terms and Concepts to Remember

maturation, p. 149
cognition, p. 151
schema, p. 152
assimilation, p. 152
accommodation, p. 152
sensorimotor stage, p. 152
object permanence, p. 152
preoperational stage, p. 153
conservation, p. 154
egocentrism, p. 154
theory of mind, p. 154
concrete operational stage, p. 155
formal operational stage, p. 155
autism, p. 156
stranger anxiety, p. 158
attachment, p. 158
critical period, p. 159
imprinting, p. 159
basic trust, p. 161

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. We all learned to walk as infants, and we retain that learning as adults. Yet we would be unable to consciously recall just how we achieved this feat. Why can't we reconstruct those memories?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

12

Adolescence

How will you look back on your life 10 years from now? Are you making choices that someday you will recollect with satisfaction?

Many psychologists once believed that childhood sets our traits. Today's developmental psychologists see development as lifelong. At a five-year high school reunion, former best friends may be surprised at their divergence; a decade later, they may have trouble sustaining a conversation.

As the *life-span perspective* emerged, psychologists began to look at how maturation and experience shape us not only in infancy and childhood, but also in adolescence and beyond. **Adolescence**—the years spent morphing from child to adult—starts with the physical beginnings of sexual maturity and ends with the social achievement of independent adult status (which means that in some cultures, where teens are self-supporting, adolescence hardly exists).

G. Stanley Hall (1904), one of the first psychologists to describe adolescence, believed that the tension between biological maturity and social dependence creates a period of "storm and stress." Indeed, after age 30, many who grow up in independence-fostering Western cultures look back on their teenage years as a time they would not want to relive, a time when their peers' social approval was imperative, their sense of direction in life was in flux, and their feeling of alienation from their parents was deepest (Arnett, 1999; Macfarlane, 1964).

But for many, adolescence is a time of vitality without the cares of adulthood, a time of rewarding friendships, heightened idealism, and a growing sense of life's exciting possibilities.

Physical Development

12-1: What physical changes mark adolescence?

Adolescence begins with **puberty,** the time when we mature sexually. Puberty follows a surge of hormones, which may intensify moods and which trigger a two-year period of rapid physical development, usually beginning at about age 11 in girls and at about age 13 in boys. About the time of puberty, boys' growth propels them to greater height than their female counterparts (**FIGURE 12.1**). During this growth spurt, the **primary sex characteristics**—the reproductive organs and external genitalia—develop dramatically. So do **secondary sex characteristics,**

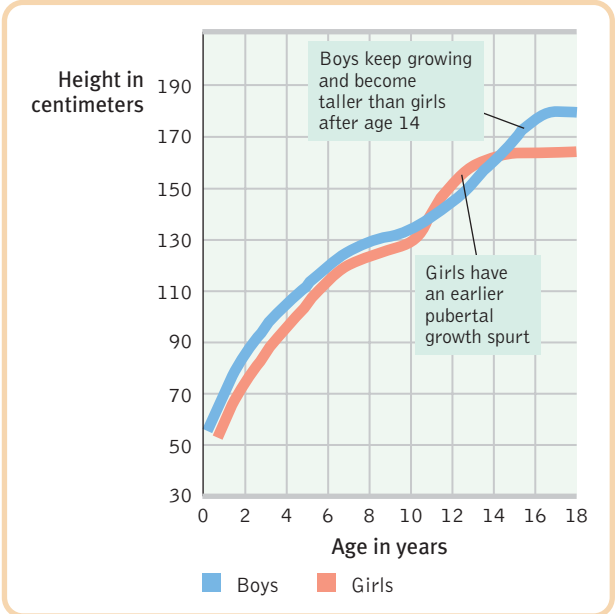


FIGURE 12.1 Height differences Throughout childhood, boys and girls are similar in height. At puberty, girls surge ahead briefly, but then boys overtake them at about age 14. (Data from Tanner, 1978.) Sexual development and growth spurts are now beginning somewhat earlier than was the case a half-century ago (Herman-Giddens et al., 2001).

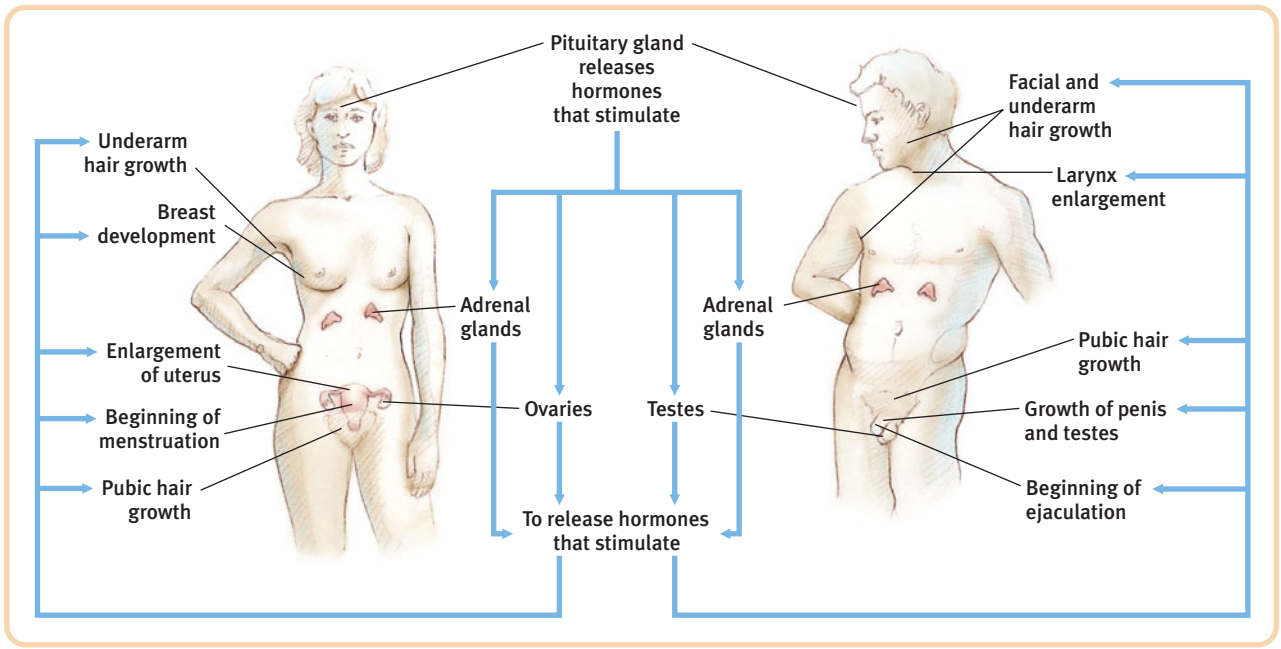


FIGURE 12.2 Body changes at puberty
At about age 11 in girls and age 13 in boys, a surge of hormones triggers a variety of physical changes.

the nonreproductive traits such as breasts and hips in girls, facial hair and deepened voice in boys, pubic and underarm hair in both sexes (**FIGURE 12.2**). A year or two before puberty, however, boys and girls often feel the first stirrings of attraction toward those of the other (or their own) sex (McClintock & Herdt, 1996).

In girls, puberty starts with breast development, which now often begins by age 10 (Brody, 1999). But puberty's landmarks are the first ejaculation in boys *(spermarche)*, usually by about age 14, and the first menstrual period in girls (**menarche**—meh-NAR-key), usually within a year of age 12½ (Anderson et al., 2003). Nearly all adult women recall their first menstrual period and remember experiencing a mixture of pride, excitement, embarrassment, and apprehension (Greif & Ulman, 1982; Woods et al., 1983). Girls who have been prepared for menarche usually experience it as a positive life transition. Most men similarly recall their first ejaculation, which usually occurs as a nocturnal emission (Fuller & Downs, 1990).

Menarche appears to occur a few months earlier, on average, for girls who have experienced stresses related to father absence or sexual abuse (Vigil et al., 2005; Zabin et al., 2005).

Just as in the earlier life stages, the *sequence* of physical changes in puberty (for example, breast buds and visible pubic hair before menarche) is far more predictable than their *timing.* Some girls start their growth spurt at 9, some boys as late as age 16. Though such variations have little effect on height at maturity, they may have psychological consequences. For boys, early maturation pays dividends: Being stronger and more athletic during their early teen years, they tend to be more popular, self-assured, and independent, though also more at risk for alcohol use, delinquency, and premature sexual activity (Lynne et al., 2007; Steinberg & Morris, 2001). For girls, early maturation can be stressful (Mendle et al., 2007). If a young girl's body is out of sync with her own emotional maturity and her friends' physical development and experiences, she may begin associating with older adolescents or may suffer teasing or sexual harassment. It is not only when we mature that counts, but how people react to our genetically influenced physical development. Remember: *Heredity and environment interact.*

An adolescent's brain is also a work in progress. As teens mature, their frontal lobes continue to develop. The growth of *myelin,* the fatty tissue that forms around axons and speeds neurotransmission, enables better communication with other brain regions (Kuhn, 2006; Silveri et al., 2006). These developments bring improved judgment, impulse control, and the ability to plan for the long term.

Frontal lobe maturation lags the emotional limbic system. Puberty's hormonal surge and limbic system development help explain teens' occasional impulsiveness, risky behaviors, emotional storms—slamming doors and turning up the music (Casey et al., 2008). No wonder younger teens (whose unfinished frontal lobes

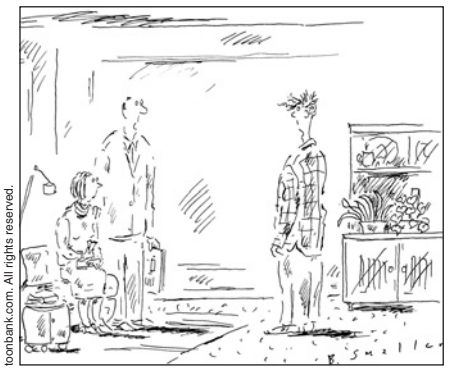
adolescence the transition period from childhood to adulthood, extending from puberty to independence.

puberty the period of sexual maturation, during which a person becomes capable of reproducing.

primary sex characteristics the body structures (ovaries, testes, and external genitalia) that make sexual reproduction possible.

secondary sex characteristics nonreproductive sexual characteristics, such as female breasts and hips, male voice quality, and body hair.

menarche [meh-NAR-key] the first menstrual period.



"Young man, go to your room and stay there until your cerebral cortex matures."

aren't yet fully equipped for making long-term plans and curbing impulses) so often succumb to the lure of smoking, which most adult smokers could tell them they will later regret. Teens actually don't underestimate the risks of smoking—or fast driving or unprotected sex—they just, when reasoning from their gut, weigh the benefits more heavily (Reyna & Farley, 2006; Steinberg, 2007).

So, when Junior drives recklessly and academically self-destructs, should his parents reassure themselves that "he can't help it; his frontal cortex isn't yet fully grown"? They can at least take hope: The brain with which Junior begins his teens differs from the brain with which he will end his teens. Unless he slows his brain development with heavy drinking—leaving him prone to impulsivity and addiction—his frontal lobes will continue maturing until about age 25 (Beckman, 2004; Crews et al., 2007).

In 2004, the American Psychological Association joined seven other medical and mental health associations in filing U.S. Supreme Court briefs, arguing against the death penalty for 16- and 17-years-olds. The briefs documented the teen brain's immaturity "in areas that bear upon adolescent decision-making." Teens are "less guilty by reason of adolescence," suggested psychologist Laurence Steinberg and law professor Elizabeth Scott (2003). In 2005, by a 5-to-4 margin, the Court concurred, declaring juvenile death penalties unconstitutional.

"If a gun is put in the control of the prefrontal cortex of a hurt and vengeful 15-year-old, and it is pointed at a human target, it will very likely go off."

—National Institutes of Health brain scientist Daniel R. Weinberger, "A Brain Too Young for Good Judgment," 2001

"When the pilot told us to brace and grab our ankles, the first thing that went through my mind was that we must all look pretty stupid."

—Jeremiah Rawlings, age 12, after a 1989 DC-10 crash in Sioux City, Iowa

Cognitive Development

12-2: How did Piaget and Kohlberg describe adolescent cognitive and moral development?

As young teenagers become capable of thinking about their thinking, and of thinking about other people's thinking, they begin imagining what other people are thinking about *them*. (Adolescents might worry less if they understood their peers' similar preoccupation.) As their cognitive abilities mature, many begin to think about what is ideally possible and compare that with the imperfect reality of their society, their parents, and even themselves.

"Ben is in his first year of high school, and he's questioning all the right things."

Developing Reasoning Power

During the early teen years, reasoning is often self-focused. Adolescents may think their private experiences are unique, something parents just could not understand: "But, Mom, *you* don't really know how it feels to be in love" (Elkind, 1978).

Gradually, though, most achieve the intellectual summit Piaget called *formal operations*, and they become more capable of abstract reasoning. Adolescents ponder and debate human nature, good and evil, truth and justice. Having left behind the concrete images of early childhood, they may now seek a deeper conception of God and existence (Elkind, 1970; Worthington, 1989). The ability to reason hypothetically and deduce consequences also enables them to detect inconsistencies in others' reasoning and to spot hypocrisy. This can lead to heated debates with parents and silent vows never to lose sight of their own ideals (Peterson et al., 1986).

Developing Morality

Two crucial tasks of childhood and adolescence are discerning right from wrong and developing character—the psychological muscles for controlling impulses. Much of our morality is rooted in gut-level reactions, for which the mind seeks rationalization (Haidt, 2006). Often, reason justifies passions such as disgust or liking. Yet to be a moral person is to *think* morally and *act* accordingly.

Piaget (1932) believed that children's moral judgments build on their cognitive development. Agreeing with Piaget, Lawrence Kohlberg (1981, 1984) sought to describe the development of *moral reasoning*, the thinking that occurs as we consider right and wrong. Kohlberg posed moral dilemmas (for example, whether a person

William Thomas Cain/Getty Images

AP/Wide World Photos

Demonstrating their reasoning ability Although on opposite sides of the Iraq war debate, these teens are demonstrating their ability to think logically about abstract topics. According to Piaget, they are in the final cognitive stage, formal operations.

should steal medicine to save a loved one's life) and asked children, adolescents, and adults if the action was right or wrong. He then analyzed their answers for evidence of stages of moral thinking.

His findings led him to believe that as we develop intellectually, we pass through three basic levels of moral thinking:

- ***Preconventional morality*** Before age 9, most children's morality focuses on self-interest: They obey rules either to avoid punishment or to gain concrete rewards.
- ***Conventional morality*** By early adolescence, morality focuses on caring for others and on upholding laws and social rules, simply because they are the laws and rules.
- ***Postconventional morality*** With the abstract reasoning of formal operational thought, people may reach a third moral level. Actions are judged "right" because they flow from people's rights or from self-defined, basic ethical principles.

Kohlberg claimed these levels form a moral ladder. As with all stage theories, the sequence is unvarying. We begin on the bottom rung and ascend to varying heights.

Research confirms that children in various cultures progress from Kohlberg's preconventional level into his conventional level (Gibbs et al., 2007). The postconventional level is more controversial. It appears mostly in the European and North American educated middle class, which prizes *individualism*—giving priority to one's own goals rather than to group goals (Eckensberger, 1994; Miller & Bersoff, 1995). Critics have therefore contended that Kohlberg's theory is biased against the moral reasoning of members of collectivist societies such as China and India. Moreover, people's thinking about real-world moral choices also engages their emotions, and moral feelings don't easily fit into Kohlberg's neat stages (Krebs & Denton, 2005).

"I am a bit suspicious of any theory that says that the highest moral stage is one in which people talk like college professors."

—James Q. Wilson, *The Moral Sense,* 1993

AP Photo/Eric Gray

Moral reasoning New Orleans Hurricane Katrina victims were faced with a moral dilemma: Should they help themselves to household necessities? Their reasoning likely reflected different levels of moral thinking, even if they behaved similarly.

"It is a delightful harmony when doing and saying go together."

—Michel Eyquem de Montaigne (1533–1592)

Many character-education programs therefore tend to focus both on thinking about moral issues but also on *doing* the right thing. They teach children *empathy* for others' feelings and also the self-discipline needed to restrain one's own impulses—to delay small gratifications now to enable bigger rewards later. Those who do learn to *delay gratification* become more socially responsible, academically successful, and productive (Funder & Block, 1989; Mischel et al., 1988, 1989). In service-learning programs, teens tutor, clean up their neighborhoods, and assist the elderly, and their sense of competence and desire to serve increase at the same time that their school absenteeism and drop-out rates diminish (Andersen, 1998; Piliavin, 2003). Moral action feeds moral attitudes.

Social Development

12-3: What are the social tasks and challenges of adolescence?

Theorist Erik Erikson (1963) contended that each stage of life has its own *psychosocial* task, a crisis that needs resolution. Young children wrestle with issues of *trust,* then *autonomy* (independence), then *initiative* (**TABLE 12.1**). School-age children strive for *competence,* feeling able and productive. The adolescent's task, said Erikson, is to synthesize past, present, and future possibilities into a clearer sense of self. Adolescents wonder, "Who am I as an individual? What do I want to do with my life? What values should I live by? What do I believe in?" Erikson called this quest the adolescent's *search for identity.*

Forming an Identity

To refine their sense of identity, adolescents in individualistic cultures usually try out different "selves" in different situations. They may act out one self at home, another with friends, and still another at school or on Facebook. If two situations overlap—as when a teenager brings home friends—the discomfort can be considerable.

Jeff Greenberg/PhotoEdit

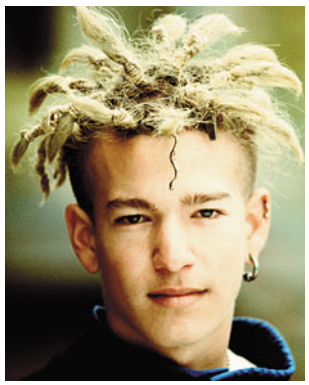
Competence vs. inferiority

John Eastcott/Yves Momatiuk/The Image Works

Intimacy vs. isolation

TABLE 12.1 Erikson's Stages of Psychosocial Development

Stage (approximate age)	Issue	Description of Task
Infancy (to 1 year)	Trust vs. mistrust	If needs are dependably met, infants develop a sense of basic trust.
Toddlerhood (1 to 3 years)	Autonomy vs. shame and doubt	Toddlers learn to exercise their will and do things for themselves, or they doubt their abilities.
Preschool (3 to 6 years)	Initiative vs. guilt	Preschoolers learn to initiate tasks and carry out plans, or they feel guilty about their efforts to be independent.
Elementary school (6 years to puberty)	Industry vs. inferiority	Children learn the pleasure of applying themselves to tasks, or they feel inferior.
Adolescence (teen years into 20s)	Identity vs. role confusion	Teenagers work at refining a sense of self by testing roles and then integrating them to form a single identity, or they become confused about who they are.
Young adulthood (20s to early 40s)	Intimacy vs. isolation	Young adults struggle to form close relationships and to gain the capacity for intimate love, or they feel socially isolated.
Middle adulthood (40s to 60s)	Generativity vs. stagnation	In middle age, people discover a sense of contributing to the world, usually through family and work, or they may feel a lack of purpose.
Late adulthood (late 60s and up)	Integrity vs. despair	Reflecting on his or her life, an older adult may feel a sense of satisfaction or failure.



Leland Bobbe/Getty Images

Matthias Clamer/Getty Images

Who shall I be today? By varying the way they look, adolescents try out different "selves." Although we eventually form a consistent and stable sense of identity, the self we present may change with the situation.

identity our sense of self; according to Erikson, the adolescent's task is to solidify a sense of self by testing and integrating various roles.

social identity the "we" aspect of our self-concept; the part of our answer to "Who am I?" that comes from our group memberships.

intimacy in Erikson's theory, the ability to form close, loving relationships; a primary developmental task in late adolescence and early adulthood.

The teen asks, "Which self should I be? Which is the real me?" The resolution is a self-definition that unifies the various selves into a consistent and comfortable sense of who one is—an **identity.**

For both adolescents and adults, group identities often form around how we differ from those around us. When living in Britain, I became conscious of my Americanness. When spending time with my daughter in South Africa, I become conscious of my minority (White) race. When surrounded by women, I am mindful of my gender identity. For international students, for people with a disability, for those on a team, a **social identity** often forms around their distinctiveness.

"Self-consciousness, the recognition of a creature by itself as a 'self,' [cannot] exist except in contrast with an 'other,' a something which is not the self."

—C. S. Lewis, *The Problem of Pain,* 1940

But not always. Erikson noticed that some adolescents forge their identity early, simply by adopting their parents' values and expectations. (Traditional, less individualistic cultures inform adolescents about who they are, rather than encouraging them to decide on their own.) Other adolescents may adopt an identity defined in opposition to parents but in conformity with a particular peer group—jocks, preps, geeks, goths.

Most young people do develop a sense of contentment with their lives. When American teens were asked whether a series of statements described them, 81 percent said *yes* to "I would choose my life the way it is right now." But others never quite seem to find themselves: The other 19 percent agreed with "I wish I were somebody else." In response to another question, 28 percent agreed that "I often wonder why I exist" (Lyons, 2004). Reflecting on their existence, 75 percent of American collegians say they "discuss religion/spirituality" with friends, "pray," and agree that "we are all spiritual beings" and "search for meaning/purpose in life" (Astin et al., 2004; Bryant & Astin, 2007). This would not surprise Stanford psychologist William Damon and his colleagues (2003), who contend that a key task of adolescent development is to achieve a purpose—a desire to accomplish something personally meaningful that makes a difference to the world beyond oneself.

The late teen years, when many people in industrialized countries begin attending college or working full time, provide new opportunities for trying out possible roles. Many college seniors have achieved a clearer identity and a more positive self-concept than they had as first-year students (Waterman, 1988). In several nationwide studies, researchers have given young Americans tests of self-esteem. (Sample item: "I am able to do things as well as most other people.") During the early to mid-teen years, self-esteem falls and, for girls, depression scores often increase, but then self-image rebounds during the late teens and twenties (Robins et al., 2002; Twenge & Campbell, 2001; Twenge & Nolen-Hoeksema, 2002).

Erikson contended that the adolescent identity stage is followed in young adulthood by a developing capacity for **intimacy.** With a clear and comfortable sense of who you are, said Erikson, you are ready to form emotionally close relationships. Such relationships are, for most of us, a source of great pleasure. When Mihaly Csikszentmihalyi (pronounced chick-SENT-me-hi) and Jeremy Hunter (2003) used a beeper to sample the daily experiences of American teens, they found them unhappiest when alone and happiest when with friends. As Aristotle long ago recognized, we humans are "the social animal."

© David Sipress

"She says she's someone from your past who gave birth to you, and raised you, and sacrificed everything so you could have whatever you wanted."

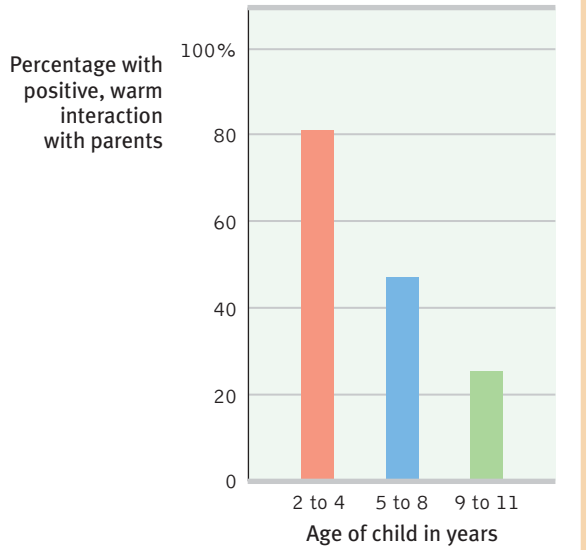


FIGURE 12.3 The changing parent-child relationship Interviews from a large, national study of Canadian families reveal that the typically close, warm relationships between parents and preschoolers loosen as children become older. (Data from Statistics Canada, 1999.)

Parent and Peer Relationships

As adolescents in Western cultures seek to form their own identities, they begin to pull away from their parents (Shanahan et al., 2007). The preschooler who can't be close enough to her mother, who loves to touch and cling to her, becomes the 14-year-old who wouldn't be caught dead holding hands with Mom. The transition occurs gradually (**FIGURE 12.3**). By adolescence, arguments occur more often, usually over mundane things—household chores, bedtime, homework (Tesser et al., 1989). Parent-child conflict during the transition to adolescence tends to be greater with first-born than with second-born children (Shanahan et al., 2007).

For a minority of parents and their adolescents, differences lead to real splits and great stress (Steinberg & Morris, 2001). But most disagreements are at the level of harmless bickering. And most adolescents—6000 of them in 10 countries, from Australia to Bangladesh to Turkey—have said that they like their parents (Offer et al., 1988). "We usually get along but . . . ," adolescents often report (Galambos, 1992; Steinberg, 1987).

"I love u guys."

—Emily Keyes' final text message to her parents before dying in a Colorado school shooting, 2006

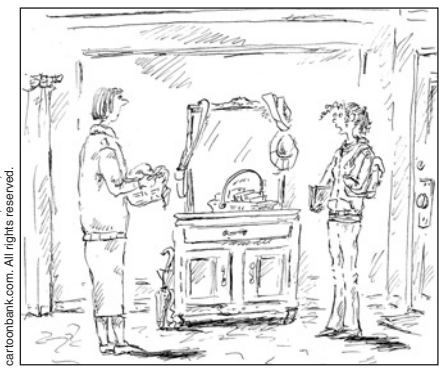
Positive parent-teen relations and positive peer relations often go hand-in-hand. High school girls who have the most affectionate relationships with their mothers tend also to enjoy the most intimate friendships with girlfriends (Gold & Yanof, 1985). And teens who feel close to their parents tend to be healthy and happy and to do well in school (Resnick et al., 1997). Of course, we can state this correlation the other way: Misbehaving teens are more likely to have tense relationships with parents and other adults.

Adolescence is typically a time of diminishing parental influence and growing peer influence. Asked in a survey if they had "ever had a serious talk" with their child about illegal drugs, 85 percent of American parents answered *yes.* But if the parents had indeed given this earnest advice, many teens apparently had tuned it out: Only 45 percent could recall such a talk (Morin & Brossard, 1997).

Heredity does much of the heavy lifting in forming individual personality differences, and parent and peer influences do much of the rest. Most teens are herd animals. They talk, dress, and act more like their peers than their parents. In 2008, according to a Nielsen study, the average American 13- to 17-year old sent or received more than 1700 text messages a month (Steinhauer & Holson, 2008). Many adolescents become absorbed by Internet social networking through sites such as chat rooms, Facebook, and MySpace. For better or for worse—and sometimes with a compulsive use that produces "Facebook fatigue"—online communication stimulates intimate self-disclosure (Subrahmanyam & Greenfield, 2008; Valkenburg & Peter, 2009). What their friends are, they often become, and what "everybody's doing," they often do. In teen calls to hotline counseling services, peer relationships have been the most discussed topic (Boehm et al., 1999).

For those who feel excluded, the pain is acute. "The social atmosphere in most high schools is poisonously clique-driven and exclusionary," observed social psychologist Elliot Aronson (2001). Most excluded "students suffer in silence. . . . A small number act out in violent ways against their classmates." They are also vulnerable to loneliness, low self-esteem, and depression (Steinberg & Morris, 2001). Most children and youth, however, benefit from their friendships (Berndt & Murphy, 2002). A positive academic reputation among their peers helps boost their academic self-concept and performance (Gest et al., 2008). In ways both bad and good, peer approval matters.

Teens see their parents as having more influence in other areas—for example, in shaping their religious faith and in thinking about college and career choices (*Emerging Trends,* 1997). A Gallup Youth Survey reveals that most share their parent's political views (Lyons, 2005).



"How was my day? How was my day? Must you micromanage my life?"

Emerging Adulthood

12-4: What is emerging adulthood?

In young adulthood, emotional ties with parents loosen further. During their early twenties, many people still lean heavily on their parents. But by the late twenties, most feel more comfortably independent and better able to empathize with parents as fellow adults (Frank, 1988; White, 1983). This graduation from adolescence to adulthood is now taking longer in some cultures.

In the Western world, adolescence now roughly corresponds to the teen years. At earlier times, and still today in other parts of the world, this slice of the life span has been much smaller (Baumeister & Tice, 1986). Shortly after sexual maturity, such societies bestowed adult responsibilities and status on the young person, often marking the event with an elaborate initiation—a public *rite of passage*. With society's blessing, the new adult would then work, marry, and have children.

With compulsory schooling, independence has been occurring later in many Western industrialized countries. From Europe to Australia, adolescents now take more time to finish college, leave the nest, and establish careers. In the United States, for example, the average age at first marriage varies by ethnic group but has increased more than four years since 1960 (to 27 for men, 25 for women).

While cultural traditions were changing, Western adolescents were also beginning to develop earlier. Today's earlier sexual maturity is related both to increased body fat (which can support pregnancy and nursing) and to weakened parent-child bonds, including absent fathers (Ellis, 2004). Together, delayed independence and earlier sexual maturity have widened the once-brief interlude between biological maturity and social independence (**FIGURE 12.4**).

Especially for those still in school, the time from 18 to the mid-twenties is an increasingly not-yet-settled phase of life, which some now call **emerging adulthood** (Arnett, 2006, 2007; Reitzle, 2006). Unlike some other cultures with an abrupt transition to adulthood, Westerners typically ease their way into their new status. Those who leave home for college, for example, are separated from parents and, more than ever before, managing their time and priorities. Yet they may remain dependent on their parents' financial and emotional support and may return home for holidays. For many others, their parents' home may be the only affordable place to live. No longer adolescents, these emerging adults have not yet assumed full adult responsibilities and independence, and they feel "in between." But adulthood emerges gradually, and often with diminishing bouts of depression or anger and increased self-esteem (Galambos et al., 2006).

"When I was your age, I was an adult."

emerging adulthood for some people in modern cultures, a period from the late teens to mid-twenties, bridging the gap between adolescent dependence and full independence and responsible adulthood.

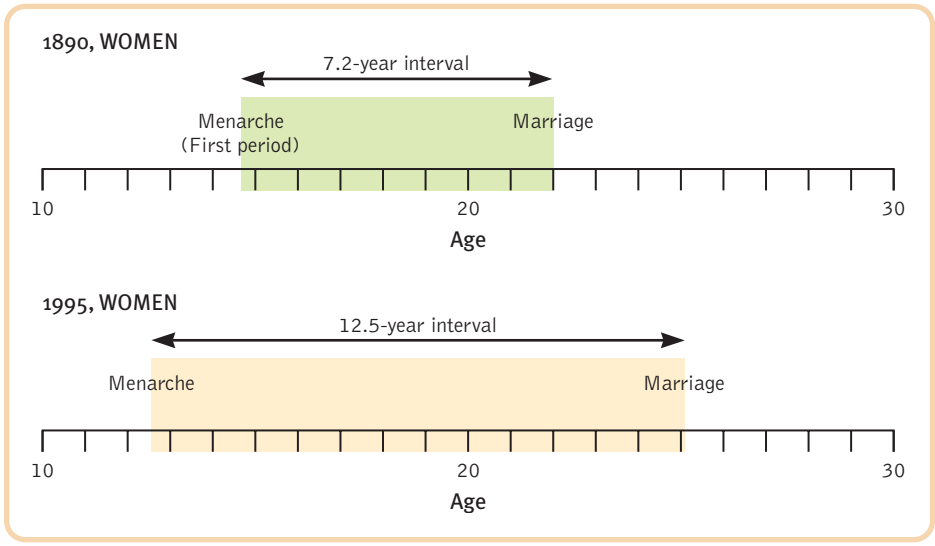


FIGURE 12.4 The transition to adulthood is being stretched from both ends In the 1890s, the average interval between a woman's first menstrual period and marriage, which typically marked a transition to adulthood, was about 7 years; in industrialized countries today it is about 12 years (Guttmacher, 1994, 2000). Although many adults are unmarried, later marriage combines with prolonged education and earlier menarche to help stretch out the transition to adulthood.

Adolescence

Module Review

12-1: What physical changes mark adolescence? *Adolescence* is the transition period between *puberty* and social independence. During puberty, both *primary* and *secondary sex characteristics* develop dramatically. Boys seem to benefit from early maturation, girls from late maturation. During adolescence, the growth of myelin speeds neurotransmission and the brain's frontal lobes continue to develop, enabling improved judgment, impulse control, and long-term planning.

12-2: How did Piaget and Kohlberg describe adolescent cognitive and moral development? Piaget theorized that adolescents develop a capacity for formal operations and that this development is the foundation for moral judgment. Kohlberg proposed a three-stage theory of moral reasoning, from a preconventional morality of self-interest, to a conventional morality concerned with upholding laws and social rules, to (in some people) a postconventional morality of universal ethical principles. Kohlberg's critics argue that his theory represents morality from the perspective of middle-class individualists, and that it also fails to account for moral actions and emotions.

12-3: What are the social tasks and challenges of adolescence? Erikson theorized that the psychosocial task of adolescence is solidifying a sense of self—an *identity*. This often means "trying on" a number of different selves. During adolescence, parental influence diminishes and peer influence increases.

12-4: What is emerging adulthood? The transition from adolescence to adulthood is now taking longer. *Emerging adulthood* is the period from age 18 to the mid-twenties, when many young people are not yet fully independent. Critics note that this stage is found mostly in today's Western cultures.

Rehearse It!

1. Adolescence is marked by the onset of
   a. an identity crisis.
   b. puberty.
   c. separation anxiety.
   d. parent-child conflict.

2. Primary sex characteristics relate to _____; secondary sex characteristics refer to _____.
   a. ejaculation; menarche
   b. breasts and facial hair; ovaries and testes
   c. emotional maturity; hormone surges
   d. reproductive organs; nonreproductive traits

3. According to Piaget, the ability to think logically about abstractions indicates
   a. concrete operational thought.
   b. egocentrism.
   c. formal operational thought.
   d. conservation.

4. According to Kohlberg, preconventional morality focuses on _____; conventional morality is more concerned with _____.
   a. upholding laws and social rules; self-interest
   b. self-interest; basic ethical principles
   c. upholding laws and social rules; basic ethical principles
   d. self-interest; upholding laws and social rules

5. In Erikson's stages, the primary task during adolescence is
   a. attaining formal operations.
   b. forging an identity.
   c. developing a sense of intimacy with another person.
   d. living independent of parents.

6. Some developmental psychologists now refer to the period from age 18 to the mid-twenties and beyond (up to the time of social independence) as
   a. emerging adulthood.
   b. adolescence.
   c. formal operations.
   d. true maturity.

Answers: 1. b, 2. d, 3. c, 4. d, 5. b, 6. a.

Terms and Concepts to Remember

adolescence, p. 166
puberty, p. 166
primary sex characteristics, p. 166
secondary sex characteristics, p. 166
menarche [meh-NAR-key], p. 167
identity, p. 171
social identity, p. 171
intimacy, p. 171
emerging adulthood, p. 173

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. A counselor has advised a teenager's frustrated parents that his behavior may improve when his brain matures. What evidence supports the counselor's suggestion?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 13

Adulthood

Physical Development

Cognitive Development

Social Development

At one time, psychologists viewed the center-of-life years between adolescence and old age as one long plateau. No longer. Those who follow the unfolding of people's adult lives now believe our development continues.

It is more difficult to generalize about adulthood stages than about life's early years. If you know that James is a 1-year-old and Jamal is a 10-year-old, you could say a great deal about each child. Not so with adults who differ by a similar number of years. The boss may be 30 or 60; the marathon runner may be 20 or 50; the 19-year-old may be a parent who supports a child or a child who receives an allowance. Yet our life courses are in some ways similar. Physically, cognitively, and especially socially, we are at age 50 different from our 25-year-old selves. In the discussion that follows, we recognize these differences and use three terms: *early adulthood* (roughly twenties and thirties), *middle adulthood* (to age 65), and *late adulthood* (the years after 65). Remember, though, that within each of these stages, people vary widely in physical, psychological, and social development.

Rick Doyle/Corbis

Adult abilities vary widely Eighty-seven-year-olds: Don't try this. In 2002, George Blair became the world's oldest barefoot water skier, 18 days after his eighty-seventh birthday.

Physical Development

13-1: What physical changes occur during middle and late adulthood?

"I am still learning."
—Michelangelo, 1560, at age 85

Our physical abilities—muscular strength, reaction time, sensory keenness, and cardiac output—all crest by the mid-twenties. Like the declining daylight after the summer solstice, the decline of physical prowess begins imperceptibly. Athletes are often the first to notice. World-class sprinters and swimmers peak by their early twenties. Women—who mature earlier than men—also peak earlier. But most of us—especially those of us whose daily lives do not require top physical performance—hardly perceive the early signs of decline.

How old does a person have to be before you think of him or her as old? The average 18- to 29-year-old says 67. The average person 60 and over says 76 (Yankelovich, 1995).

Physical Changes in Middle Adulthood

Middle-aged athletes know all too well that physical decline gradually accelerates (**FIGURE 13.1** on the next page). As a 66-year-old who plays basketball, I now find myself occasionally wondering whether my team really needs me to run for that loose ball. But even diminished vigor is sufficient for normal activities. Moreover, during early and middle adulthood, physical vigor has less to do with age than with a person's health and exercise habits. Many of today's physically fit 50-year-olds run four miles with ease, while sedentary 25-year-olds find themselves huffing and puffing up two flights of stairs.

Aging also brings a gradual decline in fertility. For a 35- to 39-year-old woman, the chances of getting pregnant after a single act of intercourse are only half those of a woman 19 to 26 (Dunson et al., 2002). A woman's foremost biological sign of aging, the onset of **menopause,** ends her menstrual cycles, usually within a few years of age 50. Will she see it as a sign that she is losing her femininity and growing old? Or will she view it as liberation from menstrual periods and fears of pregnancy? As in so many areas, her expectations and attitudes will influence the emotional impact of this event.

"Happy fortieth. I'll take the muscle tone in your upper arms, the girlish timbre of your voice, your amazing tolerance for caffeine, and your ability to digest french fries. The rest of you can stay."

menopause the time of natural cessation of menstruation; also refers to the biological changes a woman experiences as her ability to reproduce declines.

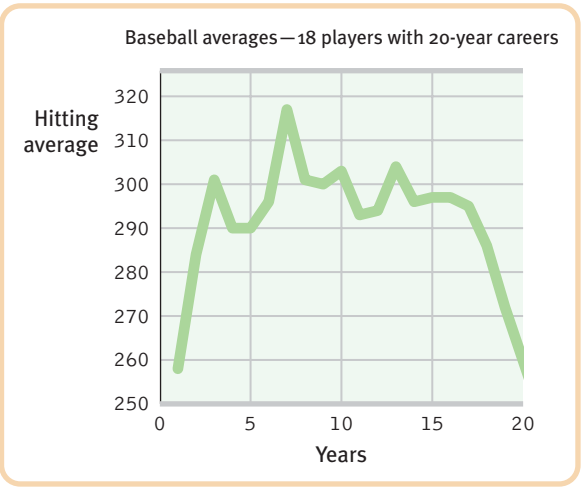


FIGURE 13.1 Gradually accelerating decline An analysis of aging and batting averages of twentieth-century major league baseball players revealed a gradual but accelerating decline in players' later years (Schall & Smith, 2000).

"If the truth were known, we'd have to diagnose [older women] as having P.M.F.—Post-Menstrual Freedom."

—Social psychologist Jacqueline Goodchilds (1987)

Men experience no equivalent to menopause—no cessation of fertility, no sharp drop in sex hormones. They do experience a gradual decline in sperm count, testosterone level, and speed of erection and ejaculation. Some may also experience distress related to their perception of declining virility and physical capacities. But most age without such problems.

In a national survey of Canadians ages 40 to 64, only 3 in 10 rated their sex life as less enjoyable than during their twenties (Wright, 2006). After middle age, most men and women remain capable of satisfying sexual activity. In another survey by the National Council on Aging, 39 percent of people over 60 expressed satisfaction with the amount of sex they were having and 39 percent said they wished for sex more frequently (Leary, 1998). And in an American Association of Retired Persons sexuality survey, it was not until age 75 or older that most women and nearly half of men reported little sexual desire (DeLamater & Sill, 2005).

"The things that stop you having sex with age are exactly the same as those that stop you riding a bicycle (bad health, thinking it looks silly, no bicycle)."

—Alex Comfort, *The Joy of Sex*, 2002

Physical Changes in Later Life

Is old age "more to be feared than death" (Juvenal, *Satires*)? Or is life "most delightful when it is on the downward slope" (Seneca, *Epistulae ad Lucilium*)? What is it like to grow old?

Sensory Abilities

"For some reason, possibly to save ink, the restaurants had started printing their menus in letters the height of bacteria."

—Dave Barry, *Dave Barry Turns Fifty*, 1998

Although physical decline begins in early adulthood, we are not usually acutely aware of it until later life, when the stairs get steeper, the print gets smaller, and other people seem to mumble more. Visual sharpness diminishes, and distance perception and adaptation to changes in light level are less acute. Muscle strength, reaction time, and stamina also diminish noticeably, as do vision, the sense of smell, and hearing (**FIGURE 13.2**). In Wales, teens' loitering around a convenience store has been discouraged by a device that emits an aversive high-pitched sound that almost no one over 30 can hear (Lyall, 2005). Some students have also used that pitch to their advantage with cell-phone ring tones that their instructors cannot hear (Vitello, 2006).

Most stairway falls taken by older people occur on the top step, precisely where the person typically descends from a window-lit hallway into the darker stairwell (Fozard & Popkin, 1978). Our knowledge of aging could be used to design environments that would reduce such accidents (National Research Council, 1990).

With age, the eye's pupil shrinks and its lens becomes less transparent, reducing the amount of light reaching the retina. In fact, a 65-year-old retina receives only about one-third as much light as its 20-year-old counterpart (Kline & Schieber, 1985). Thus, to see as well as a 20-year-old when reading or driving, a 65-year-old needs three times as much light—a reason for buying cars with untinted windshields. This also explains why older people sometimes ask younger people, "Don't you need better light for reading?"

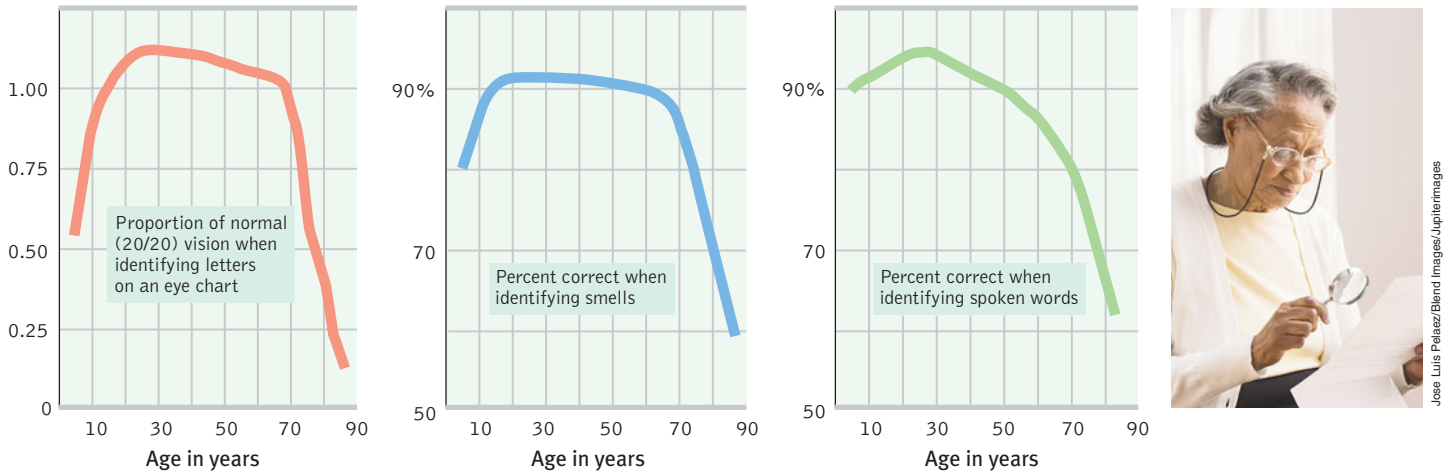


FIGURE 13.2 The aging senses Sight, smell, and hearing all are less acute among those over age 70. (From Doty et al., 1984.)

Health

For those growing older, there is both bad and good news about health. The bad news: The body's disease-fighting immune system weakens, making older people more susceptible to life-threatening ailments such as cancer and pneumonia. The good news: Thanks partly to a lifetime's accumulation of antibodies, people over 65 suffer fewer short-term ailments, such as common flu and cold viruses. They are, for example, half as likely as 20-year-olds and one-fifth as likely as preschoolers to suffer upper respiratory flu each year (National Center for Health Statistics, 1990).

Aging levies a tax on the brain by slowing our neural processing. Up to the teen years, we process information with greater and greater speed (Fry & Hale, 1996; Kail, 1991). But compared with teens and young adults, older people take a bit more time to react, to solve perceptual puzzles, even to remember names (Bashore et al., 1997; Verhaeghen & Salthouse, 1997). The lag is greatest on complex tasks (Cerella, 1985; Poon, 1987). At video games, most 70-year-olds are no match for a 20-year-old. And, as **FIGURE 13.3** indicates, fatal accident rates per mile driven increase sharply after age 75. By age 85, they exceed the 16-year-old level. Nevertheless, because older people drive less, they account for fewer than 10 percent of crashes (Coughlin et al., 2004).

Brain regions important to memory begin to atrophy during aging (Schacter, 1996). In young adulthood, a small, gradual net loss of brain cells begins, contributing

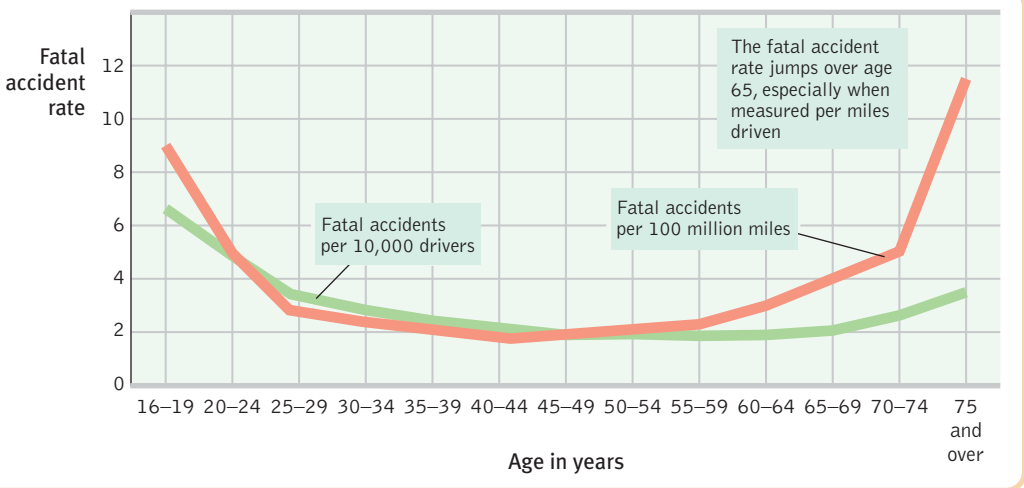


FIGURE 13.3 Age and driver fatalities Slowing reactions contribute to increased accident risks among those 75 and older, and their greater fragility increases their risk of death when accidents happen (NHTSA, 2000). Would you favor driver exams based on performance, not age, to screen out those whose slow reactions or sensory impairments indicate accident risk?

crystallized intelligence our accumulated knowledge and verbal skills; tends to increase with age.

fluid intelligence our ability to reason speedily and abstractly; tends to decrease during late adulthood.

by age 80 to a brain-weight reduction of 5 percent or so. Earlier, we noted that late-maturing frontal lobes help account for teen impulsivity. Late in life, atrophy of the inhibition-controlling frontal lobes seemingly explains older people's frank comments and occasional blunt questions ("Have you put on weight?") (von Hippel, 2007).

Active older adults tend to be mentally quick older adults. Physical exercise not only enhances muscles, bones, and energy and helps to prevent obesity and heart disease, it also stimulates brain cell development and neural connections, thanks perhaps to increased oxygen and nutrient flow (Kempermann et al., 1998; Pereira et al., 2007). That may explain why, across 20 studies, sedentary older adults randomly assigned to aerobic exercise programs have exhibited enhanced memory and sharpened judgment (Colcombe & Kramer, 2003; Colcombe et al., 2004; Weuve et al., 2004). Exercise also promotes neurogenesis (the birth of new nerve cells) in the hippocampus, a brain region important for memory (Pereira et al., 2007). We are more likely to rust from disuse than to wear out from overuse.

Cognitive Development

13-2: How do memory and intelligence change with age?

Among the most intriguing developmental psychology questions is whether adult cognitive abilities, such as memory, intelligence, and creativity, parallel the gradually accelerating decline of physical abilities.

Aging and Memory

If you are within five years of 20, what experiences from your last year will you likely never forget? (This is the time of your life you may best remember when you are 50.)

As we age, we remember some things well. Looking back in later life, people asked to recall the one or two most important events over the last half-century tend to name events from their teens or twenties (Conway et al., 2005; Rubin et al., 1998). Whatever people experience around this time of life—the Iraq war, the events of 9/11, the civil rights movement, World War II—becomes pivotal (Pillemer, 1998; Schuman & Scott, 1989). Our teens and twenties are a time of many memorable "firsts"—first date, first job, first going to college or university, first meeting your parents-in-law.

Early adulthood is indeed a peak time for some types of learning and remembering. In one experiment, Thomas Crook and Robin West (1990) invited 1205 people to learn some names. Fourteen videotaped people said their names, using a common format: "Hi, I'm Larry." Then the same individuals reappeared and said, for example, "I'm from Philadelphia"—thus providing visual *and* voice cues for remembering their name. As **FIGURE 13.4** shows, everyone remembered more names after a second and third replay of the introductions, but younger adults consistently surpassed older adults. Perhaps it is not surprising, then, that nearly two-thirds of people over age 40 say their memory is worse than it was 10 years ago (KRC, 2001).

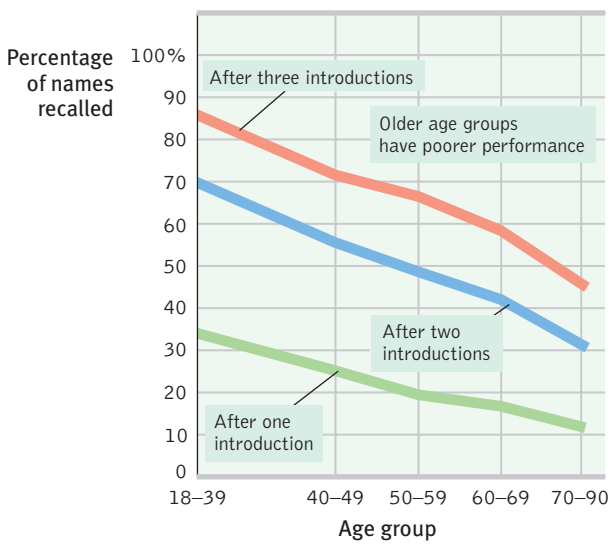


FIGURE 13.4 Tests of recall
Recalling new names introduced once, twice, or three times is easier for younger adults than for older ones. (Data from Crook & West, 1990.)

But consider another experiment (Schonfield & Robertson, 1966), in which adults of various ages learned a list of 24 words. Without giving any clues, the researchers then asked some to *recall* as many words as they could from the list, and others simply to

recognize words, using multiple-choice questions. Although younger adults had better recall, no age-related memory decline appeared on the recognition tests (**FIGURE 13.5**). So, how well older people remember depends: Are they being asked simply to *recognize* what they have tried to memorize (minimal decline) or to *recall* it without clues (greater decline)?

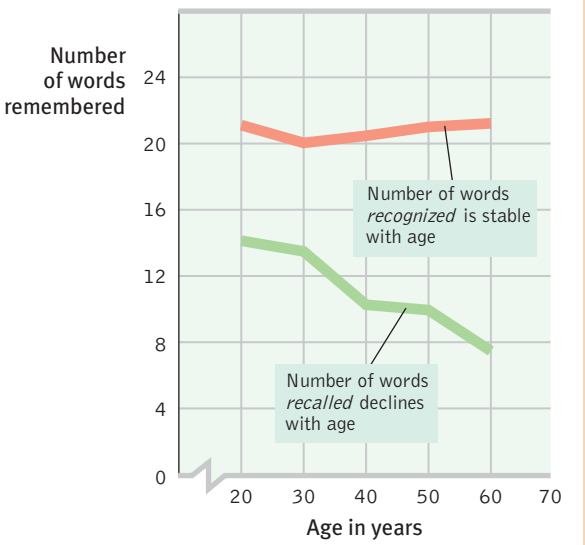


FIGURE 13.5 Recall and recognition in adulthood
In this experiment, the ability to *recall* new information declined during early and middle adulthood, but the ability to *recognize* new information did not. (From Schonfield & Robertson, 1966.)

No matter how quick or slow we are, remembering seems also to depend on the type of information we are trying to retrieve. If the information is meaningless—nonsense syllables or unimportant events—then the older we are, the more errors we are likely to make. If the information is *meaningful,* older people's rich web of existing knowledge will help them to catch it, though they may take longer than younger adults to *produce* the words and things they know (Burke & Shafto, 2004). (Quick-thinking game show winners are usually younger to middle-aged adults.) Older people's capacity to learn and remember *skills* also declines less than their verbal recall (Graf, 1990; Labouvie-Vief & Schell, 1982; Perlmutter, 1983).

Aging and Intelligence

What happens to our broader intellectual powers as we age? Do they gradually decline, as does our ability to recall new material? Or do they remain constant, as does our ability to recognize meaningful material?

Whether intelligence increases or decreases with age depends on the type of intellectual performance we measure. **Crystallized intelligence**—our accumulated knowledge as reflected in vocabulary and analogies tests—*increases* up to old age. **Fluid intelligence**—our ability to reason speedily and abstractly, as when solving novel logic problems—*decreases* slowly up to age 75 or so, then more rapidly, especially after age 85 (Cattell, 1963; Horn, 1982). We can see this pattern in the intelligence scores of a national sample of adults (Kaufman et al., 1989). After adjustments for education, verbal scores (which reflect crystallized intelligence) held relatively steady from ages 20 to 74. Nonverbal, puzzle-solving intelligence declined.

So, with age, we lose and we win. We lose recall memory and processing speed, but we gain vocabulary and knowledge (Park et al., 2002). Our decisions also become less distorted by negative emotions such as anxiety, depression, and anger (Blanchard-Fields, 2007; Carstensen & Mikels, 2005). These cognitive differences help explain why mathematicians and scientists produce much of their most creative work during their late twenties or early thirties, whereas those in literature, history, and philosophy tend to produce their best work in their forties, fifties, and beyond, after accumulating more knowledge (Simonton, 1988, 1990). For example, poets (who depend on fluid intelligence) reach their peak output earlier than prose authors (who need a deeper knowledge reservoir), a finding observed in every major literary tradition, for both living and dead languages.

"In youth we learn, in age we understand."

—Marie Von Ebner-Eschenbach, *Aphorisms,* 1883

Recently, psychologists who study the aging mind have been debating whether "brain-fitness" computer training programs can stave off cognitive decline. Given what we know about the brain's plasticity, can using our brains—with memory, visual speed, and problem-solving exercises—avert losing our minds? "At every point in life, the brain's natural plasticity gives us the ability to improve how our brains function," says neuroscientist-entrepreneur Michael Merzenich (2007). With support from the National Institutes of Health and the National Institute on Aging, researchers are exploring possible benefits of cognitive training (Mahncke et al., 2006).

social clock the culturally preferred timing of social events such as marriage, parenthood, and retirement.

One five-year study of nearly 3000 people in six cities found that 10 one-hour cognitive training sessions, with follow-up booster sessions a year (and more) later, led to improved cognitive scores on tests related to their training (Boron et al., 2007; Willis et al., 2006). Based on such findings, some computer game makers are marketing daily brain-exercise programs for the elderly. But Timothy Salthouse (2006, 2007), a veteran researcher of cognitive aging, advises caution. The available evidence, he contends, does not indicate that the benefits of brain-mind exercise programs generalize to other tasks.

Despite age-related cognitive changes, studies in several countries indicate that age is only a modest predictor of abilities such as memory and intelligence. Mental ability more strongly correlates with proximity to death. Tell me whether someone is 70, 80, or 90, and you haven't told me much about the person's mental sharpness. But if you tell me whether someone is 8 months or 8 years from death, regardless of age, you'll give me a better clue to the person's mental ability. Especially in the last three or four years of life, cognitive decline typically accelerates (Wilson et al., 2007). Researchers call this near-death drop *terminal decline* (Backman & MacDonald, 2006).

Social Development

13-3: What themes and influences mark our social journey from early adulthood to death?

Many differences between younger and older adults are created by significant life events. A new job means new relationships, new expectations, and new demands. Marriage brings the joy of intimacy and the stress of merging your life with another's. The birth of a child introduces responsibilities and alters your life focus. The death of a loved one creates an irreplaceable loss. Do these adult life events shape a sequence of life changes?

Adulthood's Ages and Stages

"Midway in the journey of our life I found myself in a dark wood, for the straight way was lost."
—Dante, *The Divine Comedy,* 1314

As people enter their forties, they undergo a transition to middle adulthood, a time when they realize that life will soon be mostly behind instead of ahead of them. Some psychologists have argued that for many the *midlife transition* is a crisis, a time of great struggle, regret, or even feeling struck down by life. The popular image of the midlife crisis is an early-forties man who forsakes his family for a younger girlfriend and a hot sports car. But the fact—reported by large samples of people—is that unhappiness, job dissatisfaction, marital dissatisfaction, divorce, anxiety, and suicide do *not* surge during the early forties (Hunter & Sundel, 1989; Mroczek & Kolarz, 1998). Divorce, for example, is most common among those in their twenties, suicide among those in their seventies and eighties. One study of emotional instability in nearly 10,000 men and women found "not the slightest evidence" that distress peaks anywhere in the midlife age range (**FIGURE 13.6**).

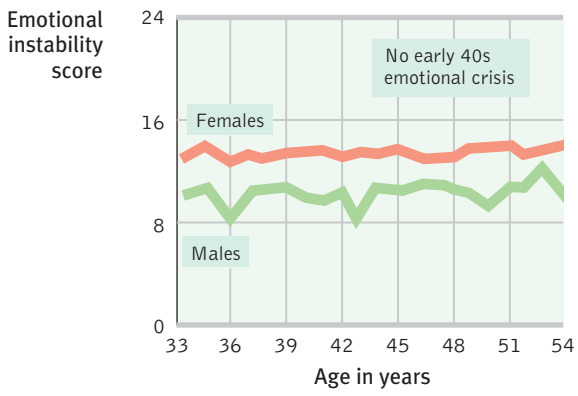


FIGURE 13.6 Early forties midlife crises? Among 10,000 people responding to a national health survey, there was no early forties increase in emotional instability ("neuroticism") scores. (From McCrae & Costa, 1990.)

For the 1 in 4 adults who do report experiencing a life crisis, the trigger is not age, but a major event, such as illness, divorce, or job loss (Lachman, 2004). Some middle-aged adults describe themselves as a "sandwich generation," as they simultaneously support both their aging parents and their emerging adult children or grandchildren (Riley & Bowen, 2005).

Life events trigger transitions to new life stages at varying ages. The **social clock**—the definition of "the right time" to leave home, get a job, marry, have children, and retire—varies from era to era and culture to culture. In Western Europe, fewer than 10 percent of men over 65 remain in the work force, as do 16 percent in the United States, 36 percent in Japan, and 69 percent in Mexico (Davies et al., 1991). And the once-rigid sequence for many Western women—of student to worker to wife to at-home mom to worker again—has loosened. Contemporary women occupy these roles in any order or all at once. The social clock still ticks, but people feel freer about being out of sync with it.

"The important events of a person's life are the products of chains of highly improbable occurrences."
—Joseph Traub, "Traub's Law," 2003

Adulthood's Commitments

Two basic aspects of our lives dominate adulthood. Erik Erikson called them *intimacy* (forming close relationships) and *generativity* (being productive and supporting future generations). Researchers have chosen various terms—*affiliation* and *achievement*, *attachment* and *productivity*, *commitment* and *competence*. Sigmund Freud (1935) put it most simply: The healthy adult, he said, is one who can *love* and *work*.

"One can live magnificently in this world if one knows how to work and how to love."
—Leo Tolstoy, 1856

Love

We typically flirt, fall in love, and commit—one person at a time. "Pair-bonding is a trademark of the human animal," observed anthropologist Helen Fisher (1993). From an evolutionary perspective, relatively monogamous pairing makes sense: Parents who cooperated to nurture their children to maturity were more likely to have their genes passed along to posterity than were parents who didn't.

Adult bonds of love are most satisfying and enduring when marked by a similarity of interests and values, a sharing of emotional and material support, and intimate self-disclosure. Couples who seal their love with commitment—via, in one Vermont study, marriage for heterosexual couples and civil unions for homosexual couples—more often endure (Balsam et al., 2008). Marriage bonds are especially likely to last when couples marry after age 20 and are well educated. Compared with their counterparts of 40 years ago, people in Western countries *are* better educated and marrying later. Yet, ironically, they are nearly twice as likely to divorce. (Both Canada and the United States now have about one divorce for every two marriages [Bureau of the Census, 2007], and in Europe, divorce is only slightly less common.) The divorce rate partly reflects women's lessened economic dependence on men, and men and women's rising expectations. We now hope not only for an enduring bond, but also for a mate who is a wage earner, caregiver, intimate friend, and warm and responsive lover.

Might test-driving life together in a "trial marriage" minimize divorce risk? In a 2001 Gallup survey of American twenty-somethings, 62 percent thought it would (Whitehead & Popenoe, 2001). In reality, in Europe, Canada, and the United States, those who cohabit before marriage have had *higher* rates of divorce and marital dysfunction than those who did not cohabit (Dush et al., 2003; Popenoe & Whitehead, 2002). The risk appears greatest for cohabiting prior to engagement (Kline et al., 2004).

American children born to cohabiting parents are about five times more likely to experience their parents' separation than are children born to married parents (Osborne et al., 2007). Two factors contribute. First, cohabiters tend to be initially less committed to the ideal of enduring marriage. Second, they become even less marriage-supporting while cohabiting.


Lisa B./Corbis

Love Intimacy, attachment, commitment—love by whatever name—is central to healthy and happy adulthood.

What do you think? Does marriage correlate with happiness because marital support and intimacy breed happiness, because happy people more often marry and stay married, or both?

Nonetheless, the institution of marriage endures. Worldwide, reports the United Nations, 9 in 10 heterosexual adults marry. And marriage is a predictor of happiness, health, sexual satisfaction, and income. National Opinion Research Center surveys of more than 40,000 Americans since 1972 reveal that 40 percent of married adults, though only 23 percent of unmarried adults, have reported being "very happy." Lesbian couples, too, report greater well-being than those who are alone (Peplau & Fingerhut, 2007; Wayment & Peplau, 1995). Moreover, neighborhoods with high marriage rates typically have low rates of social pathologies such as crime, delinquency, and emotional disorders among children (Myers & Scanzoni, 2005).

Often, love bears children. For most people, this most enduring of life changes is a happy event. "I feel an overwhelming love for my children unlike anything I feel for anyone else," said 93 percent of American mothers in a national survey (Erickson & Aird, 2005). Many fathers feel the same. A few weeks after the birth of my first child I was suddenly struck by a realization: "So *this* is how my parents felt about me!"

When children begin to absorb time, money, and emotional energy, satisfaction with the marriage itself may decline. This is especially likely among employed women who, more than they expected, carry the traditional burden of doing the chores at home. Putting effort into creating an equitable relationship can thus pay double dividends: a more satisfying marriage, which breeds better parent-child relations (Erel & Burman, 1995).

If you have left home, did your parents suffer the "empty nest syndrome"—a demoralized loss of purpose? Did they mourn the lost joy of listening for you in the wee hours of Saturday morning? Or did they discover a new freedom and (if still married) renewed satisfaction with their own relationship?

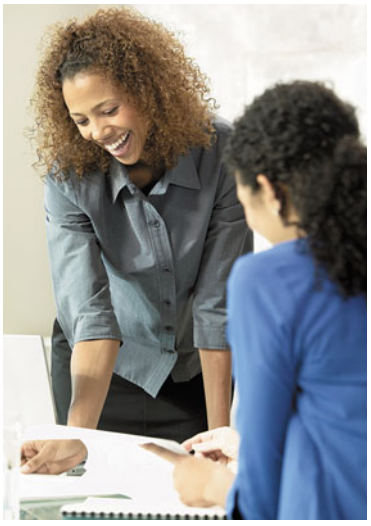
Although love bears children, children eventually leave home. This departure is a significant and sometimes difficult event. For most people, however, an empty nest is a happy place (Adelmann et al., 1989; Glenn, 1975). Many parents experience a "postlaunch honeymoon," especially if they maintain close relationships with their children (White & Edwards, 1990). As Daniel Gilbert (2006) has said, "The only known symptom of 'empty nest syndrome' is increased smiling."

Work

For many adults, the answer to "Who are you?" depends a great deal on the answer to "What do you do?" For women and men, choosing a career path is difficult, especially during bad economic times. Even in the best of times, few students in their first two years of college or university can predict their later careers. Most shift from their initially intended major, many find their postcollege employment in a field not directly related to their major, and most will change careers (Rothstein, 1980).

In the end, happiness is about having work that fits your interests and provides you with a sense of competence and accomplishment. It is having a close, supportive companion who cheers your accomplishments (Gable et al., 2006). And for some, it includes having children who love you and whom you love and feel proud of.

Elena Roald/PhotoEdit



LWA—Dann Tardif/Corbis

Job satisfaction and life satisfaction
Work can provide us with a sense of identity and competence and opportunities for accomplishment. Perhaps this is why challenging and interesting occupations enhance people's happiness.

Well-Being Across the Life Span

To live is to grow older. This moment marks the oldest you have ever been and the youngest you will henceforth be. That means we all can look back with satisfaction or regret, and forward with hope or dread. When asked what they would have done differently if they could relive their lives, people's most common answer is "Taken my education more seriously and worked harder at it" (Kinnier & Metha, 1989; Roese & Summerville, 2005). Other regrets—"I should have told my father I loved him," "I regret that I never went to Europe"—also focus less on mistakes made than on the things one *failed* to do (Gilovich & Medvec, 1995).

From the teens to midlife, people typically experience a strengthening sense of identity, confidence, and self-esteem (Miner-Rubino et al., 2004; Robins & Trzesniewski, 2005). In later life, challenges arise: Income shrinks, work is often taken away, the body deteriorates, recall fades, energy wanes, family members and friends die or move away, and the great enemy, death, looms ever closer. Small wonder that most presume that happiness declines in later life (Lacey et al., 2006). But the over-65 years are not notably unhappy, as Ronald Inglehart (1990) discovered when he amassed interviews conducted during the 1980s with representative samples of nearly 170,000 people in 16 nations (**FIGURE 13.7**). Newer surveys of some 2 million people worldwide confirm that happiness is slightly higher among both young and older adults than among those middle-aged.

"I hope I die before I get old," sang rock star Pete Townshend—when he was 20.

If anything, positive feelings grow after midlife and negative feelings subside (Charles et al., 2001; Mroczek, 2001). National studies in both Britain and Australia reveal that the risk of depression tapers off in later life (Blanchflower & Oswald, 2008; Troller et al., 2007). Consider:

- Older adults increasingly use words that convey positive emotions (Pennebaker & Stone, 2003).
- Older adults attend less and less to negative information. For example, they are slower than younger adults to perceive negative faces (Carstensen & Mikels, 2005).
- The amygdala, a neural processing center for emotions, shows diminishing activity in older adults in response to negative events, but it maintains its responsiveness to positive events (Mather et al., 2004; Williams et al., 2006).
- Brain-wave reactions to negative images diminish with age (Kisley et al., 2007).

At twenty we worry about what others think of us. At forty we don't care what others think of us. At sixty we discover they haven't been thinking about us at all.

—Anonymous

Moreover, at all ages, the bad feelings we associate with negative events fade faster than do the good feelings we associate with positive events (Walker et al., 2003). This contributes to most older people's sense that life, on balance, has

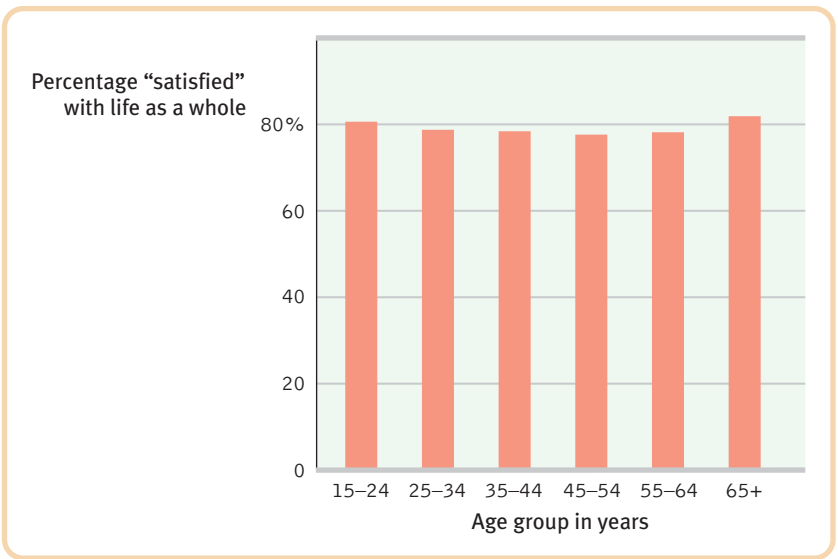


FIGURE 13.7 Age and life satisfaction
With the tasks of early adulthood behind them, many older adults have more time to pursue personal interests. No wonder their satisfaction with life remains high, and may even rise if they are healthy and active. As this graph, based on surveys of 170,000 people in 16 countries, shows, age differences in life satisfaction are small. (Data from Inglehart, 1990.)

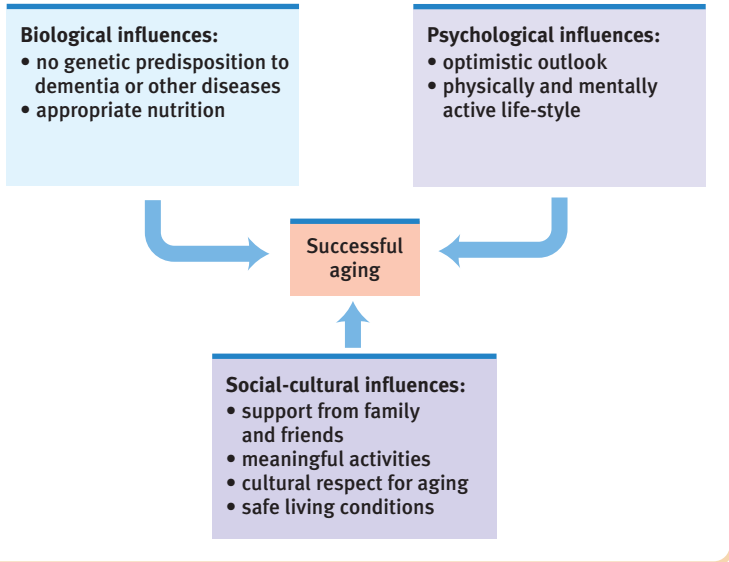


FIGURE 13.8 Biopsychosocial influences on successful aging Biological, psychological, and social-cultural factors affect the way we age. With the right genes, we have a good chance of aging successfully if we maintain a positive outlook, stay mentally and physically active, and remain connected to family and friends.

"The best thing about being 100 is *no peer pressure*."

—Lewis W. Kuester, 2005, on turning 100

been mostly good. Given that growing older is an outcome of living (an outcome most prefer to early dying), the positivity of later life is comforting. More and more people flourish into later life, thanks to biological, psychological, and social-cultural influences (**FIGURE 13.8**).

Death and Dying

"Love—why, I'll tell you what love is: It's you at 75 and her at 71, each of you listening for the other's step in the next room, each afraid that a sudden silence, a sudden cry, could mean a lifetime's talk is over."

—Brian Moore, *The Luck of Ginger Coffey*, 1960

Most of us will suffer and cope with the deaths of relatives and friends. Usually, the most difficult separation is from a spouse—a loss suffered by five times more women than men. When, as usually happens, death comes at an expected late-life time, the grieving may be relatively short-lived. (**FIGURE 13.9** shows the typical emotional path before and after a spouse's death.) But even 20 years after losing a spouse, people still talk about the long-lost partner once a month on average (Carnelley et al., 2006).

Grief is especially severe when a loved one's death comes suddenly and before its expected time on the social clock. The sudden illness that claims a 45-year-old life partner or the accidental death of a child may trigger a year or more of memory-laden mourning that eventually subsides to a mild depression (Lehman et al., 1987).

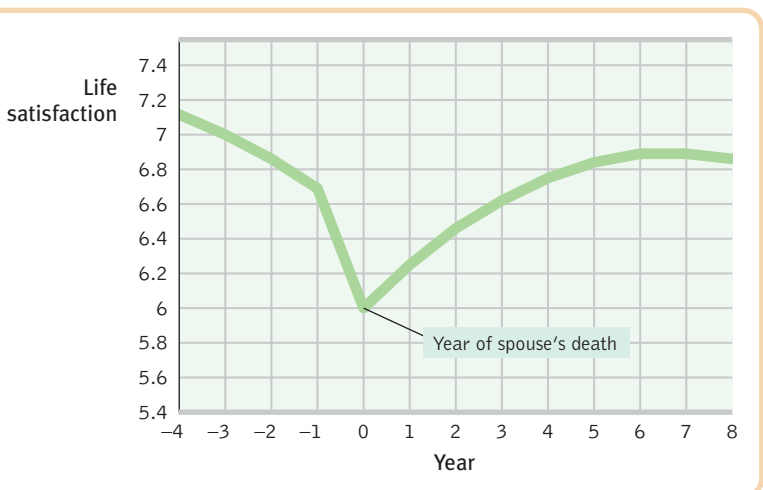
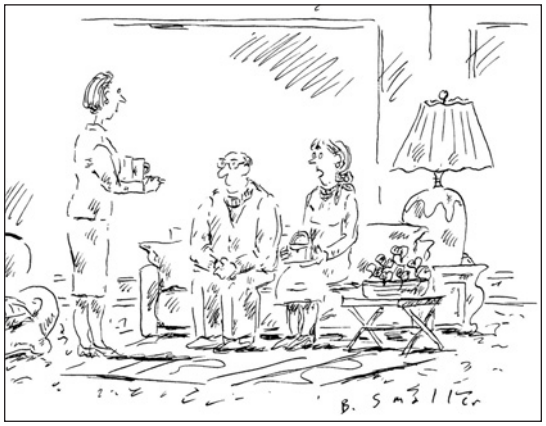


FIGURE 13.9 Life satisfaction before, during the year of, and after a spouse's death Richard Lucas and his collaborators (2003) examined data collected from repeated annual surveys of more than 30,000 Germans. They identified 513 married people who had experienced a spouse's death and had not remarried. In this group, life satisfaction began to dip during the prewidowhood year, dropped significantly during the year of the spouse's death, and then eventually rebounded to nearly the earlier level. (*Source:* Richard Lucas.)

For some, however, the loss is unbearable. One Danish long-term study of more than 1 million people found that about 17,000 of them had suffered the death of a child under 18. In the five years following that death, 3 percent of them had a first psychiatric hospitalization. This rate was 67 percent higher than the rate recorded for parents who had not lost a child (Li et al., 2005).



"Donald is such a fatalist—he's convinced he's going to grow old and die."

Even so, reactions to a loved one's death range more widely than most suppose. Some cultures encourage public weeping and wailing; others hide grief. Within any culture, individuals differ. Given similar losses, some people grieve hard and long, others are more resilient (Ott et al., 2007). Contrary to popular misconceptions, however,

- terminally ill and bereaved people do not go through identical predictable stages, such as denial before anger (Nolen-Hoeksema & Larson, 1999). A Yale study following 233 bereaved individuals through time did, however, find that yearning for the loved one reached a high point four months after the loss, with anger peaking, on average, about a month later (Maciejewski et al., 2007).
- those who express the strongest grief immediately do not purge their grief more quickly (Bonanno & Kaltman, 1999; Wortman & Silver, 1989).
- bereavement therapy and self-help groups offer support, but there is similar healing power in the passing of time, the support of friends, and the act of giving support and help to others (Brown et al., 2008). Grieving spouses who talk often with others or receive grief counseling adjust about as well as those who grieve more privately (Bonanno, 2001, 2004; Genevro, 2003; Stroebe et al., 2001, 2002, 2005).

We can be grateful for the waning of death-denying attitudes. Facing death with dignity and openness helps people complete the life cycle with a sense of life's meaningfulness and unity—the sense that their existence has been good and that life and death are parts of an ongoing cycle. Although death may be unwelcome, life itself can be affirmed even at death. This is especially so for people who review their lives not with despair but with what Erik Erikson called a sense of *integrity*—a feeling that one's life has been meaningful and worthwhile.

"Consider, friend, as you pass by, as you are now, so once was I. As I am now, you too shall be. Prepare, therefore, to follow me."

—Scottish tombstone epitaph

Adulthood

Module Review

13-1: What physical changes occur during middle and late adulthood? Decline of muscular strength, reaction time, sensory abilities, and cardiac output begins in the late twenties and continues throughout middle and late adulthood. Around age 50, *menopause* ends women's period of fertility but usually does not trigger psychological problems or interfere with a satisfying sex life. Men do not undergo a similar sharp drop in hormone levels or fertility. The immune system weakens in later life, increasing the risk of life-threatening illnesses, but accumulated antibodies protect older people from many short-term ailments. In late adulthood, neural processing slows, and some brain regions atrophy.

13-2: How do memory and intelligence change with age? As the years pass, recall begins to decline, especially for meaningless information, but recognition memory remains strong. *Fluid intelligence* declines in later life but *crystallized intelligence* does not. Mental ability correlates more strongly with nearness to death than with absolute age.

13-3: What themes and influences mark our social journey from early adulthood to death? Adults do not progress through an orderly sequence of age-related social stages. Transitions are more often triggered by life events. The strict dictates of the *social clock*—the culturally preferred timing of social events—have loosened. The dominant themes of adulthood are love and work, which Erikson called intimacy and generativity. Life satisfaction tends to remain high across the life span. Expressions of grief vary from person to person and from culture to culture.

Rehearse It!

1. By age 65, a person would be most likely to experience a cognitive decline in the ability to
   a. recall and list all the important terms and concepts in a module.
   b. select the correct definition in a multiple-choice question.
   c. evaluate whether a statement is true or false.
   d. exercise sound judgment in answering an essay question.
2. Freud defined the healthy adult as one who is able to love and work. Erikson agreed, observing that the adult struggles to attain intimacy and
   a. affiliation.
   b. identity.
   c. competence.
   d. generativity.
3. Contrary to what many people assume,
   a. older people are much happier than adolescents.
   b. men in their forties express much greater dissatisfaction with life than do women of the same age.
   c. people of all ages report similar levels of happiness.
   d. those whose children have recently left home—the empty nesters—have the lowest level of happiness of all groups.

Answers: 1. a, 2. d, 3. c.

Terms and Concepts to Remember

menopause, p. 175
crystallized intelligence, p. 179
fluid intelligence, p. 179
social clock, p. 181

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. "I hope I die before I get old," sang rock star Pete Townshend—when he was 20. What could you tell other 20-year-olds to make them feel more optimistic about aging?
2. Research has shown that living together before marriage predicts an increased likelihood of future divorce. Can you imagine two possible explanations for this correlation?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Sensation and Perception

Sensation and Perception

"I have perfect vision," explains my colleague, Heather Sellers, an acclaimed writer and writing teacher. Her vision may be fine, but there is a problem with her perception. She cannot recognize faces.

In her memoir, *Face First,* Sellers (2010) tells of awkward moments resulting from her lifelong *prosopagnosia*—face blindness.

> In college, on a date at the Spaghetti Station, I returned from the bathroom and plunked myself down in the wrong booth, facing the wrong man. I remained unaware he was not my date even as my date (a stranger to me) accosted Wrong Booth Guy, and then stormed out of the Station. I can't distinguish actors in movies and on television. I do not recognize myself in photos or video. I can't recognize my stepsons in the soccer pick-up line; I failed to determine which husband was mine at a party, in the mall, at the market.

Her inability to recognize acquaintances means that people sometimes perceive her as snobby or aloof. "Why did you walk past me?" someone might later ask. Similar to those of us with hearing loss who fake hearing during trite social conversation, Sellers sometimes fakes recognition. She often smiles at people she passes, in case she knows them. Or she pretends to know the person with whom she is talking. (To avoid the stress associated with such perception failures, people with serious hearing loss or with prosopagnosia often shy away from busy social situations.) But there is an upside: When encountering someone who previously irritated her, she typically won't feel ill will, because she doesn't recognize the person.

This curious mix of "perfect vision" and face blindness illustrates the distinction between sensation and perception. When Sellers looks at a friend, her *sensation* is normal: Her sensory receptors detect the same information yours would, and they transmit that information to her brain. And her *perception*—the organization and interpretation of sensory information that enables her to consciously recognize objects—is almost normal. Thus, she may recognize people from their hair, their gait, their voice, or their particular physique, just not their face. She can see the elements of their face—the nose, the eyes, the chin—and yet, at a party, "[I introduce myself] to my colleague Gloria THREE TIMES." Her experience is much like the struggle you or I would have trying to recognize a specific penguin in a group of waddling penguins.

Thanks to an area on the underside of your brain's right hemisphere, you can recognize a human face (but not a penguin's) in one-seventh of a second. As soon as you detect a face, you recognize it (Jacques & Rossion, 2006).

How do you do it? Twenty-four hours a day, all kinds of stimuli from the outside world bombard your body. Meanwhile, in a silent, cushioned, inner world, your brain floats in utter darkness. By itself, it sees nothing. It hears nothing. It feels nothing. *So, how does the world out there get in?*

To phrase the question scientifically: How do we construct our representations of the external world? How do a campfire's flicker, crackle, and smoky scent activate neural connections? And how, from this living neurochemistry, do we create our conscious experience of the fire's motion and temperature, its aroma and beauty? In search of answers to such questions, let's look more closely at what psychologists have learned about how we sense and perceive the world around us. Module 14 outlines some basic principles and takes a close look at vision. Module 15 examines our senses of hearing, touch, taste, and smell. Module 16 explores perceptual organization and interpretation.

MODULE 14

Basic Concepts and Vision

Sensing the World: Some Basic Principles

14-1: What do we mean by *bottom-up processing* and *top-down processing?*

In our everyday experiences, **sensation** and **perception** blend into one continuous process. Here, we slow down that process to study its parts.

We start with the sensory receptors and work up to higher levels of processing. Psychologists refer to sensory analysis that starts at the entry level as **bottom-up processing.** But our minds also *interpret* what our senses *detect.* We construct perceptions drawing both on sensations coming bottom-up to the brain and on our experience and expectations, which psychologists call **top-down processing.** For example, as our brain deciphers the information in FIGURE 14.1, bottom-up processing enables our sensory systems to detect the lines, angles, and colors that form the horses, rider, and surroundings. Using top-down processing, we consider the painting's title, notice the apprehensive expressions, and then direct our attention to aspects of the painting that will give those observations meaning.

For humans as for other species, nature's sensory gifts suit the recipients' needs, enabling organisms to obtain information essential to their survival. Consider:

- A frog, which feeds on flying insects, has eyes with receptor cells that fire only in response to small, dark, moving objects. A frog could starve to death knee-deep in motionless flies. But let one zoom by and the frog's "bug detector" cells snap awake.
- A male silkworm moth has receptors so sensitive to the female sex-attractant odor that a single female need release only a billionth of an ounce per second to attract every male silkworm moth within a mile. That is why there continue to be silkworms.
- We are similarly equipped to detect the important features of our environment. Our ears are most sensitive to sound frequencies that include human voice consonants and a baby's cry.

We begin our exploration of our sensory gifts with a question that cuts across all our sensory systems: What stimuli cross our threshold for conscious awareness?

sensation the process by which our sensory receptors and nervous system receive and represent stimulus energies from our environment.

perception the process of organizing and interpreting sensory information, enabling us to recognize meaningful objects and events.

bottom-up processing analysis that begins with the sensory receptors and works up to the brain's integration of sensory information.

top-down processing information processing guided by higher-level mental processes, as when we construct perceptions drawing on our experience and expectations.

Detail, *The Forest Has Eyes* by Bev Doolittle © The Greenwich Workshop, Inc., Trumbull, CT.

FIGURE 14.1 What's going on here? Our sensory and perceptual processes work together to help us sort out the complex images, including the hidden faces, in this Bev Doolittle painting, *The Forest Has Eyes.*

psychophysics the study of relationships between the physical characteristics of stimuli, such as their intensity, and our psychological experience of them.

absolute threshold the minimum stimulation needed to detect a particular stimulus 50 percent of the time.

subliminal below one's absolute threshold for conscious awareness.

priming the activation, often unconsciously, of certain associations, thus predisposing one's perception, memory, or response.

difference threshold the minimum difference between two stimuli required for detection 50 percent of the time. We experience the difference threshold as a *just noticeable difference* (or *jnd*).

Weber's law the principle that, to be perceived as different, two stimuli must differ by a constant minimum percentage (rather than a constant amount).

Thresholds

14-2: What are absolute and difference thresholds, and do stimuli below the absolute threshold have any influence?

We exist in a sea of energy. At this moment, you and I are being struck by X-rays and radio waves, ultraviolet and infrared light, and sound waves of very high and very low frequencies. To all of these we are blind and deaf. Other animals detect a world that lies beyond human experience (Hughes, 1999). Migrating birds stay on course aided by an internal magnetic compass. Bats and dolphins locate prey with sonar (bouncing echoing sound off objects). On a cloudy day, bees navigate by detecting polarized light from an invisible (to us) sun.

The shades on our own senses are open just a crack, allowing us only a restricted awareness of this vast sea of energy. Let's see what **psychophysics** has discovered about the physical energy we can detect and its effect on our psychological experience.

Absolute Thresholds

To some kinds of stimuli we are exquisitely sensitive. Standing atop a mountain on an utterly dark, clear night, most of us could see a candle flame atop another mountain 30 miles away. We could feel the wing of a bee falling on our cheek. We could smell a single drop of perfume in a three-room apartment (Galanter, 1962).

Our awareness of these faint stimuli illustrates our **absolute thresholds**—the minimum stimulation necessary to detect a particular light, sound, pressure, taste, or odor 50 percent of the time. To test your absolute threshold for sounds, a hearing specialist would expose each of your ears to varying sound levels. For each tone, the test would define where half the time you correctly detect the sound and half the time you do not. For each of your senses, that 50-50 recognition point defines your absolute threshold.

Subliminal Stimulation

Hoping to penetrate our unconscious, entrepreneurs offer recordings that supposedly speak directly to our brains to help us lose weight, stop smoking, or improve our memories. Masked by soothing ocean sounds, unheard messages ("I am thin," "Smoke tastes bad," or "I do well on tests. I have total recall of information") will, they say, influence our behavior. Such claims make two assumptions: (1) We can unconsciously sense **subliminal** (literally, "below threshold") stimuli, and (2) without our awareness, these stimuli have extraordinary suggestive powers. Can we? Do they?

Can we sense stimuli below our absolute thresholds? In one sense, the answer is clearly *yes.* Remember that an "absolute" threshold is merely the point at which we detect a stimulus *half the time* (**FIGURE 14.2**). At or slightly below this threshold, we will still detect the stimulus some of the time.

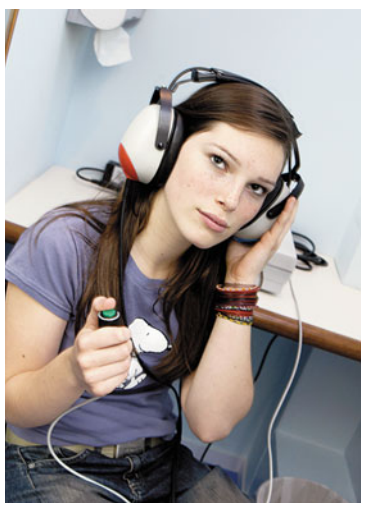
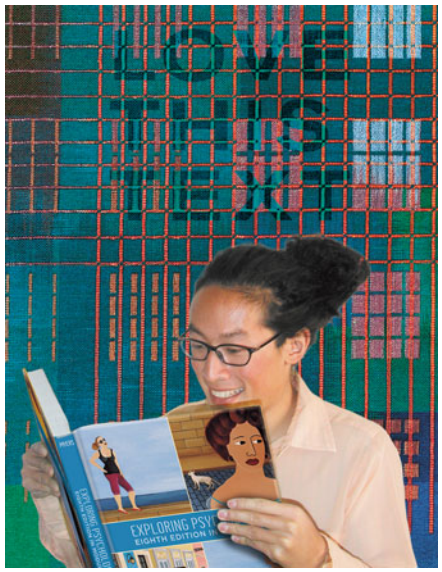


FIGURE 14.2 Absolute threshold Can I detect this sound? An *absolute threshold* is the intensity at which a person can detect a stimulus half the time. Hearing tests locate these thresholds for various frequency levels.

Can we be affected by stimuli so weak as to be unnoticed? Under certain conditions, the answer is *yes.* An invisible image or word can briefly **prime** your response to a later question. In a typical experiment, the image or word is quickly flashed, then replaced by a *masking stimulus* that interrupts the brain's processing before conscious perception. For example, one experiment subliminally flashed either emotionally positive scenes (kittens, a romantic couple) or negative scenes (a werewolf, a dead body) an instant before participants viewed slides of people (Krosnick et al., 1992). The participants consciously perceived either scene as only a flash of light. Yet the people somehow looked nicer if their image immediately followed unperceived kittens rather than an unperceived werewolf.

This experiment illustrates an intriguing phenomenon: Sometimes we *feel* what we do not know and cannot describe. An imperceptibly brief stimulus often triggers a weak response that *can* be detected by brain scanning (Blankenburg et al., 2003; Haynes & Rees, 2005, 2006). The conclusion (turn up the volume here): *Much of our information processing occurs automatically, out of sight, off the radar screen of our conscious mind.*



Babs Reingold

Subliminal persuasion? Although subliminally presented stimuli *can* subtly influence people, experiments discount attempts at subliminal advertising and self-improvement. (The playful message here is not actually subliminal—because you can perceive it.)

But does the fact of subliminal *sensation* verify entrepreneurial claims of subliminal *persuasion?* Can advertisers really manipulate us with "hidden persuasion"? The near-consensus among researchers is *no.* Their verdict is similar to that of astronomers who say of astrologers, *yes,* they are right that stars and planets are out there; but *no,* the celestial bodies don't directly affect us. The laboratory research reveals a *subtle, fleeting* effect. Priming thirsty people with the subliminal word *thirst* might therefore, for a brief interval, make a thirst-quenching beverage ad more persuasive (Strahan et al., 2002). Likewise, priming thirsty people with Lipton Ice Tea may increase their choosing the primed brand (Karremans et al., 2006). But the subliminal-message hucksters claim something different: a *powerful, enduring* effect on behavior.

When Anthony Greenwald and his colleagues (1991, 1992) tested that claim in 16 experiments evaluating subliminal self-help tapes, their results were uniform: None had any therapeutic effect beyond that of a placebo (the effect of one's belief in them). Their conclusion: "Subliminal procedures offer little or nothing of value to the marketing practitioner" (Pratkanis & Greenwald, 1988).

"The heart has its reasons which reason does not know."
—Pascal, *Pensées,* 1670

Difference Thresholds

To function effectively, we need absolute thresholds low enough to allow us to detect important sights, sounds, textures, tastes, and smells. We also need to detect small differences among stimuli. A musician must detect minute discrepancies in an instrument's tuning. Parents must detect the sound of their own child's voice amid other children's voices. Even after living two years in Scotland, sheep *baa's* all sound alike to my ears. But not to those of ewes, which I have observed streaking, after shearing, directly to the *baa* of their lamb amid the chorus of other distressed lambs.

The **difference threshold,** also called the *just noticeable difference (jnd),* is the minimum difference a person (or sheep) can detect between any two stimuli half the time. That detectable difference increases with the size of the stimulus. Thus, if you add 1 ounce to a 10-ounce weight, you will detect the difference; add 1 ounce to a 100-ounce weight and you probably will not.

More than a century ago, Ernst Weber noted something so simple and so widely applicable that people today still refer to it as **Weber's law:** For their difference to be perceptible, two stimuli must differ by a constant *proportion*—not a constant amount. The exact proportion varies, depending on the stimulus. For the average person to perceive their differences, two lights must differ in intensity by 8 percent. Two objects must differ in weight by 2 percent. And two tones must differ in frequency by only 0.3 percent (Teghtsoonian, 1971).

The difference threshold In this computer-generated copy of the Twenty-third Psalm, each line of the typeface changes imperceptibly. How many lines are required for you to experience a just noticeable difference?

The LORD is my shepherd;
I shall not want.
He maketh me to lie down
in green pastures:
he leadeth me
beside the still waters.
He restoreth my soul:
he leadeth me
in the paths of righteousness
for his name's sake.
Yea, though I walk through the valley
of the shadow of death,
I will fear no evil:
for thou art with me;
thy rod and thy staff
they comfort me.
Thou preparest a table before me
in the presence of mine enemies:
thou anointest my head with oil,
my cup runneth over.
Surely goodness and mercy
shall follow me
all the days of my life:
and I will dwell
in the house of the LORD
for ever.

sensory adaptation diminished sensitivity as a consequence of constant stimulation.

Sensory Adaptation

14-3: What is the function of sensory adaptation?

Entering your neighbors' living room, you smell a musty odor. You wonder how they can stand it, but within minutes you no longer notice it. **Sensory adaptation**—our diminishing sensitivity to an unchanging stimulus—has come to your rescue. (To experience this phenomenon, move your watch up your wrist an inch: You will feel it—but only for a few moments.) After constant exposure to a stimulus, our nerve cells fire less frequently.

"We need above all to know about changes; no one wants or needs to be reminded 16 hours a day that his shoes are on."
—Neuroscientist David Hubel (1979)

Why, then, if we stare at an object without flinching, does it not vanish from sight? Because, unnoticed by us, our eyes are always moving, flitting from one spot to another enough to guarantee that stimulation on the eyes' receptors continually changes (**FIGURE 14.3**).

For 9 in 10 people—but for only 1 in 3 of those with schizophrenia—this eye flutter turns off when the eye is following a moving target (Holzman & Matthyss, 1990).

What if we actually could stop our eyes from moving? Would sights seem to vanish, as odors do? To find out, psychologists have devised ingenious instruments for maintaining a constant image on the eye's inner surface. Imagine that we have fitted a volunteer, Mary, with one of these instruments—a miniature projector mounted on a contact lens. When Mary's eye moves, the image from the projector moves as well. So everywhere that Mary looks, the scene is sure to go.

If we project the profile of a face through such an instrument, what will Mary see? At first, she will see the complete profile. But within a few seconds, as her sensory system begins to fatigue, things will get weird. Bit by bit, the image will vanish, only later to reappear and then disappear—in recognizable fragments or as a whole (**FIGURE 14.4**).

"My suspicion is that the universe is not only queerer than we suppose, but queerer than we can suppose."
—J. B. S. Haldane, *Possible Worlds,* 1927

Although sensory adaptation reduces our sensitivity, it offers an important benefit: freedom to focus on *informative* changes in our environment without being distracted by the constant chatter of uninformative background stimulation. Our sensory receptors are alert to novelty; bore them with repetition and they free our attention for more important things. Stinky or heavily perfumed people don't notice their odor because, like you and me, they adapt to what's constant and only detect change. This reinforces a fundamental lesson: *We perceive the world not exactly as it is, but as it is useful for us to perceive it.*

Our sensitivity to changing stimulation helps explain television's attention-grabbing power. Cuts, edits, zooms, pans, sudden noises—all demand attention, even from TV researchers: During interesting conversations, notes Percy Tannenbaum (2002), "I cannot for the life of me stop from periodically glancing over to the screen."

FIGURE 14.3 The jumpy eye University of Edinburgh psychologist John Henderson (2007) illustrates how a person's gaze jumps from one spot to another every third of a second or so. Eye-tracking equipment shows how a typical person views a photograph of Edinburgh's Princes Street Gardens. Circles represent fixations, and the numbers indicate the time of fixation in milliseconds (300 milliseconds = three-tenths of a second).

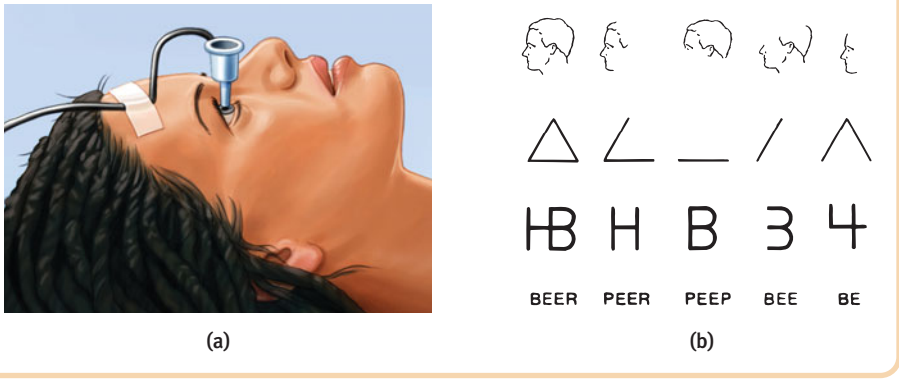


FIGURE 14.4 Sensory adaptation: now you see it, now you don't! (a) A projector mounted on a contact lens makes the projected image move with the eye. (b) Initially, the person sees the stabilized image, but soon she sees fragments fading and reappearing. (From "Stabilized images on the retina," by R. M. Pritchard. Copyright © 1961 Scientific American, Inc. All rights reserved.)

Sensory thresholds and adaptation are only two of the commonalities shared by the senses. All our senses receive sensory stimulation, transform it into neural information, and deliver that information to the brain. Let's look more closely at this process in vision, the sense we humans prize the most.

wavelength the distance from the peak of one light or sound wave to the peak of the next. Electromagnetic wavelengths vary from the short blips of cosmic rays to the long pulses of radio transmission.

hue the dimension of color that is determined by the wavelength of light; what we know as the color names *blue*, *green*, and so forth.

Vision

14-4: What is the energy that we see as visible light?

One of nature's great wonders is neither bizarre nor remote, but commonplace: How does our material body construct our conscious visual experience? How do we transform particles of light energy into colorful sights?

Part of this genius is our ability to convert one sort of energy to another. Our eyes, for example, receive light energy and transform it into neural messages that our brain then processes into what we consciously see. How does such a taken-for-granted yet remarkable thing happen?

The Stimulus Input: Light Energy

Scientifically speaking, what strikes our eyes is not color but pulses of energy that our visual system perceives as color. What we see as visible light (**FIGURE 14.5**) is but a thin slice of the whole spectrum of *electromagnetic energy* ranging from the imperceptibly short waves of gamma rays to the long waves of radio transmission. Other organisms are sensitive to differing portions of this spectrum. Bees, for instance, cannot see red but can see ultraviolet light.

Two physical characteristics of light help determine our sensory experience of them. Light's **wavelength**—the distance from one wave peak to the next—influences our perception of its **hue** (the color we experience, such as blue or green).

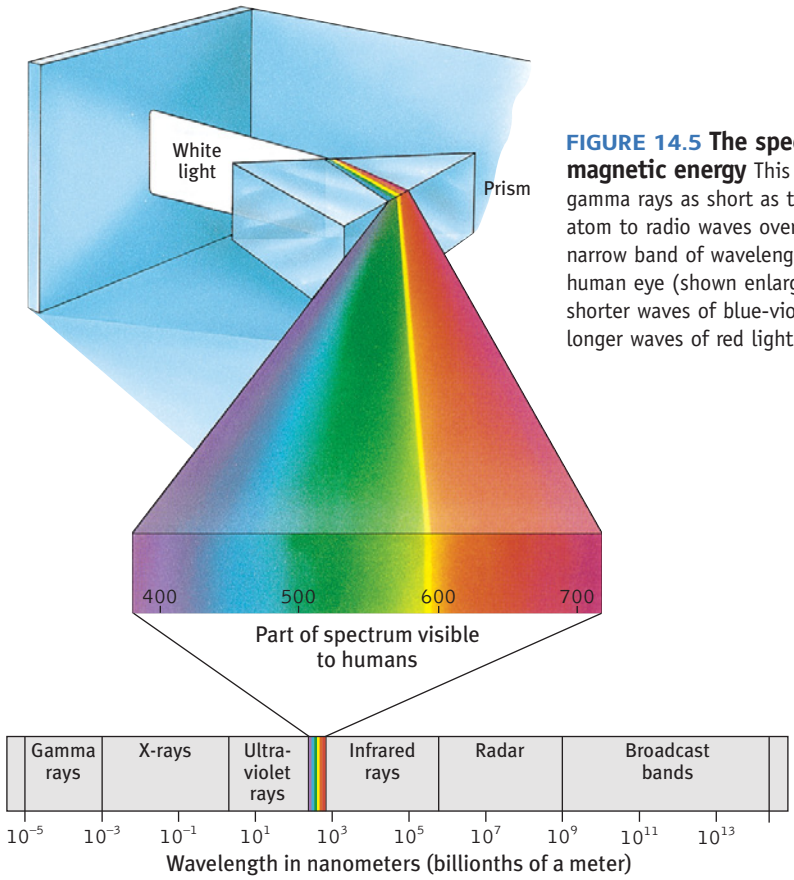


FIGURE 14.5 The spectrum of electromagnetic energy This spectrum ranges from gamma rays as short as the diameter of an atom to radio waves over a mile long. The narrow band of wavelengths visible to the human eye (shown enlarged) extends from the shorter waves of blue-violet light to the longer waves of red light.

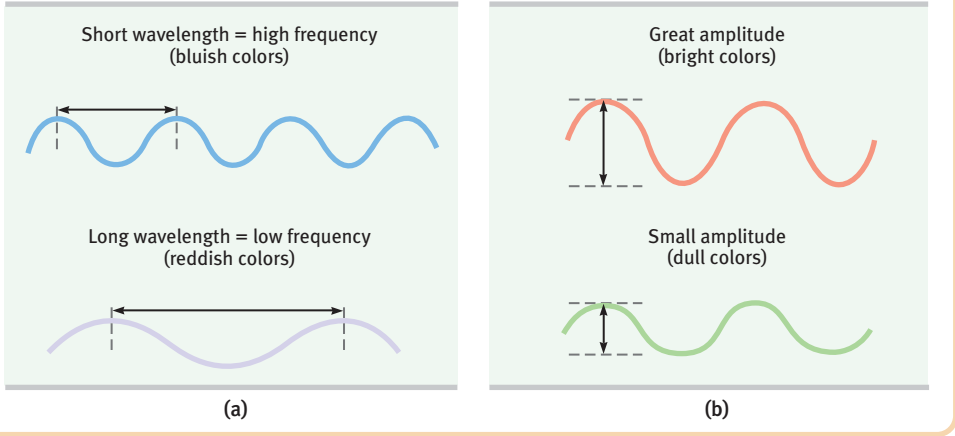


FIGURE 14.6 The physical properties of waves (a) Waves vary in *wavelength* (the distance between successive peaks). *Frequency,* the number of complete wavelengths that can pass a point in a given time, depends on the wavelength. The shorter the wavelength, the higher the frequency. (b) Waves also vary in *amplitude* (the height from peak to trough). Wave amplitude determines the intensity of colors.

intensity the amount of energy in a light or sound wave, which we perceive as brightness or loudness, as determined by the wave's amplitude.

Intensity, the amount of energy in a light wave (as determined by the wave's amplitude, or height), influences our perception of its brightness (**FIGURE 14.6**). To understand how we transform physical energy into color and meaning, we first need to understand vision's window, the eye.

The Eye

14-5: How does the eye transform light energy into neural messages?

retina the light-sensitive inner surface of the eye, containing the receptor rods and cones plus layers of neurons that begin the processing of visual information.

accommodation the process by which the eye's lens changes shape to focus near or far objects on the retina.

Light enters the eye through the *cornea,* which protects the eye and bends light to provide focus (**FIGURE 14.7**). The light then passes through the *pupil,* a small adjustable opening surrounded by the *iris,* a colored muscle that adjusts light intake. The iris dilates or constricts in response to light intensity and even to inner emotions. (When we're feeling amorous, our telltale dilated pupils and dark eyes subtly signal our interest.) Each iris is so distinctive that an iris-scanning machine could confirm your identity.

Behind the pupil is a *lens* that focuses incoming light rays into an image on the **retina,** a multilayered tissue on the eyeball's sensitive inner surface. The lens focuses the rays by changing its curvature in a process called **accommodation.**

For centuries, scientists knew that when an image of a candle passes through a small opening, it casts an inverted mirror image on a dark wall behind. If the retina receives this sort of upside-down image, as in Figure 14.7, how can we see the world right side up? Eventually, the answer became clear: The retina doesn't "see" a whole image. Rather, its millions of receptor cells convert particles of light energy into neural impulses and forward those to the brain. There, the impulses are reassembled into a perceived, upright-seeming image.

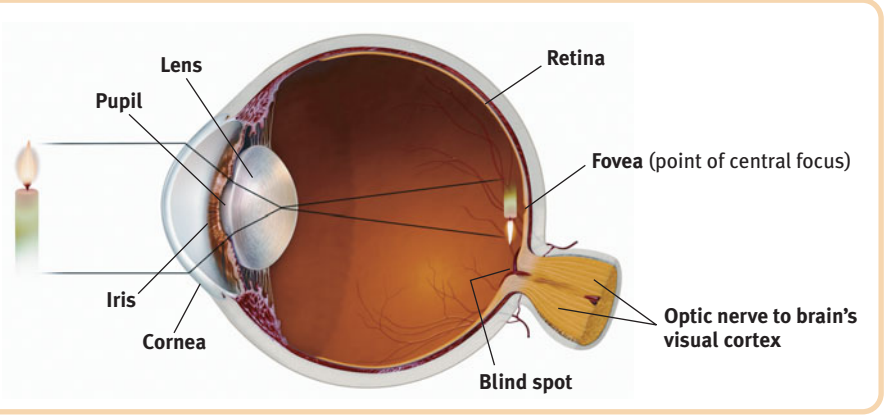


FIGURE 14.7 The eye Light rays reflected from the candle pass through the cornea, pupil, and lens. The curvature and thickness of the lens change to bring either nearby or distant objects into focus on the retina. Rays from the top of the candle strike the bottom of the retina and those from the left side of the candle strike the right side of the retina. The candle's retinal image is thus upside-down and reversed.

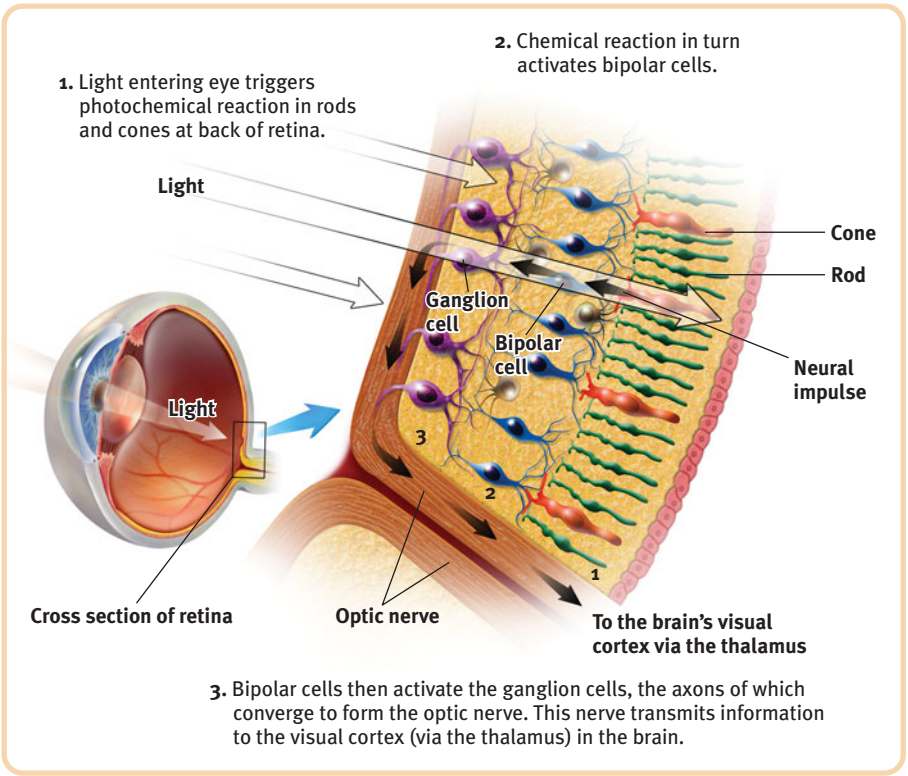


FIGURE 14.8 The retina's reaction to light

The Retina

If you could follow a single light-energy particle into your eye, you would first make your way through the retina's outer layer of cells to its buried receptor cells, the **rods** and **cones** (FIGURE 14.8). There, you would see the light energy trigger chemical changes that would spark a neural impulse, activating neighboring *bipolar cells.* The bipolar cells in turn would activate the neighboring *ganglion cells.* Following the particle's path, you would see axons from this network of ganglion cells converging, like the strands of a rope, to form the **optic nerve** that carries information to your brain (where the thalamus will receive and distribute the information). The optic nerve can send nearly 1 million messages at once through its nearly 1 million ganglion fibers. (The auditory nerve, which enables hearing, carries much less information through its mere 30,000 fibers.)

Where the optic nerve leaves the eye there are no receptor cells—creating a **blind spot** (FIGURE 14.9), which you normally don't notice because your two eyes work together to send information to your brain. But even if you close one eye, you won't see a black hole on your TV screen. Without seeking your approval, your brain will fill in the hole.

rods retinal receptors that detect black, white, and gray; necessary for peripheral and twilight vision, when cones don't respond.

cones retinal receptor cells that are concentrated near the center of the retina and that function in daylight or in well-lit conditions. The cones detect fine detail and give rise to color sensations.

optic nerve the nerve that carries neural impulses from the eye to the brain.

blind spot the point at which the optic nerve leaves the eye, creating a "blind" spot because no receptor cells are located there.

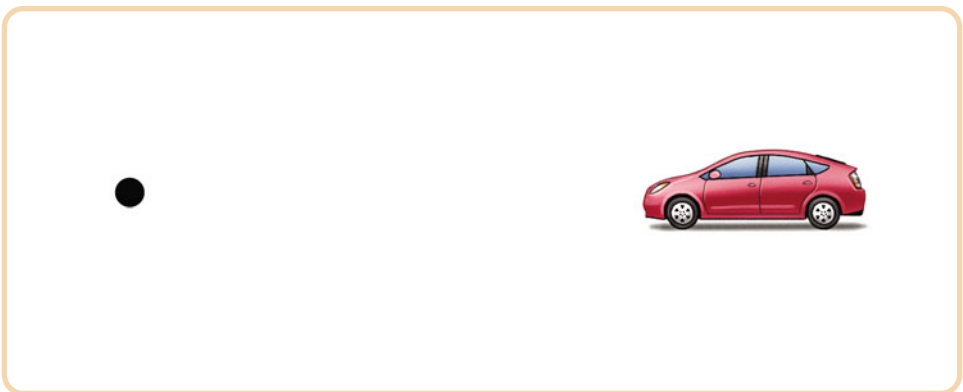
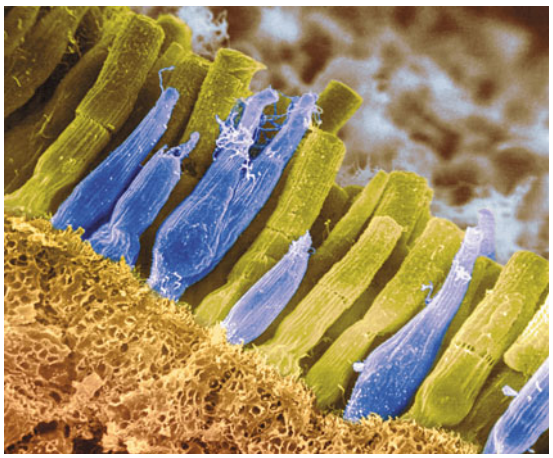


FIGURE 14.9 The blind spot There are no receptor cells where the optic nerve leaves the eye (see Figure 14.8). This creates a blind spot in your vision. To demonstrate, close your left eye, look at the black dot, and hold the page about a foot from your face, at which point the car will disappear. The blind spot does not normally impair your vision, because your eyes are moving and because one eye catches what the other misses.



Omikron/Photo Researchers, Inc.

TABLE 14.1 Receptors in the Human Eye: Rod-Shaped Rods and Cone-Shaped Cones

	Cones	Rods
Number	6 million	120 million
Location in retina	Center	Periphery
Sensitivity in dim light	Low	High
Color sensitivity	High	Low
Detail sensitivity	High	Low

Rods and cones differ in their geography and in the tasks they handle (**TABLE 14.1**). Cones cluster in and around the **fovea,** the retina's area of central focus (see Figure 14.7). Many cones have their own hotline to the brain—bipolar cells that help relay the cone's individual message to the visual cortex, which devotes a large area to input from the fovea. These direct connections preserve the cones' precise information, making them better able to detect fine detail. Rods have no such hotline; they share bipolar cells with other rods, sending combined messages. To experience this difference in sensitivity to details, pick a word in this sentence and stare directly at it, focusing its image on the cones in your fovea. Notice that words a few inches off to the side appear blurred? Their image strikes the more peripheral region of your retina, where rods predominate. The next time you are driving or biking, note, too, that you can detect a car in your peripheral vision well before perceiving its details.

Cones also enable you to perceive color. In dim light they become ineffectual, so you see no colors. Rods, which enable black-and-white vision, remain sensitive in dim light, and several rods will funnel their faint energy output onto a single bipolar cell. Thus, cones and rods each provide a special sensitivity—cones to detail and color, and rods to faint light.

When you enter a darkened theater or turn off the light at night, your pupils dilate to allow more light to reach your retina. It typically takes 20 minutes or more before your eyes fully adapt. You can demonstrate dark adaptation by closing or covering one eye for up to 20 minutes. Then make the light in the room not quite bright enough to read this book with your open eye. Now open the dark-adapted eye and read (easily). This period of dark adaptation parallels the average natural twilight transition between the sun's setting and darkness.

Visual Information Processing

14-6: How does the brain process visual information?

Visual information percolates through progressively more abstract levels. At the entry level, the retina processes information before routing it via the thalamus to the brain's cortex. The retina's neural layers—which are actually brain tissue that migrates to the eye during early fetal development—don't just pass along electrical impulses; they also help to encode and analyze the sensory information. The third neural layer in a frog's eye, for example, contains the "bug detector" cells that fire only in response to moving flylike stimuli.

After processing by your retina's nearly 130 million receptor rods and cones, information travels to your bipolar cells, then to your million or so ganglion cells, through their axons making up the optic nerve, to your brain. Any given retinal area relays its information to a corresponding location in the visual cortex, in the occipital lobe at the back of your brain (**FIGURE 14.10**).

Feature Detection

Nobel Prize winners David Hubel and Torsten Wiesel (1979) demonstrated that neurons in the occipital lobe's visual cortex receive information from individual ganglion cells in the retina. These **feature detector** cells derive their name from their ability to respond to a scene's specific features—to particular edges, lines, angles, and movements.

Feature detectors in the visual cortex pass such information to other cortical areas where teams of cells *(supercell clusters)* respond to more complex patterns. One temporal lobe area just behind your right ear, for example, enables you to perceive faces. If this region were damaged, you might recognize other forms and objects, but, like Heather Sellers, not familiar faces. Functional MRI (fMRI) scans show

fovea the central focal point in the retina, around which the eye's cones cluster.

feature detectors nerve cells in the brain that respond to specific features of a stimulus, such as shape, angle, or movement.

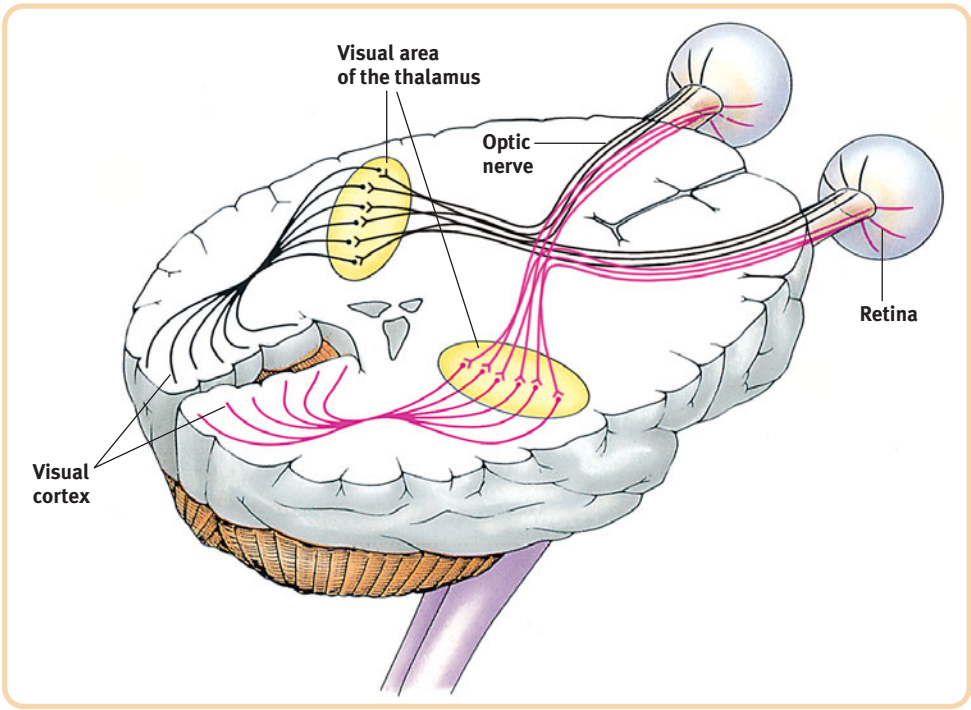


FIGURE 14.10 Pathway from the eyes to the visual cortex Ganglion axons forming the optic nerve run to the thalamus, where they synapse with neurons that run to the visual cortex.

other brain areas lighting up when people view other object categories (Downing et al., 2001). Amazingly specific combinations of activity may appear (**FIGURE 14.11**). "We can tell if a person is looking at a shoe, a chair, or a face, based on the pattern of their brain activity," notes researcher James Haxby (2001).

Psychologist David Perrett and his colleagues (1988, 1992, 1994) reported that for biologically important objects and events, monkey brains (and surely ours as well) have a "vast visual encyclopedia" distributed as cells that specialize in responding to one type of stimulus—such as a specific gaze, head angle, posture, or body movement. Other supercell clusters integrate this information and fire only when the cues collectively indicate the direction of someone's attention and approach. This instant analysis, which aided our ancestors' survival, also helps a soccer goalie anticipate the direction of an impending kick, and a driver anticipate a pedestrian's next movement.

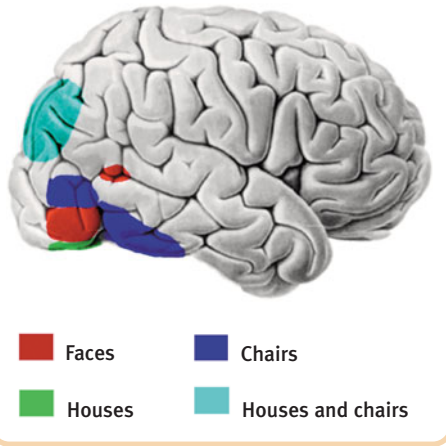


FIGURE 14.11 The telltale brain Looking at faces, houses, and chairs activates different brain areas in this right-facing brain.

Reuters/Claro Cortes IV (China)

Well-developed supercells In this 2007 World Cup match, Brazil's Marta instantly processed visual information about the positions and movements of Australia's defenders and goalie (Melissa Barbieri) and somehow managed to get the ball around them all and into the net.

parallel processing the processing of many aspects of a problem simultaneously; the brain's natural mode of information processing for many functions, including vision. Contrasts with the step-by-step (serial) processing of most computers and of conscious problem solving.

Parallel Processing

Unlike most computers, which do step-by-step *serial processing*, our brain engages in **parallel processing:** doing many things at once. The brain divides a visual scene into subdimensions, such as color, movement, form, and depth (**FIGURE 14.12**), and works on each aspect simultaneously (Livingstone & Hubel, 1988). We then construct our perceptions by integrating the separate but parallel work of these different visual teams.

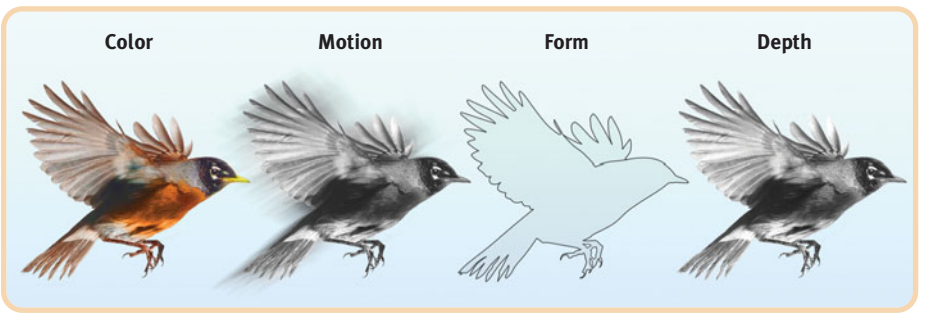
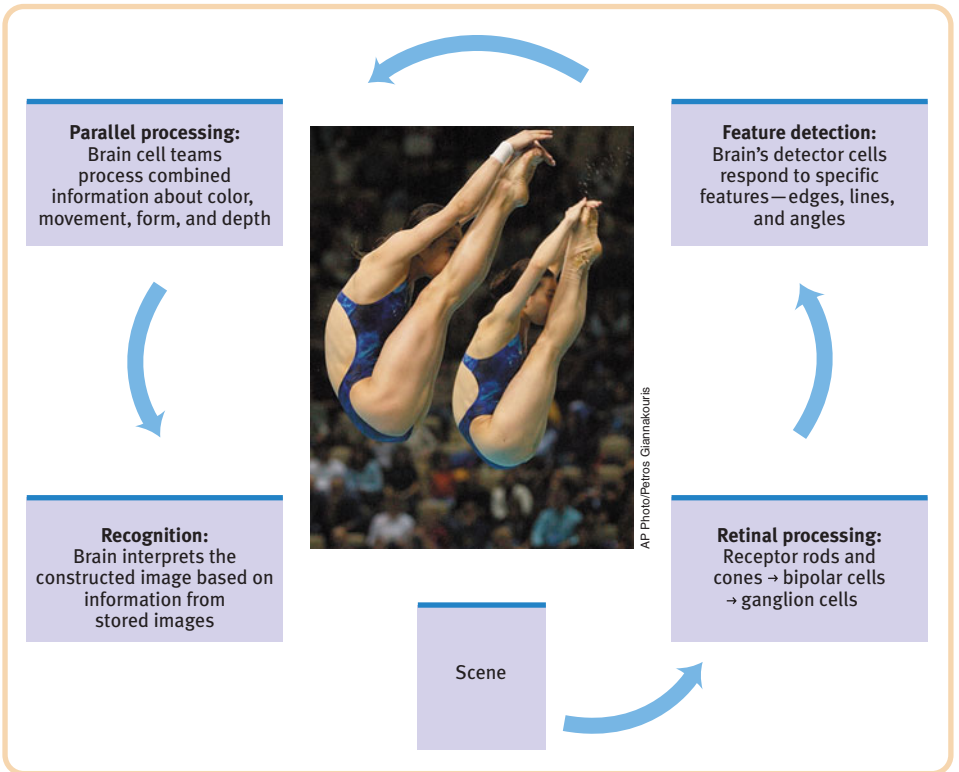


FIGURE 14.12 Parallel processing Studies of patients with brain damage suggest that the brain delegates the work of processing color, movement, form, and depth to different areas. After taking a scene apart, how does the brain integrate these subdimensions into the perceived image? The answer to this question is the ultimate quest of vision research.

Destroying or disabling the neural workstation for other visual subtasks produces different peculiar results, as happened to "Mrs. M." (Hoffman, 1998). Since a stroke damaged areas near the rear of both sides of her brain, she can no longer perceive movement. People in a room seem "suddenly here or there but I have not seen them moving." Pouring tea into a cup is a challenge because the fluid appears frozen—she cannot perceive it rising in the cup.

Others with stroke or surgery damage to their brain's visual cortex have experienced *blindsight*, a localized area of blindness in part of their field of vision (Weiskrantz, 1986). Shown a series of sticks in the blind field, they report seeing nothing. Yet when asked to guess whether the sticks are vertical or horizontal, their visual intuition typically offers the correct response. When told, "You got them all right," they are astounded. There is, it seems, a second "mind"—a parallel processing system—operating unseen.

FIGURE 14.13 A simplified summary of visual information processing



A scientific understanding of visual information processing leaves many neuropsychologists awestruck. As Roger Sperry (1985) observed, the "insights of science give added, not lessened, reasons for awe, respect, and reverence." Think about it: As you look at someone, visual information is transformed into millions of neural impulses, sent to your brain, constructed into component features, and finally, in some as-yet mysterious way, composed into a meaningful image, which you compare with previously stored images and recognize: "That's Sara!" Likewise, as you read this page, the printed squiggles are transmitted by reflected light rays onto your retina, which triggers a process that sends formless nerve impulses to several areas of your brain, which integrates the information and decodes meaning, thus completing the transfer of information across time and space from my mind to your mind. The whole process (**FIGURE 14.13**) is

more complex than taking apart a car, piece by piece, transporting it to a different location, then having specialized workers reconstruct it. That all of this happens instantly, effortlessly, and continuously is indeed awesome.

"I am . . . wonderfully made."
—King David, Psalm 139:14

Color Vision

14-7: What theories help us understand color vision?

We talk as though objects possess color: "A tomato is red." Perhaps you have pondered the old question, "If a tree falls in the forest and no one hears it, does it make a sound?" We can ask the same of color: If no one sees the tomato, is it red?

The answer is *no.* First, the tomato is everything *but* red, because it *rejects* (reflects) the long wavelengths of red. Second, the tomato's color is our mental construction. As Isaac Newton (1704) noted, "The [light] rays are not colored." Color, like all aspects of vision, resides not in the object but in the theater of our brains, as evidenced by our dreaming in color.

"Only mind has sight and hearing; all things else are deaf and blind."
—Epicharmus, *Fragments,* 550 B.C.E.

In the study of vision, one of the most basic and intriguing mysteries is how we see the world in color. How, from the light energy striking the retina, does the brain manufacture our experience of color—and of such a multitude of colors? Our difference threshold for colors is so low that we can discriminate some 7 million different color variations (Geldard, 1972).

At least most of us can. For about 1 person in 50, vision is color deficient—and that person is usually male, because the defect is genetically sex-linked. To understand why some people's vision is color deficient, it will help to first understand how normal color vision works.

Modern detective work on the mystery of color vision began in the nineteenth century when Hermann von Helmholtz built on the insights of an English physicist, Thomas Young. Knowing that any color can be created by combining the light waves of three primary colors—red, green, and blue—Young and von Helmholtz inferred that the eye must have three corresponding types of color receptors. Years later, researchers measured the response of various cones to different color stimuli and confirmed the **Young-Helmholtz trichromatic (three-color) theory.** Indeed, the retina has three types of color receptors, each especially sensitive to one of three colors. And those colors are, in fact, red, green, and blue. When we stimulate combinations of these cones, we see other colors. For example, there are no receptors especially sensitive to yellow. Yet when both red-sensitive and green-sensitive cones are stimulated, we see yellow.

Young-Helmholtz trichromatic (three-color) theory the theory that the retina contains three different color receptors—one most sensitive to red, one to green, one to blue—which, when stimulated in combination, can produce the perception of any color.

Most people with color-deficient vision are not actually "colorblind." They simply lack functioning red- or green-sensitive cones, or sometimes both. Their vision—perhaps unknown to them, because their lifelong vision *seems* normal—is monochromatic (one-color) or dichromatic (two-color) instead of trichromatic, making it impossible to distinguish the red and green in **FIGURE 14.14** (Boynton, 1979). Dogs, too, lack receptors for the wavelengths of red, giving them only limited, dichromatic color vision (Neitz et al., 1989).

But trichromatic theory cannot solve all parts of the color vision mystery, as Ewald Hering soon noted. For example, we see yellow when mixing red and green light. But how is it that those blind to red and green can often still see yellow? And why does yellow appear to be a pure color and not a mixture of red and green, the way purple is of red and blue?

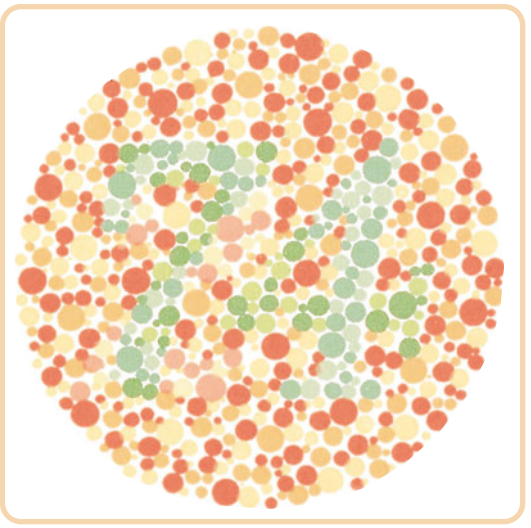


FIGURE 14.14 Color-deficient vision People who suffer red-green deficiency have trouble perceiving the number within the design.

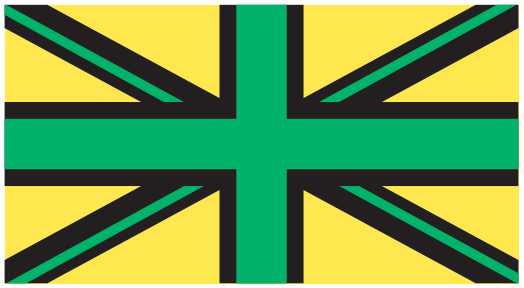


FIGURE 14.15 Afterimage effect Stare at the center of the flag for a minute and then shift your eyes to the dot in the white space beside it. What do you see? (After tiring your neural response to black, green, and yellow, you should see their opponent colors.) Stare at a white wall and note how the size of the flag grows with the projection distance!

Hering, a physiologist, found a clue in the well-known occurrence of *afterimages*. When you stare at a green square for a while and then look at a white sheet of paper, you see red, green's *opponent color*. Stare at a yellow square and you will later see its opponent color, blue, on the white paper (as in the flag demonstration in **FIGURE 14.15**). Hering surmised that there must be two additional color processes, one responsible for red-versus-green perception, and one for blue-versus-yellow.

A century later, researchers confirmed Hering's **opponent-process theory.** As visual information leaves the receptor cells, we analyze it in terms of three sets of opponent colors: *red-green, yellow-blue,* and *white-black*. In the retina and in the thalamus (where impulses from the retina are relayed en route to the visual cortex), some neurons are turned "on" by red but turned "off" by green. Others are turned on by green but off by red (DeValois & DeValois, 1975).

opponent-process theory the theory that opposing retinal processes (red-green, yellow-blue, white-black) enable color vision. For example, some cells are stimulated by green and inhibited by red; others are stimulated by red and inhibited by green.

Opponent processes explain afterimages, such as in the flag demonstration, in which we tire our green response by staring at green. When we then stare at white (which contains all colors, including red), only the red part of the green-red pairing will fire normally.

The present solution to the mystery of color vision is therefore roughly this: Color processing occurs in two stages. The retina's cones for red, green, and blue respond in varying degrees to different color stimuli, as the Young-Helmholtz trichromatic theory suggested. The cones' signals are then processed by the nervous system's opponent-process cells, en route to the visual cortex.

Basic Concepts and Vision

Module Review

14-1: What do we mean by *bottom-up processing* and *top-down processing?* *Sensation* and *perception* are parts of one continuous process. *Bottom-up processing* is sensory analysis that begins at the entry level, with information flowing from the sensory receptors to the brain. *Top-down processing* is analysis that begins with the brain and flows down, filtering information through our experience and expectations to produce perceptions.

14-2: What are absolute and difference thresholds, and do stimuli below the absolute threshold have any influence? Our *absolute threshold* for any stimulus is the minimum stimulation needed to be consciously aware of it 50 percent of the time. Our *difference threshold* (also called just noticeable difference, or jnd) is the barely noticeable difference we discern between two stimuli 50 percent of the time. *Priming* shows that we can process some information from *subliminal* stimuli—those below our absolute threshold for conscious awareness. But the effect is not powerful or enduring. *Weber's law* states that, to be perceived as different, two stimuli must differ by a constant minimum proportion.

14-3: What is the function of sensory adaptation? By diminishing our sensitivity to constant or routine stimuli, *sensory adaptation* focuses our attention on informative changes in our environment.

14-4: What is the energy that we see as visible light? Each sense receives stimulation, transforms it into neural signals, and sends these neural messages to the brain. In vision, the signals consist of light-energy particles from a thin slice of the broad spectrum of electromagnetic energy. The *hue* we perceive in a light depends on its *wavelength,* and its brightness depends on its *intensity*.

14-5: How does the eye transform light energy into neural messages? Light-energy particles enter the eye, are focused by a lens, and then strike the eye's inner surface, the *retina*. The retina's light-sensitive *rods* and color-sensitive *cones* convert the light energy into neural impulses which, after processing by bipolar and ganglion cells, travel through the *optic nerve* to the brain.

14-6: How does the brain process visual information? Impulses travel along the optic nerve, to the thalamus, and on to the visual cortex. In the visual cortex, *feature detectors* respond to specific features of the visual stimulus and pass information to higher-level supercells in other cortical areas. *Parallel processing* by separate neural teams in the brain enables the simultaneous processing of many aspects of visual information. Other neural teams integrate the results and compare them with stored information, enabling perceptions.

14-7: What theories help us understand color vision? The *Young-Helmholtz trichromatic (three-color) theory* proposed that the retina contains three types of color receptors. Research has confirmed that we have three types of cones, each especially sensitive to the wavelengths of red, green, or blue. Hering's *opponent-process theory* proposed three additional color processes (red-versus-green, blue-versus-yellow, black-versus-white). Research has also confirmed that, en route to the brain, neurons in the retina and the thalamus code the color-related information from the cones into pairs of opponent colors. Thus, color processing occurs in two stages.

Rehearse It!

1. Sensation is to _____ as perception is to _____.
   a. absolute threshold; difference threshold
   b. bottom-up processing; top-down processing
   c. interpretation; detection
   d. conscious awareness; persuasion

2. To construct meaning from our external environment, we organize and interpret sensory information. This is the process of
   a. sensation.
   b. priming.
   c. bottom-up processing.
   d. perception.

3. Subliminal stimuli, such as undetectably faint sights or sounds, are
   a. too weak to be processed by the brain in any way.
   b. consciously perceived more than 50 percent of the time.
   c. always strong enough to affect our behavior.
   d. below the absolute threshold for conscious awareness.

4. Another term for the difference threshold is
   a. just noticeable difference.
   b. sensory adaptation.
   c. absolute threshold.
   d. subliminal stimulation.

5. Weber's law states that for a difference to be perceived, two stimuli must differ by
   a. a fixed unchanging amount.
   b. a constant minimum percentage.
   c. a constantly changing amount.
   d. more than 7 percent.

6. Sensory adaptation has survival benefits because it helps us focus on
   a. visual stimuli.
   b. auditory stimuli.
   c. constant features of the environment.
   d. important changes in the environment.

7. The physical characteristic of light that determines the color we experience, such as blue or green, is
   a. intensity.
   b. wavelength.
   c. amplitude.
   d. hue.

8. The blind spot in your retina is located in an area where
   a. there are rods but no cones.
   b. there are cones but no rods.
   c. the optic nerve leaves the eye.
   d. the bipolar cells meet the ganglion cells.

9. Cones are the eye's receptor cells that are especially sensitive to _____ light and are responsible for our _____ vision.
   a. bright; black-and-white
   b. dim; color
   c. bright; color
   d. dim; black-and-white

10. The brain cells that respond maximally to certain bars, edges, and angles are called
a. rods and cones.
b. feature detectors.
c. bipolar cells.
d. ganglion cells.

11. The brain's ability to process many aspects of an object or problem simultaneously is called
a. parallel processing.
b. serial processing.
c. opponent processing.
d. accommodation.

12. Two theories together account for color vision. The Young-Helmholtz theory shows that the eye contains _____, and the Hering theory accounts for the nervous system's having _____.
a. opposing retinal processes; three pairs of color receptors
b. opponent-process cells; three types of color receptors
c. three pairs of color receptors; opposing retinal processes
d. three types of color receptors; opponent-process cells

Answers: 1. b, 2. d, 3. d, 4. a, 5. b, 6. d, 7. b, 8. c, 9. c, 10. b, 11. a, 12. d.

Terms and Concepts to Remember

sensation, p. 189
perception, p. 189
bottom-up processing, p. 189
top-down processing, p. 189
psychophysics, p. 190
absolute threshold, p. 190
subliminal, p. 190
priming, p. 191
difference threshold, p. 191
Weber's law, p. 191
sensory adaptation, p. 192
wavelength, p. 193
hue, p. 193
intensity, p. 194
retina, p. 194
accommodation, p. 194
rods, p. 195
cones, p. 195
optic nerve, p. 195
blind spot, p. 195
fovea, p. 196
feature detectors, p. 196
parallel processing, p. 198
Young-Helmholtz trichromatic (three-color) theory, p. 199
opponent-process theory, p. 200

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Before reading this question, you probably didn't notice the sensation of your shoes touching your feet. Yet it's likely you notice them now. Why?

2. What mental processes allow you to perceive a lemon as yellow?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 15

The Other Senses

For humans, vision is the major sense. More of our brain cortex is devoted to vision than to any other sense. Yet without our senses of hearing, body position and movement, touch, taste, and smell, our capacities for experiencing the world would be vastly diminished.

Hearing

Like our other senses, our **audition,** or hearing, is highly adaptive. We hear a wide range of sounds, but we hear best those sounds with frequencies in a range corresponding to that of the human voice. We are acutely sensitive to faint sounds, an obvious boon for our ancestors' survival when hunting or being hunted, or for detecting a child's whimper. (If our ears were much more sensitive, we would hear a constant hiss from the movement of air molecules.)

We are also remarkably attuned to variations in sounds. We easily detect differences among thousands of human voices: Answering the phone, we recognize a friend calling from the moment she says "Hi." A fraction of a second after such events stimulate receptors in the ear, millions of neurons have simultaneously coordinated in extracting the essential features, comparing them with past experience, and identifying the stimulus (Freeman, 1991). For hearing as for the other senses, the fundamental question is, How do we do it?

The Stimulus Input: Sound Waves

15-1: What are the characteristics of air pressure waves that we hear as sound?

Draw a bow across a violin, and the resulting stimulus energy is sound waves—jostling molecules of air, each bumping into the next, like a shove transmitted through a concert hall's crowded exit tunnel. Those waves of compressed and expanded air are like the ripples on a pond circling out from where a stone has been tossed. As we swim in our ocean of moving air molecules, our ears detect these brief air pressure changes. Exposed to a loud, low bass sound—perhaps from a bass guitar or a cello—we can also *feel* the vibration, and we hear by both air and bone conduction.

The ears then transform the vibrating air into nerve impulses, which our brain decodes as sounds. The strength, or *amplitude,* of sound waves (FIGURE 15.1) determines their *loudness.* Waves also vary in length, and therefore in **frequency.** Their frequency determines the **pitch** we experience: Long waves have low frequency—and low pitch. Short waves have high frequency—and high pitch. A violin produces much shorter, faster sound waves than does a cello.

audition the sense or act of hearing.

frequency the number of complete wavelengths that pass a point in a given time (for example, per second).

pitch a tone's experienced highness or lowness; depends on frequency.

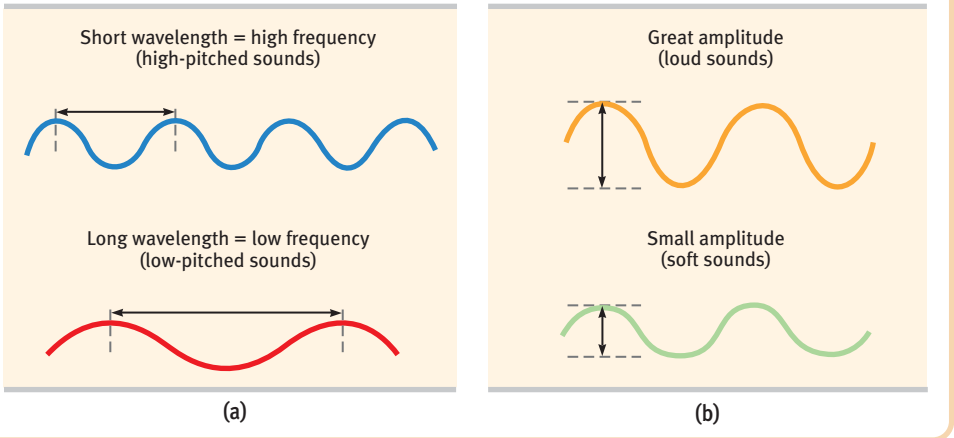


FIGURE 15.1 The physical properties of waves (a) Waves vary in *wavelength,* the distance between successive peaks. *Frequency,* the number of complete wavelengths that can pass a point in a given time, depends on the wavelength. The shorter the wavelength, the higher the frequency. (b) Waves also vary in *amplitude,* the height from peak to trough. Wave amplitude determines the *intensity* of sounds.


Jeremy Hoare/Alamy

The sounds of music A violin's short, fast waves create a high pitch, a cello's longer, slower waves a lower pitch. Differences in the waves' height, or amplitude, also create differing degrees of loudness.

middle ear the chamber between the eardrum and cochlea containing three tiny bones (hammer, anvil, and stirrup) that concentrate the vibrations of the eardrum on the cochlea's oval window.

cochlea [KOHK-lee-uh] a coiled, bony, fluid-filled tube in the inner ear through which sound waves trigger nerve impulses.

inner ear the innermost part of the ear, containing the cochlea, semicircular canals, and vestibular sacs.

We measure sounds in decibels. The absolute threshold for hearing is arbitrarily defined as zero decibels. Every 10 decibels correspond to a tenfold increase in sound intensity. Thus, normal conversation (60 decibels) is 10,000 times more intense than a 20-decibel whisper. And a temporarily tolerable 100-decibel passing subway train is 10 billion times more intense than the faintest detectable sound.

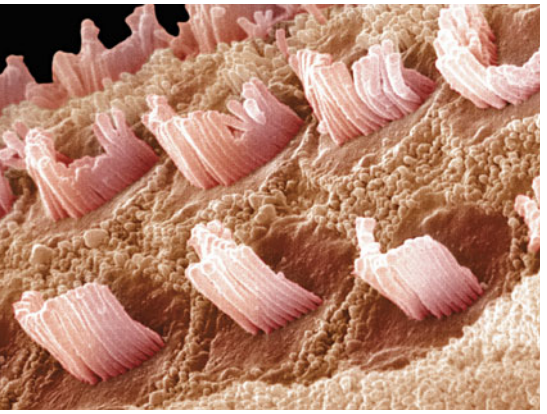
The Ear

15-2: How does the ear transform sound energy into neural messages?

To hear, we must somehow convert sound waves into neural activity. The human ear accomplishes this feat through an intricate mechanical chain reaction. First, the visible *outer ear* channels the sound waves through the auditory canal to the *eardrum,* a tight membrane that vibrates with the waves. The **middle ear** then transmits the eardrum's vibrations through a piston made of three tiny bones (the *hammer, anvil,* and *stirrup*) to the **cochlea,** a snail-shaped tube in the **inner ear (FIGURE 15.2a).** The incoming vibrations cause the cochlea's membrane (the *oval window*) to vibrate, jostling the fluid that fills the tube (Figure 15.2b). This motion causes ripples in the *basilar membrane,* bending the *hair cells* lining its surface, not unlike the wind bending a wheat field. Hair cell movement triggers impulses in the adjacent nerve cells, whose axons converge to form the *auditory nerve,* which sends neural messages (via the thalamus) to the temporal lobe's *auditory cortex.* From vibrating air to moving piston to fluid waves to electrical impulses to the brain: Voila! We hear.

My vote for the most intriguing part of the hearing process is the hair cells. A Howard Hughes Medical Institute (2008) report on these "quivering bundles that let us hear" marvels at their "extreme sensitivity and extreme speed." A cochlea has 16,000 of them, which sounds like a lot until we compare that with an eye's 130 million or so receptor rods and cones. But consider their responsiveness. Deflect the tiny bundles of cilia on the tip of a hair cell by the width of an atom—the equivalent of displacing the top of the Eiffel Tower by half an inch—and the alert hair cell, thanks to a special protein at its tip, triggers a neural response (Corey et al., 2004).

Damage to hair cells accounts for most hearing loss. They have been likened to shag carpet fibers. Walk around on them and they will spring back with a quick vacuuming. But leave a heavy piece of furniture on them for a long time and they may never rebound. As a general rule, if we cannot talk over a noise, it is potentially harmful, especially if prolonged and repeated (Roesser, 1998). Such experiences are common when sound exceeds 100 decibels, as happens in venues from frenzied sports arenas to bagpipe bands to iPods playing near maximum volume (**FIGURE 15.3**). Ringing of the ears after exposure to loud machinery or music indicates that we have been bad to our unhappy hair cells. As pain alerts us to possible bodily harm, ringing of the ears alerts us to possible hearing damage. It is hearing's equivalent of bleeding.


Dr. Fred Hossler/Visuals Unlimited

Be kind to your inner ear's hair cells When vibrating in response to sound, the hair cells shown here lining the cochlea produce an electrical signal.

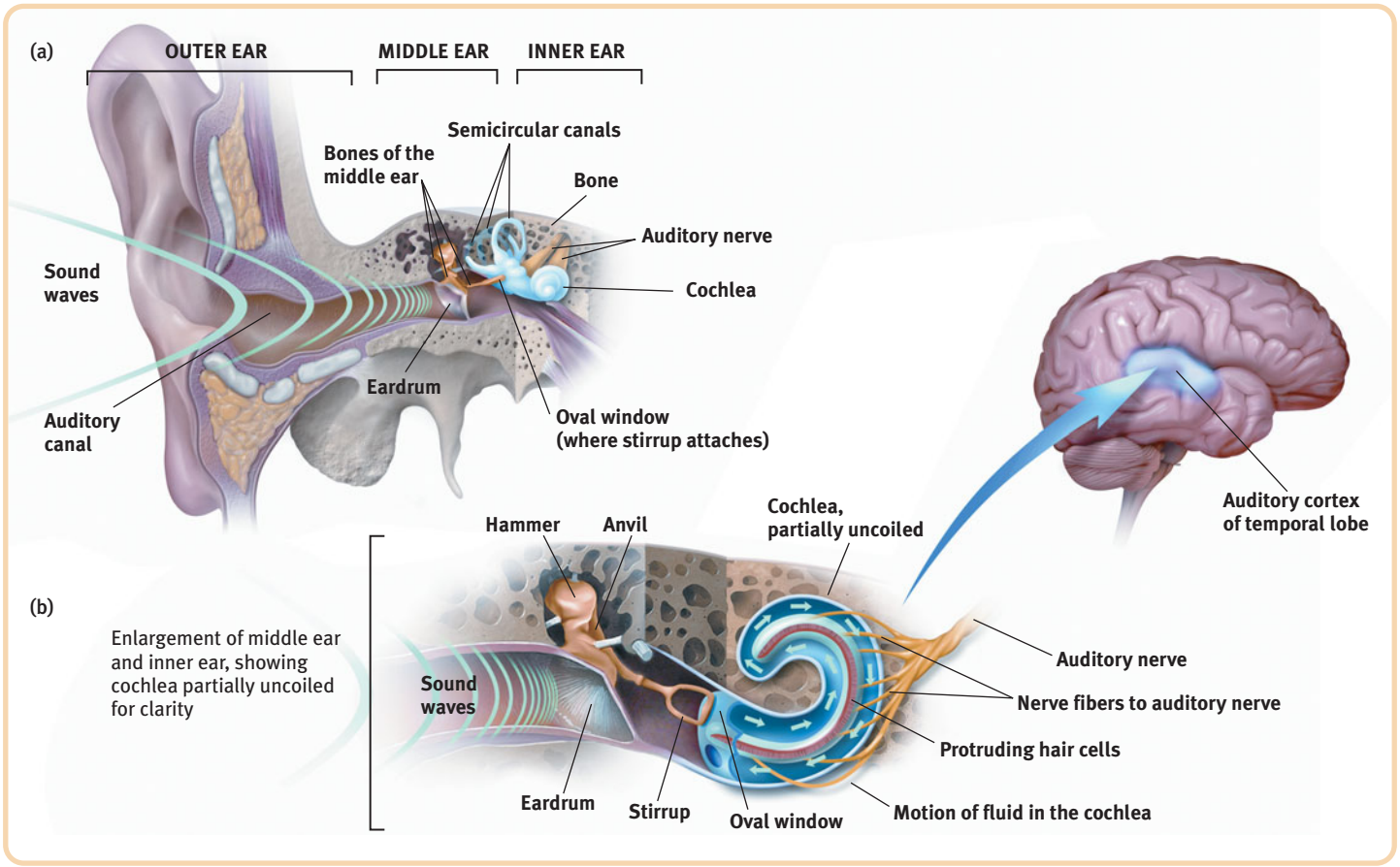
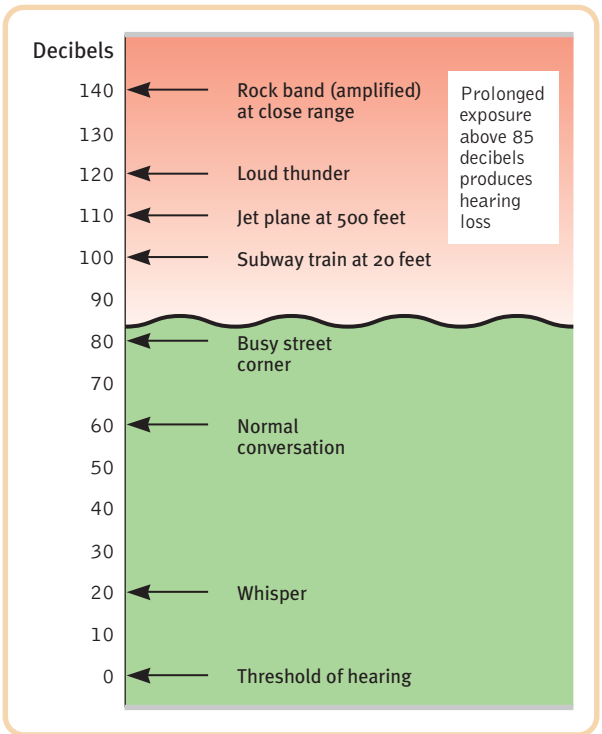


FIGURE 15.2 Hear here: How we transform sound waves into nerve impulses that our brain interprets (a) The outer ear funnels sound waves to the eardrum. The bones of the middle ear amplify and relay the eardrum's vibrations through the oval window into the fluid-filled cochlea. (b) As shown in this detail of the middle and inner ear, the resulting pressure changes in the cochlear fluid cause the basilar membrane to ripple, bending the hair cells on the surface. Hair cell movements trigger impulses at the base of the nerve cells, whose fibers converge to form the auditory nerve, which sends neural messages to the thalamus and on to the auditory cortex.

Teen boys more than teen girls or adults blast themselves with loud volumes for long periods (Zogby, 2006). Males' greater noise exposure may help explain why men's hearing tends to be less acute than women's. But male or female, those who spend many hours in a loud nightclub, behind a power mower, or above a jackhammer should wear earplugs. "Condoms or, safer yet, abstinence," say sex educators. "Earplugs or walk away," say hearing educators.



Richard Kaylin/Stone/Getty Images

FIGURE 15.3 The intensity of some common sounds At close range, the thunder that follows lightning has 120-decibel intensity.

Perceiving Loudness

So, how do we detect loudness? It is not, as I would have guessed, from the intensity of a hair cell's response. Rather, a soft, pure tone activates only the few hair cells attuned to its frequency. Given louder sounds, neighboring hair cells also respond. Thus, the brain can interpret loudness from the *number* of activated hair cells.

If a hair cell loses sensitivity to soft sounds, it may still respond to loud sounds. This helps explain another surprise: Really loud sounds may seem loud both to people with hearing loss and to those with normal hearing. As a person with hearing loss, I used to wonder what really loud music must sound like to people with normal hearing. Now I realize it can sound much the same; where we differ is in our sensation of soft sounds.

Locating Sounds

15-3: How do we locate sounds?

Why don't we have one big ear—perhaps above our one nose? The better to hear you, as the wolf said to Red Riding Hood. As the placement of our eyes allows us to sense visual depth, so the placement of our two ears allows us to enjoy stereophonic ("three-dimensional") hearing.

Two ears are better than one for at least two reasons: If a car to the right honks, your right ear receives a more *intense* sound, and it receives sound slightly *sooner* than your left ear (**FIGURE 15.4**). Because sound travels 750 miles per hour and our ears are but 6 inches apart, the intensity difference and the time lag are extremely small. However, our supersensitive auditory system can detect such minute differences (Brown & Deffenbacher, 1979; Middlebrooks & Green, 1991). A just noticeable difference in the direction of two sound sources corresponds to a time difference of just 0.000027 seconds!

So how well do you suppose we do at locating a sound that is equidistant from our two ears, such as those that come from directly ahead, behind, overhead, or beneath us? Not very well. Why? Because such sounds strike the two ears simultaneously. Sit with closed eyes while a friend snaps fingers around your head. You will easily point to the sound when it comes from either side, but you will likely make some mistakes when it comes from directly ahead, behind, above, or below. That is why, when trying to pinpoint a sound, you cock your head, so that your two ears will receive slightly different messages.

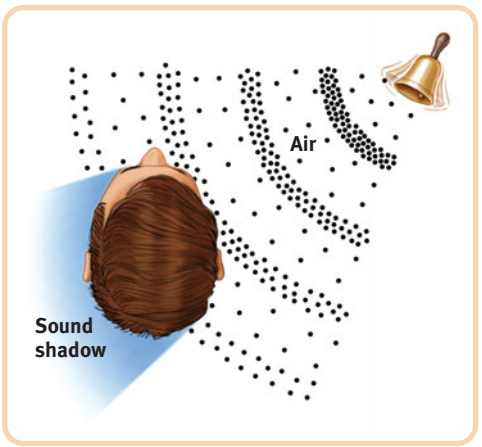


FIGURE 15.4 How we locate sounds
Sound waves strike one ear sooner and more intensely than the other. From this information, our nimble brain computes the sound's location. As you might therefore expect, people who lose all hearing in one ear often have difficulty locating sounds.

Kinesthesis and the Vestibular Sense

15-4: How do we sense our body's position and movement?

Your ears also contribute to another important sense—your **vestibular sense,** which monitors your head's (and thus your body's) position and movement. The biological gyroscopes for this sense of equilibrium are in your inner ear. The *semicircular canals,* which look like a three-dimensional pretzel (Figure 15.2a), and the *vestibular sacs,* which connect the canals with the cochlea, contain fluid that moves when your head rotates or tilts. This movement stimulates hairlike receptors, which send messages to the cerebellum at the back of the brain, thus enabling you to sense your body position and to maintain your balance.

Yet another sense, **kinesthesis**—your sense of the position and movement of your body parts—is enabled by important sensors in your joints, tendons, bones, ears, and skin. By closing your eyes or plugging your ears you can momentarily imagine being without sight or sound. But what would it be like to live without kinesthesis—without, therefore, being able to sense the positions of your limbs when you wake during the night? Ian Waterman of Hampshire, England, knows. In 1972, at age 19, Waterman contracted a rare viral infection that destroyed the nerves enabling his sense of light touch and of body position and movement.

vestibular sense the sense of body movement and position, including the sense of balance.

kinesthesis [kin-ehs-THEE-sehs] the system for sensing the position and movement of individual body parts.

People with this condition report feeling disembodied, as though their body is dead, not real, not theirs (Sacks, 1985). With prolonged practice, Waterman has learned to walk and eat—by visually focusing on his limbs and directing them accordingly. But if the lights go out, he crumples to the floor (Azar, 1998). Even for the rest of us, vision interacts with kinesthesis. Stand with your right heel in front of your left toes. Easy. Now close your eyes and you will probably wobble.

If you twirl around and then come to an abrupt halt, neither the fluid in your semicircular canals nor your kinesthetic receptors will immediately return to their neutral state. The dizzy aftereffect fools your brain with the sensation that you're still spinning. This illustrates a principle that underlies perceptual illusions: Mechanisms that normally give us an accurate experience of the world can, under special conditions, fool us. Understanding how we get fooled provides clues to how our perceptual system works.

Michal Cizek/AFP/Getty Images

The intricate vestibular sense These Cirque du Soleil performers can thank their inner ears for the information that enables their brains to monitor their bodies' position so expertly.

Touch

15-5: How do we sense touch? How do we experience pain?

Although it may not be the first sense to come to mind, touch is vital. Right from the start, touch is essential to our development. Infant rats deprived of their mother's grooming produce less growth hormone and have a lower metabolic rate—a good way to keep alive until the mother returns, but a reaction that stunts growth if prolonged. Infant monkeys allowed to see, hear, and smell—but not touch—their mother become desperately unhappy; those separated by a screen with holes that allow touching are much less miserable. Premature human babies gain weight faster and go home sooner if they are stimulated by hand massage. As lovers, we yearn to touch—to kiss, to stroke, to snuggle. And even strangers, touching only their forearms and separated by a curtain, can communicate anger, fear, disgust, love, gratitude, and sympathy at levels well above chance (Hertenstein et al., 2006).

Humorist Dave Barry may be right to jest that your skin "keeps people from seeing the inside of your body, which is repulsive, and it prevents your organs from falling onto the ground." But skin does much more. Our "sense of touch" is actually a mix of distinct senses, with different types of specialized nerve endings within the skin. Touching various spots on the skin with a soft hair, a warm or cool wire, and the point of a pin reveals that some spots are especially sensitive to pressure, others to warmth, others to cold, still others to pain.

Bruce Ayres/Stone/Getty Images

The precious sense of touch As William James wrote in his *Principles of Psychology* (1890), "Touch is both the alpha and omega of affection."

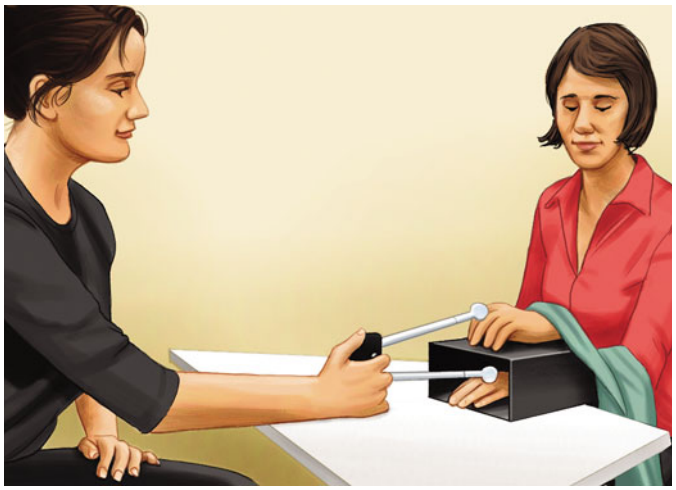


FIGURE 15.5 The rubber-hand illusion
When a researcher simultaneously touches a volunteer's real and fake hands, the volunteer feels as though the seen fake hand is her own (MacLachlan et al., 2003).

Surprisingly, there is no simple relationship between what we feel at a given spot and the type of specialized nerve ending found there. Only pressure has identifiable receptors. Other skin sensations are variations of the basic four (*pressure*, *warmth*, *cold*, and *pain*):

- Stroking adjacent pressure spots creates a tickle.
- Repeated gentle stroking of a pain spot creates an itching sensation.
- Touching adjacent cold and pressure spots triggers a sense of wetness, which you can experience by touching dry, cold metal.

Touch sensations involve more than tactile stimulation, however. A self-produced tickle produces less somatosensory cortex activation than the same tickle would from something or someone else (Blakemore et al., 1998). (The brain is wise enough to be most sensitive to unexpected stimulation.) This top-down influence on touch sensation also appears in the *rubber-hand illusion*. Imagine yourself looking at a realistic rubber hand while your own hand is hidden (**FIGURE 15.5**). If an experimenter simultaneously touches your fake and real hands, you likely will perceive the rubber hand as your own and sense it being touched. Even just "stroking" the fake hand with a laser light produces, for most people, an illusory sensation of warmth or touch in their unseen real hand (Durgin et al., 2007). Touch is not only a bottom-up property of your senses but also a top-down product of your brain and your expectations.

Pain

Be thankful for occasional pain. Pain is your body's way of telling you something has gone wrong. Drawing your attention to a burn, a break, or a sprain, pain orders you to change your behavior—"Stay off that turned ankle!" The rare people born without the ability to feel pain may experience severe injury or even die before early adulthood. Without the discomfort that makes us occasionally shift position, their joints fail from excess strain, and without the warnings of pain, the effects of unchecked infections and injuries accumulate (Neese, 1991).

"When belly with bad pains doth swell, It matters naught what else goes well."
—Sadi, *The Gulistan*, 1258

More numerous are those who live with chronic pain, which is rather like an alarm that won't shut off. The suffering of such people, and of those with persistent or recurring backaches, arthritis, headaches, and cancer-related pain, prompts two questions: What is pain? How might we control it?

Understanding Pain

Our pain experiences vary widely, depending on our physiology, our experiences and attention, and our surrounding culture (Gatchel et al., 2007). Thus, our feelings of pain combine both bottom-up sensations and top-down processes.

AP Photo/Stephen Morton

A pain-free, problematic life Ashlyn Blocker (right), shown here with her mother and sister, has a rare genetic disorder. She feels neither pain nor extreme hot and cold. She must frequently be checked for accidentally self-inflicted injuries that she herself cannot feel. "Some people would say [that feeling no pain is] a good thing," says her mother. "But no, it's not. Pain's there for a reason. It lets your body know something's wrong and it needs to be fixed. I'd give anything for her to feel pain" (quoted by Bynum, 2004).

Biological Influences

There is no one type of stimulus that triggers pain (as light triggers vision). Instead, there are different *nociceptors*—sensory receptors that detect hurtful temperatures, pressure, or chemicals (**FIGURE 15.6**).

Although no theory of pain explains all available findings, psychologist Ronald Melzack and biologist Patrick Wall's (1965, 1983) classic **gate-control theory** provides a useful model. The spinal cord contains small nerve fibers that conduct most pain signals, and larger fibers that conduct most other sensory signals. Melzack and Wall theorized that the spinal cord contains a neurological "gate." When tissue is injured, the small fibers activate and open the gate, and you feel pain. Large-fiber activity closes the gate, blocking pain signals and preventing them from reaching the brain. Thus, one way to treat chronic pain is to stimulate (by massage, by electric stimulation, or by acupuncture) "gate-closing" activity in the large neural fibers (Wall, 2000). Rubbing the area around your stubbed toe will create competing stimulation that will block some pain messages.

gate-control theory the theory that the spinal cord contains a neurological "gate" that blocks pain signals or allows them to pass on to the brain. The "gate" is opened by the activity of pain signals traveling up small nerve fibers and is closed by activity in larger fibers or by information coming from the brain.

But pain is not merely a physical phenomenon of injured nerves sending impulses to the brain—like pulling on a rope to ring a bell. Melzack and Wall noted that brain-to-spinal-cord messages can also close the gate, helping to explain some striking influences on pain. When we are distracted from pain (a psychological influence) and soothed by the release of *endorphins,* our natural painkillers (a biological influence), our experience of pain may be greatly diminished. Sports injuries may go unnoticed until the after-game shower. People who carry a gene that boosts the availability of endorphins are less bothered by pain, and their brain is less responsive to pain (Zubieta et al., 2003). Others, who carry a mutated gene that disrupts pain circuit neurotransmission, may be unable to experience pain (Cox et al., 2006). Such discoveries may point the way toward new pain medications that mimic these genetic effects.

"Pain is increased by attending to it."
—Charles Darwin, *Expression of Emotions in Man and Animals,* 1872

The brain can also create pain, as it does in people's experiences of *phantom limb sensations,* when it misinterprets the spontaneous central nervous system activity

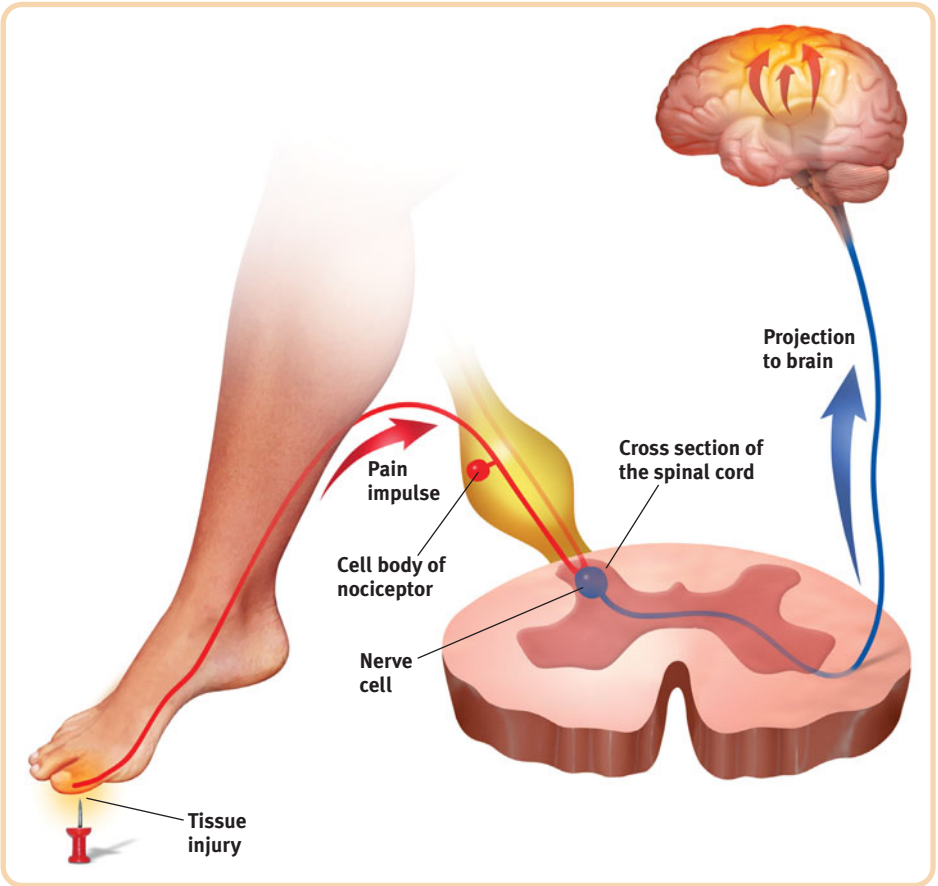


FIGURE 15.6 The pain circuit Sensory receptors (nociceptors) respond to potentially damaging stimuli by sending an impulse to the spinal cord, which passes the message to the brain, which interprets the signal as pain.

that occurs in the absence of normal sensory input. As the dreamer may see with eyes closed, so some 7 in 10 amputees may feel pain or movement in nonexistent limbs (Melzack, 1992, 2005). (An amputee may also try to step off a bed onto a phantom limb or to lift a cup with a phantom hand.) Even those born without a limb sometimes perceive sensations from the absent arm or leg. The brain, Melzack (1998) surmises, comes prepared to anticipate "that it will be getting information from a body that has limbs."

A similar phenomenon occurs with other senses. People with hearing loss often experience the sound of silence: phantom sounds—a ringing-in-the-ears sensation known as *tinnitus*. Those who lose vision to glaucoma, cataracts, diabetes, or macular degeneration may experience phantom sights—nonthreatening hallucinations (Ramachandran & Blakeslee, 1998). Some with nerve damage have had taste phantoms, such as ice water seeming sickeningly sweet (Goode, 1999). Others have experienced phantom smells, such as nonexistent rotten food. The point to remember: *We feel, see, hear, taste, and smell with our brain,* which can sense even without functioning senses.

Psychological Influences

The psychological effects of distraction are clear in the stories of athletes who, focused on winning, play through the pain. Carrie Armel and Vilayanur Ramachandran (2003) cleverly illustrated psychological influences on pain with another version of the rubber-hand illusion. They bent a finger slightly backward on the unseen hands of 16 volunteers, while simultaneously "hurting" (severely bending) a finger on a visible fake rubber hand. The volunteers felt as if their real finger were being bent, and they responded with increased skin perspiration.

We also seem to edit our *memories* of pain, which often differ from the pain we actually experienced. In experiments, and after medical procedures, people overlook a pain's duration. Their memory snapshots instead record two factors: First, people tend to record pain's *peak* moment, which can lead them to recall variable pain, with peaks, as worse (Stone et al., 2005). Second, they register how much pain they felt at the *end,* as Daniel Kahneman and his co-researchers (1993) discovered when they asked people to immerse one hand in painfully cold water for 60 seconds, and then the other hand in the same painfully cold water for 60 seconds followed by a slightly less painful 30 seconds more. Which of these experiences would you expect to recall as most painful?

Curiously, when asked which trial they would prefer to repeat, most preferred the longer trial, with more net pain—but less pain at the end. A physician used this principle with patients undergoing colon exams—lengthening the discomfort by a minute, but lessening its intensity (Kahneman, 1999). Although the extended milder discomfort added to their net pain experience, patients who received this taper-down treatment later recalled the exam as less painful than did those whose pain ended abruptly.

Tom Mihalek/AFP/Getty Images

Playing with pain In a 2008 NBA championship series game, Boston Celtics star Paul Pierce screamed in pain after an opposing player stepped on his right foot, causing his knee to twist and pop. After being carried off the court, he came back and played through the pain, which reclaimed his attention after the game's end.

Social-Cultural Influences

Our perception of pain also varies with our social situation and our cultural traditions. We tend to perceive more pain when others also seem to be experiencing pain (Symbaluk et al., 1997). This may help explain other apparent social aspects of pain, as when pockets of Australian keyboard operators during the mid-1980s suffered outbreaks of severe pain during typing or other repetitive work—without any discernible physical abnormalities (Gawande, 1998). Sometimes the pain in sprain is mainly in the brain—literally. When feeling empathy for another's pain, a person's own brain activity may partly mirror that of the other's brain in pain (Singer et al., 2004).

Thus, our perception of pain is a biopsychosocial phenomenon (**FIGURE 15.7**). Viewing pain this way can help us better understand how to cope with pain and treat it.

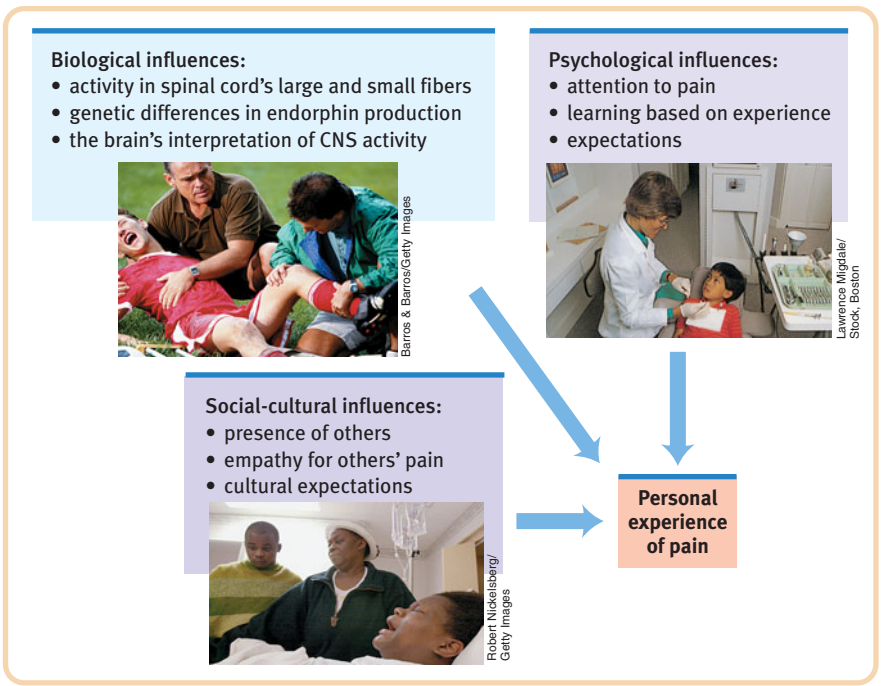


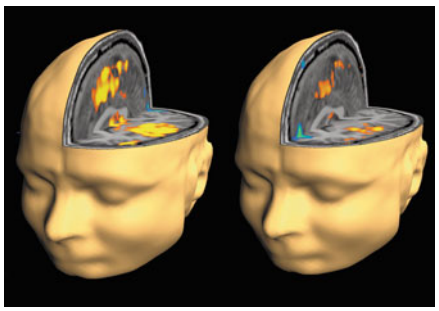
FIGURE 15.7 Biopsychosocial approach to pain Our experience of pain is much more than neural messages sent to the brain.

Controlling Pain

If pain is where body meets mind—if it is both a physical and a psychological phenomenon—then it should be treatable both physically and psychologically. Depending on the type of symptoms, pain control clinics select one or more therapies from a list that includes drugs, surgery, acupuncture, electrical stimulation, massage, exercise, hypnosis, relaxation training, and thought distraction.

Even an inert placebo can help. After being injected in the jaw with a stinging saltwater solution, men in one experiment were given a placebo that was said to relieve pain. They immediately felt better, a result associated with activity in a brain area that releases natural pain-killing opiates (Scott et al., 2007; Zubieta et al., 2005). Being given fake pain-killing chemicals caused the brain to dispense real ones. "Believing becomes reality," noted one commentator (Thernstrom, 2006), as "the mind unites with the body."

Another experiment pitted two placebos—fake pills and pretend acupuncture—against each other (Kaptchuk et al., 2006). People with persistent arm pain (270 of them) received either sham acupuncture (with trick needles that retracted without puncturing the skin) or blue cornstarch pills that looked like pills often prescribed for strain injury. A fourth of those receiving the nonexistent needle pricks and 31 percent of those receiving the pills complained of side effects, such as painful skin or dry mouth and fatigue. After two months, both groups were reporting less pain, with the fake acupuncture group reporting the greater pain drop.



No distraction Distraction

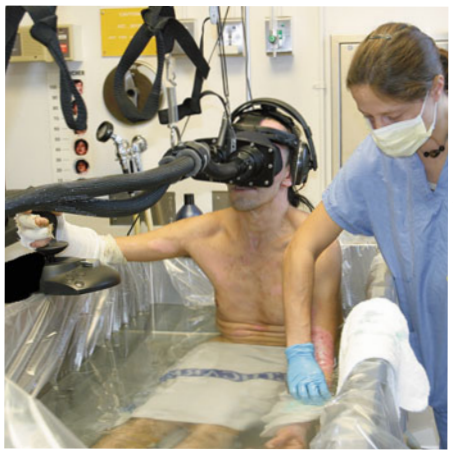


Image by Todd Richards and Aric Bills, U.W., ©Hunter Hoffman, www.vrpain.com

FIGURE 15.8 Virtual-reality pain control For burn victims undergoing painful skin repair, an escape into virtual reality can powerfully distract attention, thus reducing pain and the brain's response to painful stimulation. The fMRI scans (above) illustrate a lowered pain response when the patient is distracted.

Distracting people with pleasant images ("Think of a warm, comfortable environment") or drawing their attention away from the painful stimulation ("Count backward by 3's") is an especially effective way to increase pain tolerance (Fernandez & Turk, 1989; McCaul & Malott, 1984). A well-trained nurse may distract needle-shy patients by chatting with them and asking them to look away when inserting the needle. For burn victims receiving excruciating wound care, an even more effective distraction comes from immersion in a computer-generated 3-D world, like the snow scene in **FIGURE 15.8**. Functional MRI (fMRI) scans reveal that playing in the virtual reality reduces the brain's pain-related activity (Hoffman, 2004). Because pain is in the brain, diverting the brain's attention may bring relief.

Taste

15-6: How do we experience taste?

Like touch, our sense of taste involves several basic sensations. Taste's sensations were once thought to be sweet, sour, salty, and bitter, with all others stemming from mixtures of these four (McBurney & Gent, 1979). Then, as investigators searched for specialized nerve fibers for the four taste sensations, they encountered a receptor for what we now know is a fifth—the savory meaty taste of *umami*, best experienced as the flavor enhancer monosodium glutamate.

Tastes exist for more than our pleasure (see **TABLE 15.1**). Pleasureful tastes attracted our ancestors to energy- or protein-rich foods that enabled their survival. Aversive tastes deterred them from new foods that might be toxic. We see the inheritance of this biological wisdom in today's 2- to 6-year-olds, who are typically fussy eaters, especially when offered new meats or bitter-tasting vegetables, such as spinach and Brussels sprouts (Cooke et al., 2003). Meat and plant toxins were both potentially dangerous sources of food poisoning for our ancestors, especially for children. Given repeated small tastes of disliked new foods, children will, however, typically begin to accept them (Wardle et al., 2003).

Taste is a chemical sense. Inside each little bump on the top and sides of your tongue are 200 or more taste buds, each containing a pore that catches food chemicals. Into each taste bud pore, 50 to 100 taste receptor cells project antennalike hairs that sense food molecules. Some receptors respond mostly to sweet-tasting molecules, others to salty-, sour-, bitter-, or unami-tasting ones. It doesn't take much to trigger a response that alerts your brain's temporal lobe. If a stream of water is pumped across your tongue, the addition of a concentrated salty or sweet taste for but one-tenth of a second will get your attention (Kelling & Halpern, 1983). When a friend asks for "just a taste" of your soft drink, you can squeeze off the straw after a mere fraction of a second.

TABLE 15.1
The Survival Functions of Basic Tastes

Taste	Indicates
Sweet	Energy source
Salty	Sodium essential to physiological processes
Sour	Potentially toxic acid
Bitter	Potential poisons
Umami	Proteins to grow and repair tissue

(Adapted from Cowart, 2005.)

Taste receptors reproduce themselves every week or two, so if you burn your tongue with hot food it hardly matters. However, as you grow older, the number of taste buds decreases, as does taste sensitivity (Cowart, 1981). (No wonder adults enjoy strong-tasting foods that children resist.) Smoking and alcohol use accelerate these declines. Those who lose their sense of taste report that food tastes like "straw" and is hard to swallow (Cowart, 2005).

Essential as taste buds are, there's more to taste than meets the tongue. As with other senses, your expectations influence your brain's response. Being told that a wine costs $90 rather than its real $10 price makes an inexpensive wine taste better and triggers more activity in a brain area that responds to pleasant experiences (Plassmann et al., 2008). As happens with the pain placebo effect, the brain's thinking frontal lobes offer information that other brain regions act upon.

Sensory Interaction

Taste also illustrates another curious phenomenon. Hold your nose, close your eyes, and have someone feed you various foods. A slice of apple may be indistinguishable from a chunk of raw potato. A piece of steak may taste like cardboard. Without their smells, a cup of cold coffee may be hard to distinguish from a glass of red wine. To savor a taste, we normally breathe the aroma through our nose—which is why eating is not much fun when you have a bad cold. Smell can also change our perception of taste: A drink's strawberry odor enhances our perception of its sweetness. This is **sensory interaction** at work—the principle that one sense may influence another. Smell plus texture plus taste equals flavor.

sensory interaction the principle that one sense may influence another, as when the smell of food influences its taste.

Sensory interaction similarly influences what we hear. If I (as a person with hearing loss) watch a video with simultaneous captioning, I have no trouble hearing the words I am seeing (and may therefore think I don't need the captioning). If I then turn off the captioning, I suddenly realize I need it (**FIGURE 15.9**). But what do you suppose happens if we *see* a speaker saying one syllable while we *hear* another? Surprise: We may perceive a third syllable that blends both inputs. Seeing the mouth movements for *ga* while hearing *ba,* we may perceive *da*—a phenomenon known as the *McGurk effect,* after its discoverers, psychologist Harry McGurk and his assistant John MacDonald (1976).

Courtesy of RNID www.rnid.org.uk

FIGURE 15.9 Sensory interaction When a hard-of-hearing listener sees an animated face forming the words being spoken at the other end of a phone line, the words become easier to understand (Knight, 2004).

Sensory interaction can also affect vision and touch. A weak flicker of light that we have trouble perceiving becomes more visible when accompanied by a short burst of sound (Kayser, 2007). In detecting events, the brain can combine simultaneous visual and touch signals, thanks to neurons projecting from the somatosensory cortex back to the visual cortex (Macaluso et al., 2000).

Smell

15-7: How do we experience smell?

Inhale, exhale. Inhale, exhale. Breaths come in pairs—except at two moments: birth and death. Between those two moments, you will daily inhale and exhale nearly 20,000 breaths of life-sustaining air, bathing your nostrils in a stream of scent-laden molecules. The resulting experiences of smell *(olfaction)* are strikingly intimate: You inhale something of whatever or whoever it is you smell.

Impress your friends with your new word for the day: People unable to see are said to experience blindness. People unable to hear experience deafness. People unable to smell experience anosmia.

Like taste, smell is a chemical sense. We smell something when molecules of a substance carried in the air reach a tiny cluster of 5 million or more receptor cells at the top of each nasal cavity (**FIGURE 15.10** on the next page). These olfactory receptor cells, waving like sea plants on a reef, respond selectively—to the aroma of a cake baking, to a wisp of smoke, to a friend's fragrance. Instantly, they alert the brain through their axon fibers.

Humans have 10 to 20 million olfactory receptors. A bloodhound has some 200 million (Herz, 2001).

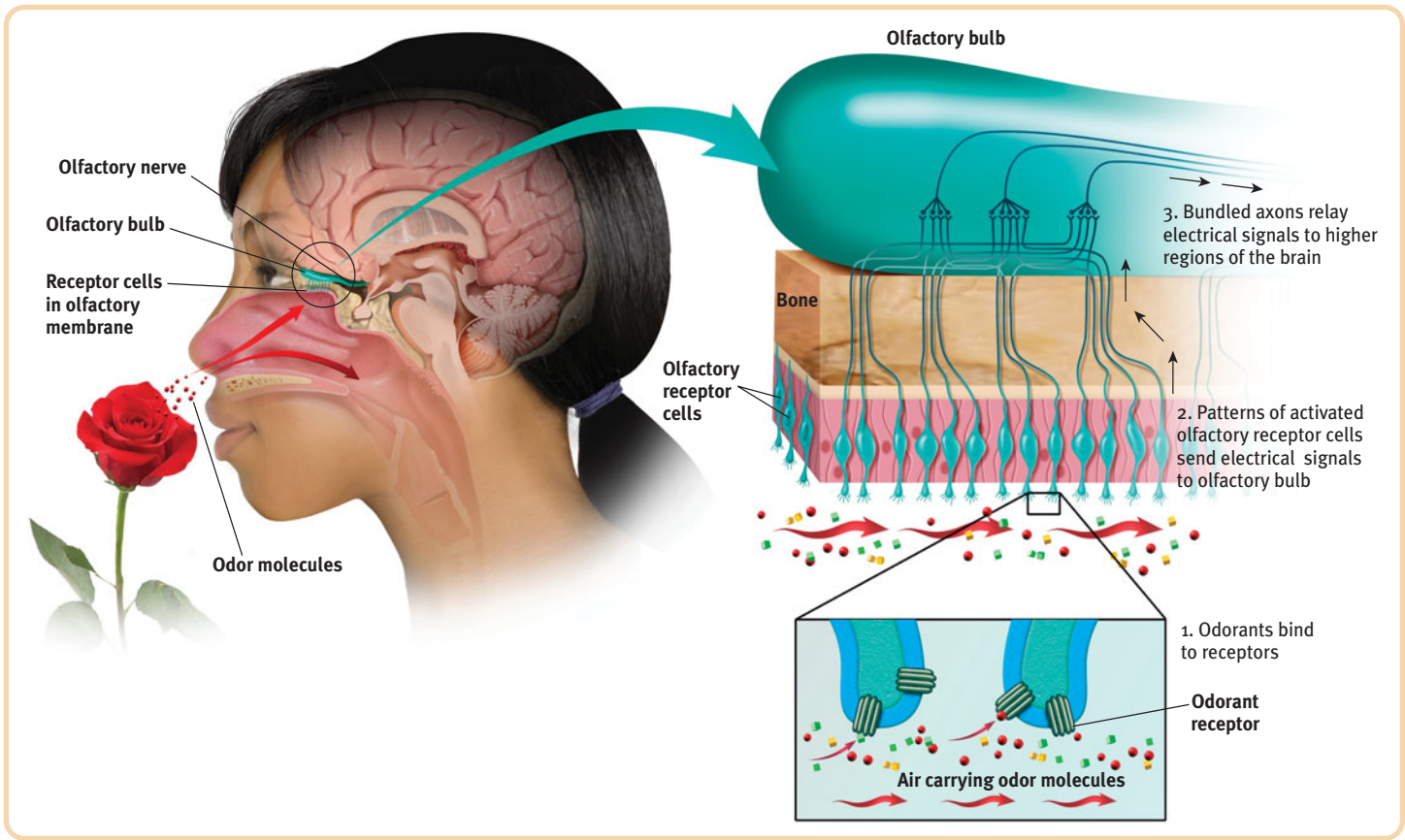


FIGURE 15.10 The sense of smell If you are to smell a flower, airborne molecules of its fragrance must reach receptors at the top of your nose. Sniffing swirls air up to the receptors, enhancing the aroma. The receptor cells send messages to the brain's olfactory bulb, and then onward to the temporal lobe's primary smell cortex and to the parts of the limbic system involved in memory and emotion.

Even nursing infants and their mothers have a literal chemistry to their relationship. They quickly learn to recognize each other's scents (McCarthy, 1986). Aided by smell, a mother fur seal returning to a beach crowded with pups will find her own. Our own sense of smell is less impressive than the acuteness of our seeing and hearing. Looking out across a garden, we see its forms and colors in exquisite detail and hear a variety of birds singing, yet we smell little of it without sticking our nose into the blossoms.

Odor molecules come in many shapes and sizes—so many, in fact, that it takes many different receptors to detect them. A large family of genes designs the 350 or so receptor proteins that recognize particular odor molecules (Miller, 2004). Richard Axel and Linda Buck (1991) discovered (in work for which they received a 2004 Nobel Prize) that these receptor proteins are embedded on the surface of nasal cavity neurons. As a key slips into a lock, so odor molecules slip into these receptors. Yet we don't seem to have a distinct receptor for each detectable odor. This suggests that some odors trigger a combination of receptors, in patterns that are interpreted by the olfactory cortex. As the English alphabet's 26 letters can combine to form many words, so odor molecules bind to different receptor arrays, producing the 10,000 odors we can detect (Malnic et al., 1999). It is the combinations of olfactory receptors, which activate different neuron patterns, that allow us to distinguish between the aromas of fresh-brewed and hours-old coffee (Zou & Buck, 2006).

For humans, the attractiveness of smells depends on learned associations (Herz, 2001). Babies are not born with a built-in preference for the smell of their mother's breast; as they nurse, their preference builds. After a good experience becomes associated with a particular scent, people come to like that scent, which helps explain why people in the United States tend to like the smell of wintergreen (which they associate with candy and gum) more than do those in Great Britain (where it often is associated with medicine). In another example of odors evoking

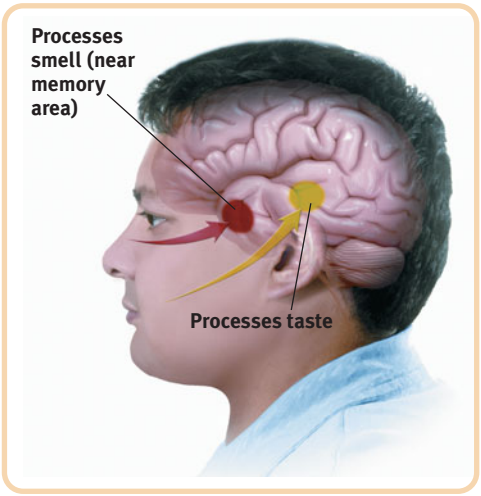


FIGURE 15.11 The olfactory brain
Information from the taste buds (yellow arrow) travels to an area of the temporal lobe not far from where the brain receives olfactory information, which interacts with taste. The brain's circuitry for smell (red arrow) also connects with areas involved in memory storage, which helps explain why a smell can trigger a memory explosion.

unpleasant emotions, Rachel Herz and her colleagues (2004) frustrated Brown University students with a rigged computer game in a scented room. Later, if exposed to the same odor while working on a verbal task, the students' frustration was rekindled and they gave up sooner than others exposed to a different odor or no odor.

Though it's difficult to recall odors by name, we have a remarkable capacity to recognize long-forgotten odors and their associated memories (Engen, 1987; Schab, 1991). The smell of the sea, the scent of a perfume, the aroma of a favorite relative's kitchen can bring to mind a happy time. It's a phenomenon understood by the British travel agent chain Lunn Poly. To evoke memories of lounging on sunny, warm beaches, the company once piped the aroma of coconut suntan oil into its shops (Fracassini, 2000).

Our brain's circuitry helps explain an odor's power to evoke feelings and memories (**FIGURE 15.11**). A hotline runs between the brain area receiving information from the nose and the brain's ancient limbic centers associated with memory and emotion. Smell is primitive. Eons before the elaborate analytical areas of our cerebral cortex had fully evolved, our mammalian ancestors sniffed for food—and for predators.

"The smell and taste of things bears unfaltering, in the tiny and almost impalpable drop of their essence, the vast structure of recollection."

—French novelist Marcel Proust, in *Remembrance of Things Past* (1913), describing how the aroma and flavor of a morsel of cake soaked in tea resurrected long-forgotten memories of the old family house.

REVIEWING

The Other Senses

Module Review

15-1: What are the characteristics of air pressure waves that we hear as sound? Sound waves are bands of compressed and expanded air. Our ears detect these air pressure changes and transform them into neural impulses for decoding in the brain. Sound waves vary in *frequency*, which we experience as differing *pitch*, and amplitude, which we perceive as differing loudness.

15-2: How does the ear transform sound energy into neural messages? The visible outer ear channels sound waves through the auditory canal, causing tiny vibrations in the eardrum. The bones of the *middle ear* amplify the vibrations and relay them to the fluid-filled *cochlea* in the *inner ear*. Pressure changes in the cochlear fluid cause the basilar membrane to ripple, bending tiny hair cells that send neural messages (via the thalamus) to the auditory cortex in the brain.

15-3: How do we locate sounds? Sound waves strike one ear sooner and more intensely than the other. The brain analyzes these minute differences between the two ears' messages and computes the sound's source.

15-4: How do we sense our body's position and movement? We monitor the body's position and maintain our balance with our *vestibular sense*. Through *kinesthesis*, we sense the position and movement of body parts.

15-5: How do we sense touch? How do we experience pain? Touch is actually several senses—pressure, warmth, cold, and pain. Only pressure has identifiable receptors. The *gate-control theory* of pain proposes a "gate" in the spinal cord that either opens to permit pain signals traveling up small nerve fibers to reach the brain, or closes to prevent their passage. Three sets of influences—biological, psychological, and social-cultural—contribute to our experience of pain and can be used in treatments to control pain.

15-6: How do we experience taste? Taste, a chemical sense, is a composite of five basic sensations—sweet, sour, salty, bitter, and umami. Smells, as well as our expectations, can influence our perception of taste. This is an example of *sensory interaction*, which can affect other senses, too.

15-7: How do we experience smell? Some 10 million olfactory receptor cells, with their approximately 350 different receptor proteins, contribute to the chemical sense of smell. The proteins recognize individual odor molecules. Combinations of receptors send patterns of messages to the brain's olfactory bulb, then to the temporal lobe and to parts of the limbic system. Odors can spontaneously evoke memories and feelings, due in part to the close connections between brain areas that process smell and memory.

Rehearse It!

1. The amplitude of a sound wave determines our perception of
   a. loudness.
   b. pitch.
   c. audition.
   d. frequency.

2. The frequency of sound waves determines their pitch. The _____ the waves are, the lower their frequency is and the _____ their pitch.
   a. shorter; higher
   b. longer; lower
   c. lower; longer
   d. higher; shorter

3. The snail-shaped tube in the inner ear, where sound waves are converted into neural activity, is called the
   a. anvil.
   b. basilar membrane.
   c. cochlea.
   d. oval window.

4. The vestibular sense monitors the body's position and movement. Vestibular sense receptors are located in the
   a. skin.
   b. brain.
   c. inner ear.
   d. skeletal muscles.

5. Of all the skin senses, only _____ has its own identifiable receptor cells.
   a. pressure
   b. warmth
   c. cold
   d. pain

6. The gate-control theory of pain proposes that
   a. special pain receptors send signals directly to the brain.
   b. pain is a property of the senses, not of the brain.
   c. small spinal cord nerve fibers conduct most pain signals.
   d. the stimuli that produce pain are unrelated to other sensations.

7. A food's smell or aroma can greatly enhance its taste. This is an example of
   a. sensory adaptation.
   b. the placebo effect.
   c. gate-control theory.
   d. sensory interaction.

Answers: 1. a, 2. b, 3. c, 4. c, 5. a, 6. c, 7. d.

Terms and Concepts to Remember

audition, p. 203
frequency, p. 203
pitch, p. 203
middle ear, p. 204
cochlea [KOHK-lee-uh], p. 204
inner ear, p. 204
vestibular sense, p. 206
kinesthesis [kin-ehs-THEE-sehs], p. 206
gate-control theory, p. 209
sensory interaction, p. 213

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Why do you feel a little dizzy immediately after a roller coaster ride?
2. Why might it be helpful for people with chronic pain to meditate or exercise?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 16

Perceptual Organization and Interpretation

Perceptual Organization

Perceptual Interpretation

Perceptual Organization

16-1: How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions?

Barring a disability, we all *sense* sights and sounds, touch and movement, tastes and smells. But how do we *perceive?* How do we see not just shapes and colors, but a rose in bloom, a loved one's face, a beautiful sunset? How do we hear not just a mix of pitches and rhythms, but a child's cry of pain, the hum of distant traffic, a symphony? In short, how do we organize and interpret our sensations so that they become meaningful perceptions?

Early in the twentieth century, a group of German psychologists noticed that when given a cluster of sensations, people tend to organize them into a **gestalt,** a German word meaning a "form" or a "whole." For example, look at FIGURE 16.1. Note that the individual elements of this figure are really nothing but eight blue circles, each containing three converging white lines. Yet when we view them all together, we see a *whole,* a form that psychologists call a *Necker cube*.

Over the years, the Gestalt psychologists provided compelling demonstrations and described principles by which we organize our sensations into perceptions. As you read further about these principles, keep in mind the fundamental truth they illustrate: *Our brain does more than register information about the world*. Perception is not just opening a shutter and letting a picture print itself on the brain. We constantly filter sensory information and infer perceptions in ways that make sense to us. Mind matters.

gestalt an organized whole. Gestalt psychologists emphasized our tendency to integrate pieces of information into meaningful wholes.

figure-ground the organization of the visual field into objects (the *figures*) that stand out from their surroundings (the *ground*).

FIGURE 16.1 A Necker cube
What do you see: circles with white lines, or a cube? If you stare at the cube, you may notice that it reverses location, moving the tiny X in the center from the front edge to the back. At times, the cube may seem to float in front of the page, with circles behind it; other times the circles may become holes in the page through which the cube appears, as though it were floating behind the page. There is far more to perception than meets the eye. (From Bradley et al., 1976.)

Form Perception

Imagine designing a video/computer system that, like your eye/brain system, could recognize faces at a glance. What abilities would it need?

Figure and Ground

To start with, the system would need to recognize faces as distinct from their backgrounds. Likewise, our first perceptual task is to perceive any object (the figure) as distinct from its surroundings (the ground). Among the voices you hear at a party, the one you attend to becomes the figure; all others, part of the ground. As you read, the words are the figure; the white paper, the ground. In FIGURE 16.2, the **figure-ground** relationship continually reverses—but always we organize the stimulus into a figure seen against a ground. Such reversible figure-and-ground illustrations demonstrate again that the same stimulus can trigger more than one perception.

FIGURE 16.2 Reversible figure and ground

Time Saving Suggestion, © 2003 Roger N. Shepard.

Grouping

Having discriminated figure from ground, we (and our video/computer system) now have to organize the figure into a meaningful form. Some basic features of a scene—such as color, movement, and light/dark contrast—we process instantly

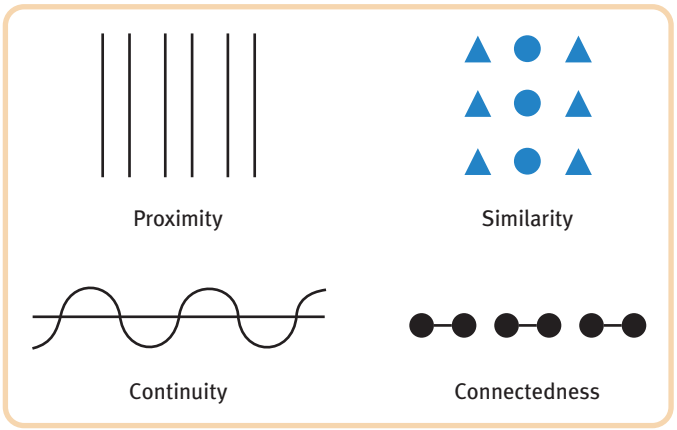


FIGURE 16.3 Organizing stimuli into groups We could perceive the stimuli shown here in many ways, yet people everywhere see them similarly. The Gestalt psychologists believed this shows that the brain follows rules to order sensory information into wholes.

and automatically (Treisman, 1987). To bring order and form to these basic sensations, our minds follow certain rules for **grouping** stimuli together. These rules, identified by the Gestalt psychologists and applied even by infants, illustrate the idea that the perceived whole differs from the sum of its parts (Quinn et al., 2002; Rock & Palmer, 1990):

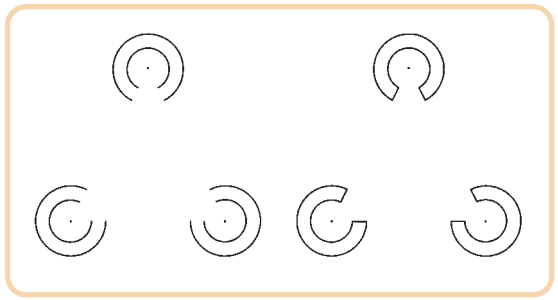
Proximity We group nearby figures together, as in **FIGURE 16.3**. We see three sets of two lines, not six separate lines.

Similarity We group similar figures together. We see the triangles and circles as vertical columns of similar shapes, not as horizontal rows of dissimilar shapes.

Continuity We perceive smooth, continuous patterns rather than discontinuous ones. The pattern in the lower-left corner of Figure 16.3 could be a series of alternating semicircles, but we perceive it as two continuous lines—one wavy, one straight.

Connectedness Because they are uniform and linked, we perceive each set of two dots and the line between them as a single unit.

Closure We fill in gaps to create a complete, whole object. Thus we assume that the circles (below left) are complete but partially blocked by the (illusory) triangle. Add nothing more than little line segments that close off the circles (below right) and now your brain stops constructing a triangle.



Enrico Ferorelli

Such principles usually help us construct reality. Sometimes, however, they lead us astray, as when we look at the doghouse in **FIGURE 16.4**.

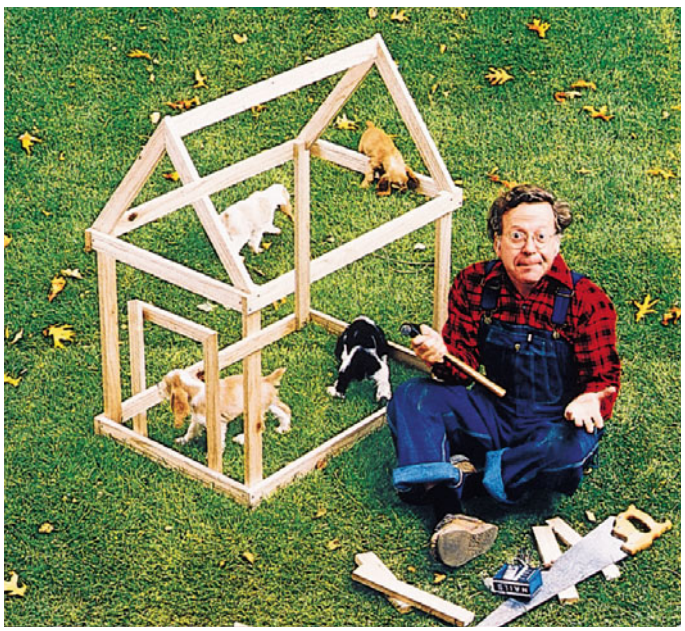


Photo by Walter Wick. Reprinted from *GAMES* Magazine. © 1983 PCS Games Limited Partnership.

FIGURE 16.4 Grouping principles What's the secret to this impossible doghouse? You probably perceive this doghouse as a gestalt—a whole (though impossible) structure. Actually, your brain imposes this sense of wholeness on the picture. As Figure 16.9 shows, Gestalt grouping principles such as closure and continuity are at work here.

Depth Perception

16-2: How do we see the world in three dimensions?

From the two-dimensional images falling on our retinas, we somehow organize three-dimensional perceptions. **Depth perception,** seeing objects in three dimensions, enables us to estimate their distance from us. At a glance, we estimate the distance of an oncoming car or the height of a house. This ability is partly innate. Eleanor Gibson and Richard Walk (1960) discovered this using a miniature cliff with a drop-off covered by sturdy glass. Gibson's inspiration for these experiments occurred while she was picnicking on the rim of the Grand Canyon. She wondered: Would a toddler peering over the rim perceive the dangerous drop-off and draw back?

Back in their Cornell University laboratory, Gibson and Walk placed 6- to 14-month-old infants on the edge of a safe canyon—a **visual cliff** (FIGURE 16.5). When the infants' mothers then coaxed them to crawl out onto the glass, most refused to do so, indicating that they could perceive depth. Crawling infants come to the lab after lots of learning. Yet newborn animals with virtually no visual experience—including young kittens, a day-old goat, and newly hatched chicks—respond similarly. To Gibson and Walk, this suggested that mobile newborn animals come prepared to perceive depth.

Innervisions

FIGURE 16.5 Visual cliff Eleanor Gibson and Richard Walk devised this miniature cliff with a glass-covered drop-off to determine whether crawling infants and newborn animals can perceive depth. Even when coaxed, infants are reluctant to venture onto the glass over the cliff.

Each species, by the time it is mobile, has the perceptual abilities it needs. But if biological maturation predisposes our wariness of heights, experience amplifies it. Infants' wariness increases with their experiences of crawling, no matter when they begin to crawl (Campos et al., 1992).

How do we do it? How do we transform two differing two-dimensional retinal images into a single three-dimensional perception? The process begins with *depth cues,* some that depend on the use of two eyes, and others that are available to each eye separately.

grouping the perceptual tendency to organize stimuli into coherent groups.

depth perception the ability to see objects in three dimensions although the images that strike the retina are two-dimensional; allows us to judge distance.

visual cliff a laboratory device for testing depth perception in infants and young animals.

binocular cues depth cues, such as retinal disparity, that depend on the use of two eyes.

retinal disparity a binocular cue for perceiving depth: By comparing images from the retinas in the two eyes, the brain computes distance—the greater the disparity (difference) between the two images, the closer the object.

Binocular Cues

Try this: With both eyes open, hold two pens or pencils in front of you and touch their tips together. Now do so with one eye closed. With one eye, the task becomes noticeably more difficult, demonstrating the importance of **binocular cues** in judging the distance of nearby objects. For carnivores catching prey, and humans catching a ball, two eyes are better than one.

Because our eyes are about 2½ inches apart, our retinas receive slightly different images of the world. When the brain compares these two images, the difference between them—their **retinal disparity**—provides one important binocular cue to the relative distance of different objects. When you hold your finger directly in front of

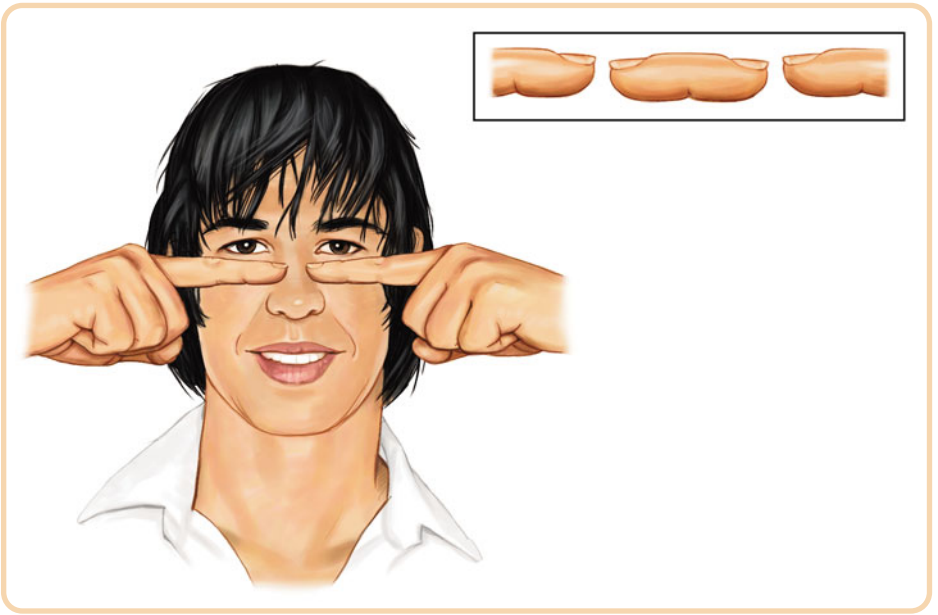


FIGURE 16.6 The floating finger sausage Hold your two index fingers about 5 inches in front of your eyes, with their tips a half-inch apart. Now look beyond them and note the weird result. Move your fingers out farther and the retinal disparity—and the finger sausage—will shrink.

monocular cues depth cues, such as interposition and linear perspective, available to either eye alone.

your nose, your retinas receive quite different views. (You can see this if you close one eye and then the other, or create a finger sausage as in **FIGURE 16.6**.) At a greater distance—say, when you hold your finger at arm's length—the disparity is smaller.

The creators of three-dimensional (3-D) movies simulate or exaggerate retinal disparity by photographing a scene with two cameras placed a few inches apart (a feature we might want to build into our seeing computer). When we view the movie through spectacles that allow the left eye to see the image from the left camera and the right eye the image from the right camera, the 3-D effect mimics or exaggerates normal retinal disparity. Similarly, twin cameras in airplanes can take photos of terrain for integration into 3-D maps.

Monocular Cues

How do we judge whether a person is 10 or 100 meters away? In both cases, retinal disparity while looking straight ahead is slight. At such distances, we depend on **monocular cues** (available to each eye separately). Monocular cues also influence our everyday perceptions. Is the St. Louis Gateway Arch (**FIGURE 16.7**)—the world's largest human-made illusion—taller than it is wide? Or wider than it is tall? To most of us, it appears taller. Actually, its height and width are equal, and this famous arch is an example of the unexplained *horizontal-vertical illusion*—our perceiving vertical dimensions as longer than identical horizontal dimensions. No wonder people (even experienced bartenders) pour less juice when given a tall, thin glass rather than a short, wide glass (Wansink & van Ittersum, 2003, 2005).

Rick Friedman/Black Star

FIGURE 16.7 The St. Louis Gateway Arch Which is greater: its height or width?

Relative height is a possible contributor to the horizontal-vertical illusion. **FIGURE 16.8** illustrates this and other monocular cues.

FIGURE 16.8 Monocular depth cues

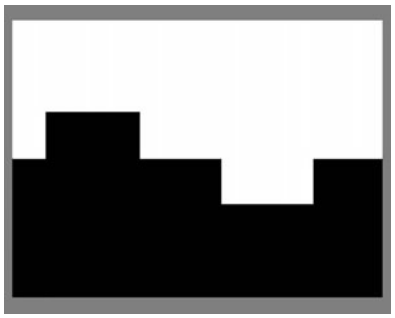


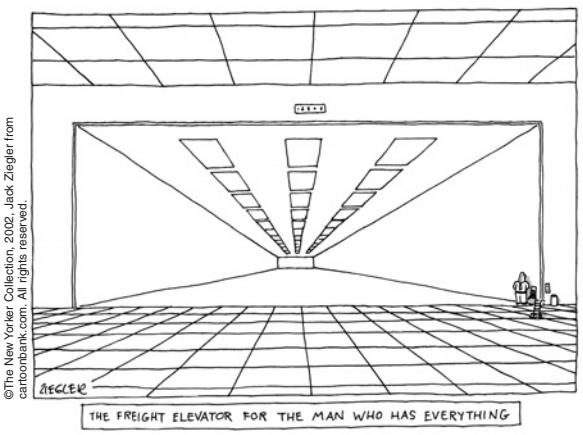
Image courtesy Shaun P. Vecera, Ph.D., adapted from stimuli that appeared in Vecera et al., 2002

Relative height We perceive objects higher in our field of vision as farther away. Because we perceive the lower part of a figure-ground illustration as closer, we perceive it as figure (Vecera et al., 2002). Invert the illustration above and the black becomes ground, like a night sky.

Relative size If we assume two objects are similar in size, *most* people perceive the one that casts the smaller retinal image as farther away.

Rene Magritte, *The Blank Signature*, oil on canvas. National Gallery of Art, Washington. Collection of Mr. and Mrs. Paul Mellon. Photo by Richard Carafelli.

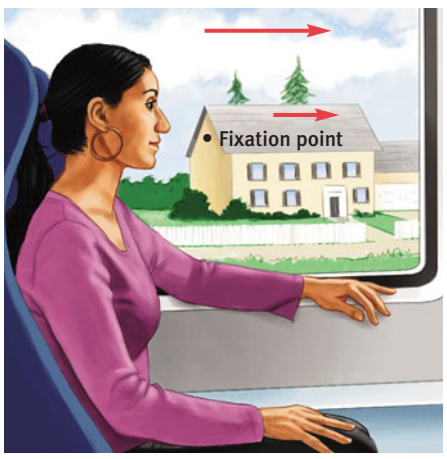
Interposition If one object partially blocks our view of another, we perceive it as closer. The depth cues provided by interposition make this an impossible scene.



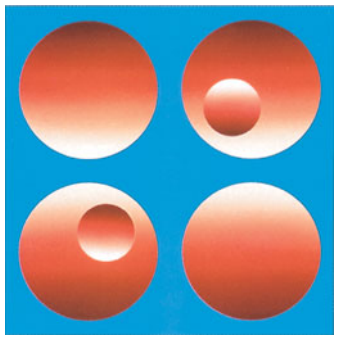
©The New Yorker Collection, 2002, Jack Ziegler from cartoonbank.com. All rights reserved.

Linear perspective Parallel lines, such as railroad tracks, appear to converge with distance. The more they converge, the greater their perceived distance.

Light and shadow Nearby objects reflect more light to our eyes. Thus, given two identical objects, the dimmer one seems farther away. Shading, too, produces a sense of depth consistent with our assumption that light comes from above. Invert the illustration below and the hollow in the bottom row will become a hill.



Relative motion As we move, objects that are actually stable may appear to move. If while riding on a bus you fix your gaze on some object—say, a house—the objects beyond the fixation point appear to move with you; objects in front of the fixation point appear to move backward. The farther those objects are from the fixation point, the faster they seem to move.



From "Perceiving Shape From Shading" by Vilayanur S. Ramachandran. Copyright © 1988 by Scientific American, Inc. All rights reserved.

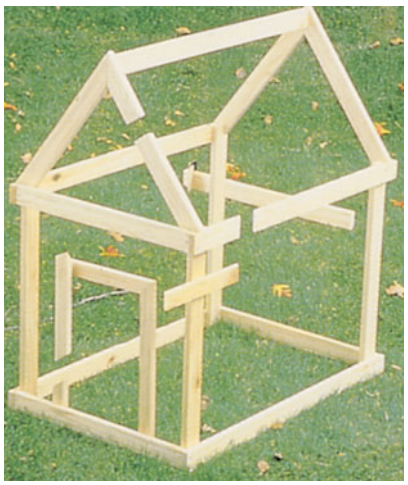


Photo by Walter Wick. Reprinted from *GAMES* Magazine. © 1983 PCS Games Limited Partnership.

FIGURE 16.9 The solution Another view of the impossible doghouse in Figure 16.4 reveals the secrets of this illusion. From the photo angle in Figure 16.4, the grouping principle of closure leads us to perceive the boards as continuous.

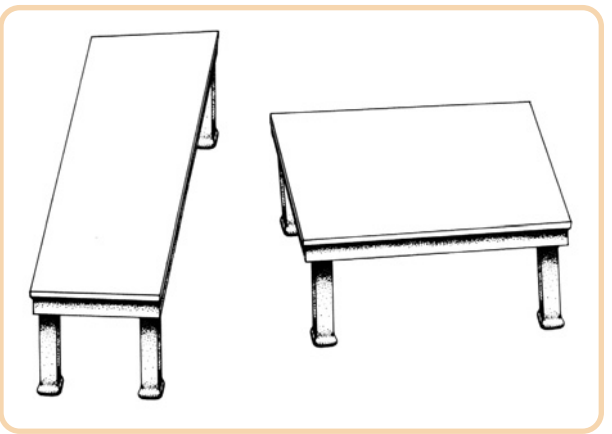
Perceptual Constancy

16-3: How do perceptual constancies help us organize our sensations into meaningful perceptions?

So far, we have noted that our video/computer system must first perceive objects as we do—as having a distinct form and location. Its next task is to recognize objects without being deceived by changes in their shape, size, brightness, or color—an ability we call **perceptual constancy.** Regardless of our viewing angle, distance, and illumination, this top-down process lets us identify people and things in less time than it takes to draw a breath. This human perceptual feat, which has intrigued researchers for decades, provides a monumental challenge for our perceiving computer.

Shape and Size Constancies

Sometimes an object whose actual shape cannot change *seems* to change shape with the angle of our view (**FIGURE 16.10**). More often, thanks to *shape constancy,* we perceive the form of familiar objects, such as the door in **FIGURE 16.11**, as constant even while our retinal image of it changes.



Shepard's tables, © 2003 Roger Shepard.

FIGURE 16.10 Perceiving shape Do the tops of these tables have different dimensions? They appear to. But—believe it or not—they are identical. (Measure and see.) With both tables, we adjust our perceptions relative to our viewing angle.

perceptual constancy perceiving objects as unchanging (having consistent shapes, size, lightness, and color) even as illumination and retinal images change.

Thanks to *size constancy,* we perceive objects as having a constant size, even while our distance from them varies. We assume a car is large enough to carry people, even when we see its tiny image from two blocks away.

Perceived distance and perceived size are so closely and effortlessly connected that we speak of the *size-distance relationship.* Given an object's perceived distance and the size of its image on our retinas, we instantly and unconsciously infer the object's size. Although the monsters in **FIGURE 16.12a** cast the same retinal images, the linear perspective tells our brain that the monster in pursuit is farther away. We therefore perceive it as larger.

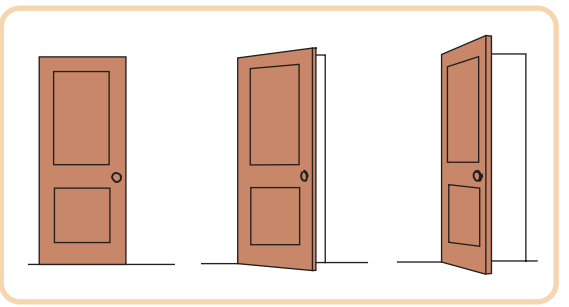


FIGURE 16.11 Shape constancy A door casts an increasingly trapezoidal image on our retinas as it opens, yet we still perceive it as rectangular.

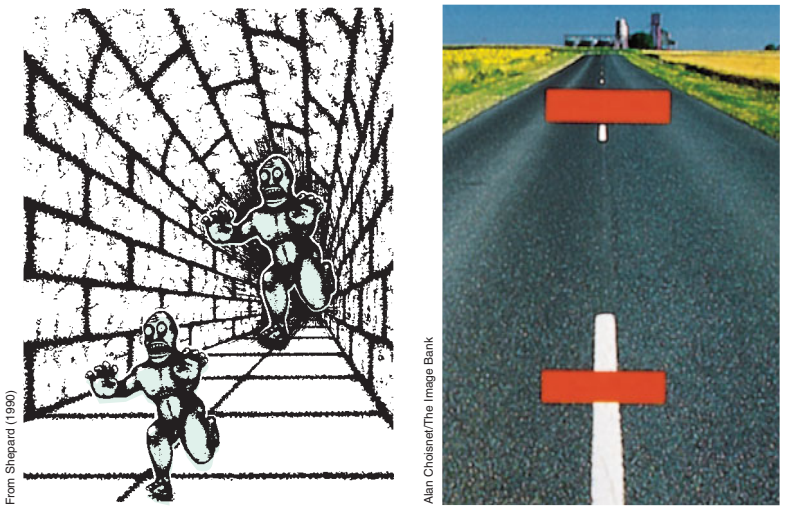


FIGURE 16.12 The interplay between perceived size and distance (a) The monocular cues for distance (such as linear perspective and relative height) make the pursuing monster look larger than the pursued. It isn't. (b) This visual trick, called the Ponzo illusion, is based on the same principle as the fleeing monsters. The two red bars cast identical-size images on our retinas. But experience tells us that a more distant object can create the same-size image as a nearer one only if it is actually larger. As a result, we perceive the bar that seems farther away as larger.

This interplay between perceived size and perceived distance helps explain several well-known illusions. For example, can you imagine why the Moon looks up to 50 percent larger when near the horizon than when high in the sky? For at least 22 centuries, scholars have debated this question (Hershenson, 1989). One reason for the *Moon illusion* is that cues to objects' distances make the horizon Moon—like the distant monster in Figure 16.12a and the distant bar in the *Ponzo illusion* in Figure 16.12b—appear farther away and therefore larger than the Moon high in the night sky (Kaufman & Kaufman, 2000). Take away these distance cues—by looking at the horizon Moon (or each monster or each bar) through a paper tube—and the object immediately shrinks.

Size-distance relationships also explain why the two same-age girls seem so different in size in the *Ames illusion* (**FIGURE 16.13**). As the diagram reveals, the girls are actually about the same size, but the room is distorted. Viewed with one eye through a peephole, its trapezoidal walls produce the same images as those of a normal rectangular room viewed with both eyes. Presented with the camera's one-eyed view, the brain makes the reasonable assumption that the room *is* normal and each girl is therefore the same distance from us. And given the different sizes of their images on the retina, our brain ends up calculating that the girls are very different in size.

Our occasional misperceptions reveal the workings of our normally effective perceptual processes. The perceived relationship between distance and size is usually valid. But under special circumstances it can lead us astray—as when helping to create the Moon illusion and the Ames illusion.

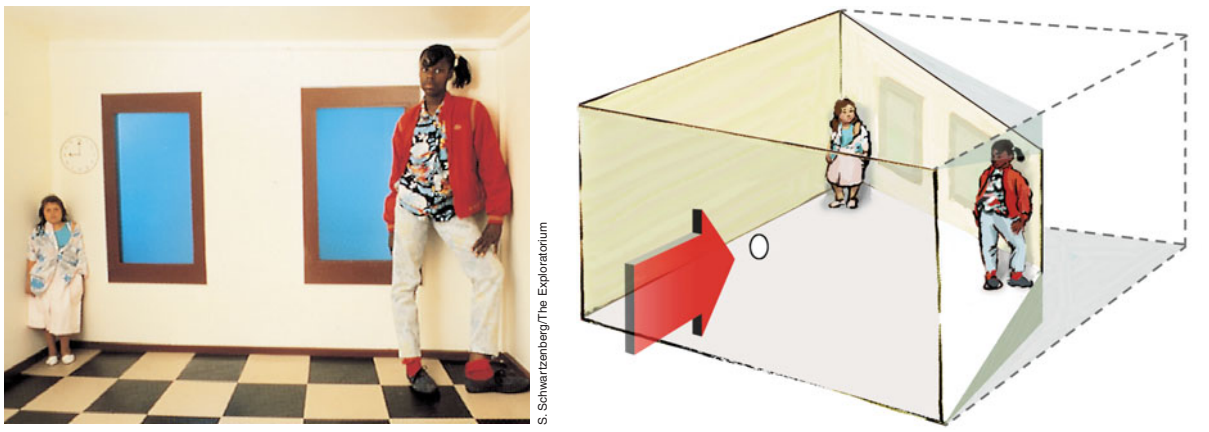
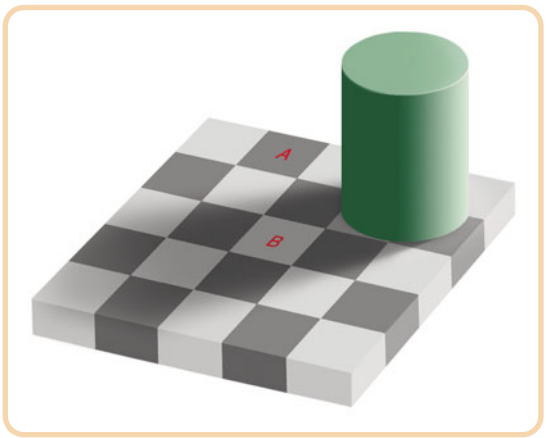


FIGURE 16.13 The illusion of the shrinking and growing girls This distorted room, designed by Adelbert Ames, appears to have a normal rectangular shape when viewed through a peephole with one eye. The girl in the right corner appears disproportionately large because we judge her size based on the false assumption that she is the same distance away as the girl in the far corner.



Courtesy Edward Adelson

FIGURE 16.14 Relative luminance Squares A and B are identical in color, believe it or not. (If you don't believe me, photocopy the illustration, cut out the squares, and compare.) But we perceive B as lighter, thanks to its surrounding context.

Lightness Constancy

White paper reflects 90 percent of the light falling on it; black paper, only 10 percent. A black paper in sunlight may reflect 100 times more light than a white paper viewed indoors, but it still looks black (McBurney & Collings, 1984). This illustrates *lightness constancy* (also called *brightness constancy*); we perceive an object as having a constant lightness even while its illumination varies.

Perceived lightness depends on *relative luminance*—the amount of light an object reflects relative to its surroundings (**FIGURE 16.14**). If you view sunlit black paper through a narrow tube so nothing else is visible, it may look gray, because in bright sunshine it reflects a fair amount of light. View it without the tube and it is again black, because it reflects much less light than the objects around it.

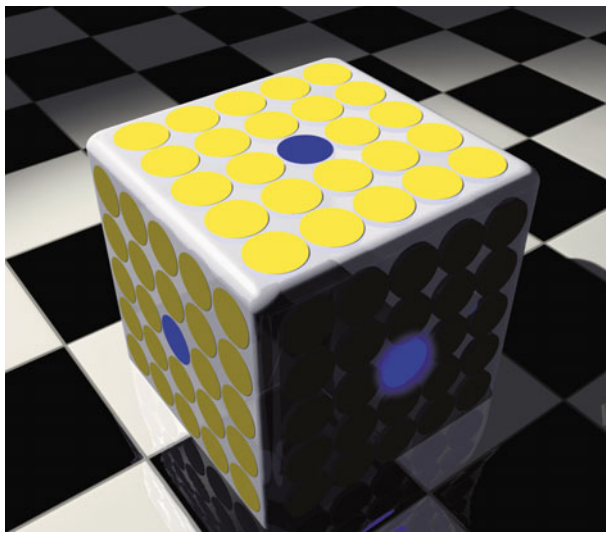
Color Constancy

Color constancy operates in a similar way. As light changes, a red apple in a fruit bowl retains its redness. That happens because our experience of color depends on something more than the wavelength information received by the cones in our retina. That something more is the surrounding *context.* If you view only part of that apple through a narrow tube, its color will seem to change as the light changes. But if you see the whole apple in context, as one item in a bowl of fresh fruit, its red color will remain roughly constant as the lighting and wavelengths shift. You and I see color thanks to our brain's computations of the light reflected by any object *relative to its surrounding objects*. But only if we grew up with normal light, it seems. Monkeys raised under a restricted range of wavelengths later have great difficulty recognizing the same color when illumination varies (Sugita, 2004).

In a context that does not vary, we maintain color constancy. But what if we change the context? If you guessed that the perceived color would change, you're right, as is dramatically apparent in **FIGURE 16.15**. This principle—that the brain computes the color of objects not in isolation but relative to their context—matters to artists, interior decorators, and clothing designers. Our perception of the color of a wall or of a streak of paint on a canvas is determined not just by the paint in the can but by the surrounding colors.

Though we take size, brightness, and color constancies for granted, these phenomena are truly remarkable. They demonstrate that our visual experiences come not just from isolated objects but from everything around them as well. The take-home lesson: Comparisons govern perceptions.

color constancy perceiving familiar objects as having consistent color, even if changing illumination alters the wavelengths reflected by the object.



R. Beau Lotto at University College, London

FIGURE 16.15 Color depends on context Believe it or not, these three blue disks are identical in color.

* * *

Form perception, depth perception, and perceptual constancy illuminate how we organize our visual world. Perceptual organization applies to other senses, too. It explains why we perceive a grandfather clock's steady ticking not as a *tick-tick-tick* but as grouped sounds, say, *TICK-tick, TICK-tick*. Listening to an unfamiliar language, we have trouble hearing where one word stops and the next one begins. Listening to our own language, we automatically hear distinct words. This, too, reflects perceptual organization. But it is more, for we even organize a string of letters—THEDOGATEMEAT—into words that make an intelligible phrase, more likely "The dog ate meat" than "The do gate me at" (McBurney & Collings, 1984). This process involves not only the organization we've been discussing, but also interpretation—discerning meaning in what we perceive—the topic we turn to next.

"From there to here, from here to there, funny things are everywhere."

—Dr. Seuss, *One Fish, Two Fish, Red Fish, Blue Fish*, 1960

Perceptual Interpretation

Philosophers have debated whether our perceptual abilities should be credited to our nature or our nurture. To what extent do we learn to perceive? German philosopher Immanuel Kant (1724–1804) maintained that knowledge comes from our inborn ways of organizing sensory experiences. Indeed, we come equipped to process sensory information. But British philosopher John Locke (1632–1704) argued that through our experiences we also learn to perceive the world. Indeed, we learn to link an object's distance with its size. So, just how important is experience? How radically does it shape our perceptual interpretations?

"Let us then suppose the mind to be, as we say, white paper void of all characters, without any ideas: How comes it to be furnished? . . . To this I answer, in one word, from EXPERIENCE."

—John Locke, *An Essay Concerning Human Understanding*, 1690

Sensory Deprivation and Restored Vision

16-4: What does research on sensory restriction and restored vision reveal about the effects of experience?

Writing to John Locke, William Molyneux wondered whether "a man *born* blind, and now adult, taught by his *touch* to distinguish between a cube and a sphere" could, if made to see, visually distinguish the two. Locke's answer was *no*, because the man would never have *learned* to see the difference.

Molyneux's hypothetical case has since been put to the test with a few dozen adults who, though blind from birth, have gained sight (Gregory, 1978; von Senden, 1932). Most had been born with cataracts—clouded lenses that allowed them to see only diffused light, rather as you or I might see a diffuse fog through a Ping-Pong ball sliced in half. After cataract surgery, the patients could distinguish figure from ground and could sense colors—suggesting that these aspects of perception are innate. But much as Locke supposed, they often could not visually recognize objects that were familiar by touch.

Experience also influences our perception of faces. You and I perceive and recognize individual faces as a whole. Show us the same top half of a face paired with two different bottom halves (as in **FIGURE 16.16** on the next page), and the identical top halves will seem different. People deprived of visual experience during childhood surpass the rest of us at recognizing that the top halves are the same, because they didn't learn to process faces as a whole (Le Grand et al., 2004). One 43-year-old man whose sight was restored after 40 years of blindness could associate people with distinct features ("Mary's the one with red hair"). But he could not instantly recognize a face. He also lacked perceptual constancy: As people walked away from him they seemed to be shrinking in size (Bower, 2003). Vision, such cases make clear, is partly an acquired sense.

Seeking to gain more control than is provided by clinical cases, researchers have conducted Molyneux's imaginary experiment with infant kittens and monkeys. In one experiment, they outfitted them with goggles through which the animals could see only diffuse, unpatterned light (Wiesel, 1982). After infancy,

Learning to see At age 3, Mike May lost his vision in an explosion. On March 7, 2000, after a new cornea restored vision to his right eye, he got his first look at his wife and children. Alas, although signals were reaching his long dormant visual cortex, it lacked the experience to interpret them. Faces, apart from features such as hair, were not recognizable. Expressions eluded him. Yet he could see an object in motion and has been gradually learning to navigate his world and to marvel at such things as dust floating in sunlight (Abrams, 2002).

Mike May, Allison Aliano Photography

Courtesy of Richard Le Grand

FIGURE 16.16 Perceiving composite faces To most people, the top halves of these two faces, created by Richard Le Grand and his colleagues (2004), look different. Actually, they are the same, though paired with two different lower face halves. People deprived of visual experience early in life have more difficulty perceiving whole faces, which ironically enables their superiority at recognizing that the top halves of these faces are identical.

when their goggles were removed, these animals exhibited perceptual limitations much like those of humans born with cataracts. They could distinguish color and brightness, but not the form of a circle from that of a square. Their eyes had not degenerated; their retinas still relayed signals to their visual cortex. But lacking stimulation, the cortical cells had not developed normal connections. Thus, the animals remained functionally blind to shape. Experience guides, sustains, and maintains the brain's neural organization.

In both humans and animals, a similar period of sensory restriction does no permanent harm if it occurs later in life. Cover the eye of an animal for several months during adulthood, and its vision will be unaffected after the eye patch is removed. Remove cataracts that developed after early childhood, and a human, too, will enjoy normal vision.

The effects of visual experiences during infancy in cats, monkeys, and humans suggest there is a *critical period* shortly after birth—an optimal time when certain events must take place—for normal sensory and perceptual development. So, too, with some auditory experiences. Cochlear implants given to congenitally deaf kittens and human infants seem to trigger an "awakening" of the pertinent brain area (Klinke et al., 1999; Sirenteanu, 1999). Nurture sculpts what nature has endowed.

Perceptual Adaptation

16-5: How adaptable is our ability to perceive?

Given a new pair of glasses, we may feel slightly disoriented, even dizzy. Within a day or two, we adjust to the changed visual input. **Perceptual adaptation** has made the world seem normal again. But imagine a far more dramatic new pair of glasses—one that shifts the apparent location of objects 40 degrees to the left. When you first put them on and toss a ball to a friend, it sails off to the left. Walking forward to shake hands with the person, you veer to the left.

Could you adapt to this distorted world? Chicks cannot. When fitted with such lenses, they have continued to peck where food grains *seemed* to be (Hess, 1956; Rossi, 1968). But we humans adapt to distorting lenses quickly. Within a few minutes your throws would again be accurate, your stride on target. Remove the lenses and you would experience an aftereffect: At first your throws would err in the *opposite* direction, sailing off to the right; but again, within minutes you would readapt.

Indeed, given an even more radical pair of glasses—one that literally turns the world upside down—you could still adapt. Psychologist George Stratton (1896) experienced this when he invented, and for eight days wore, optical headgear that flipped left to right *and* up to down, making him the first person to experience a right-side-up retinal image while standing upright. The ground was up, the sky was down.

At first, Stratton felt disoriented. When he wanted to walk, he found himself searching for his feet, which were now "up." Eating was nearly impossible. He became nauseated and depressed. But Stratton persisted, and by the eighth day he could comfortably reach for an object in the right direction and walk without bumping into things. When he finally removed the headgear, he readapted quickly.

Later experiments replicated Stratton's experience (Dolezal, 1982; Kohler, 1962). After a period of adjustment, people wearing the optical gear have even been able to ride a motorcycle, ski the Alps, and fly an airplane. Did they adjust by perceptually converting their strange worlds to "normal" views? No. Actually, the world around them still seemed above their heads or on the wrong side. But by actively moving about in these topsy-turvy worlds, they adapted to the context and learned to coordinate their movements.

Perceptual adaptation "Oops, missed," thinks researcher Hubert Dolezal as he views the world through inverting goggles. Yet, believe it or not, kittens, monkeys, and humans can adapt to an inverted world.

Courtesy of Hubert Dolezal

Perceptual Set

16-6: How do our expectations, contexts, and emotions influence our perceptions?

As everyone knows, to see is to believe. As we less fully appreciate, to believe is to see. Our experiences, assumptions, and expectations may give us a **perceptual set,** or mental predisposition, that greatly influences (top-down) what we perceive. People perceive an adult-child pair as looking more alike when told they are parent and child (Bressan & Dal Martello, 2002). And consider: Is the image in the center picture of **FIGURE 16.17** a man playing a saxophone or a woman's face? What we see in such a drawing can be influenced by first looking at either of the two unambiguous versions (Boring, 1930).

FIGURE 16.17 Perceptual set Show a friend either the left or right image. Then show the center image and ask, "What do you see?" Whether your friend reports seeing a saxophonist or a woman's face will likely depend on which of the other two drawings was viewed first. In each of those images, the meaning is clear, and it will establish perceptual expectations.
(Sara Nadar, © 1990 Roger N. Shepard)

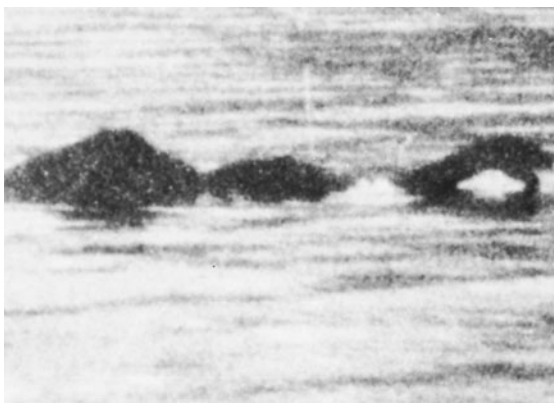
Once we have formed a wrong idea about reality, we have more difficulty seeing the truth. Everyday examples of perceptual set abound. In 1972, a British newspaper published genuine, unretouched photographs of a "monster" in Scotland's Loch Ness—"the most amazing pictures ever taken," stated the paper. If this information creates in you the same perceptual set it did in most of the paper's readers, you, too, will see the monster in the photo reproduced in **FIGURE 16.18a**. But when Steuart Campbell (1986) approached the photos with a different perceptual set, he saw a curved tree trunk—as had others the day the photo was shot. With this different perceptual set, you may now notice that the object is floating motionless, without any rippling water or wake around it—hardly what we would expect of a lively monster.

Perceptual set can similarly influence what we hear. Consider the kindly airline pilot who, on a takeoff run, looked over at his depressed co-pilot and said, "Cheer up." The co-pilot heard the usual "Gear up" and promptly raised the wheels—before they left the ground (Reason & Mycielska, 1982). Perceptual set also influences

perceptual adaptation in vision, the ability to adjust to an artificially displaced or even inverted visual field.

perceptual set a mental predisposition to perceive one thing and not another.

When shown the phrase
Mary had a
a little lamb
many people perceive what they expect, and miss the repeated word. Did you?


Frank Searle, photo Adams/Corbis-Sygma

(a)


Dick Ruhl

(b)

FIGURE 16.18 Believing is seeing What do you perceive in these photos? (a) Is this Nessie, the Loch Ness monster, or a log? (b) Are these flying saucers or clouds? We often perceive what we expect to see.

young children's taste preferences. By a 6-to-1 margin in one experiment, they judged french fries as tasting better when served in a McDonald's bag rather than a plain white bag (Robinson et al., 2007). Clearly, much of what we perceive comes not just from the world "out there" but also from what's behind our eyes and between our ears.

What determines our perceptual set? Through experience we form concepts, or *schemas*, that organize and interpret unfamiliar information. Our preexisting schemas for male saxophonists and women's faces, for monsters and tree trunks, for clouds and UFOs, all influence how we interpret ambiguous sensations with top-down processing.

"The temptation to form premature theories upon insufficient data is the bane of our profession."

—Sherlock Holmes, in Arthur Conan Doyle's *The Valley of Fear,* 1914

Context Effects

Context, as we saw earlier, guides our perception of lightness and color. Context shapes perception in other ways, too. A given stimulus may trigger radically different perceptions, partly because of our differing perceptual sets, but also because of the immediate context. Some examples:

- Imagine hearing a noise interrupted by the words "eel is on the wagon." Likely, you would actually perceive the first word as *wheel*. Given "eel is on the orange," you would hear *peel*. This curious phenomenon, discovered by Richard Warren, suggests that the brain can work backward in time to allow a later stimulus to determine how we perceive an earlier one. The context creates an expectation that, top-down, influences our perception as we match our bottom-up signal against it (Grossberg, 1995).
- Did the pursuing monster in Figure 16.12a look aggressive? Did the identical pursued one seem frightened? If so, you experienced a context effect.
- Is the "magician's cabinet" in **FIGURE 16.19** sitting on the floor or hanging from the ceiling? How we perceive it depends on the context defined by the rabbits.

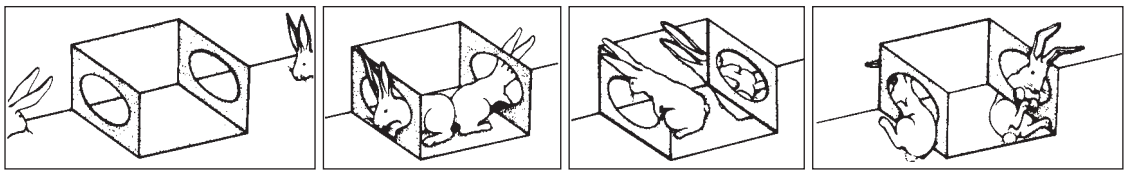


FIGURE 16.19 Context effects: the magician's cabinet Is the box in the far left frame lying on the floor or hanging from the ceiling? What about the one on the far right? In each case, the context defined by the inquisitive rabbits guides our perceptions. (From Shepard, 1990.)

Denis R. J. Geppert *Holland Sentinel.*

FIGURE 16.20 Big and "little"

Even hearing sad rather than happy music can predispose people to perceive a sad meaning in spoken homophonic words—*mourning* rather than *morning*, *die* rather than *dye*, *pain* rather than *pane* (Halberstadt et al., 1995). To experience the context effect yourself, answer this question: How tall is the shorter player in **FIGURE 16.20**? The "little guy" in that photo is actually a 6'9" former Hope College basketball center who towers over me. But he seemed like a short player when matched in a semi-pro game against the world's tallest basketball player, 7'9" Sun Ming Ming from China.

The effects of perceptual set and context show how experience helps us construct perception. In everyday life, our stereotypes (another instance of perceptual set) can color our perceptions.

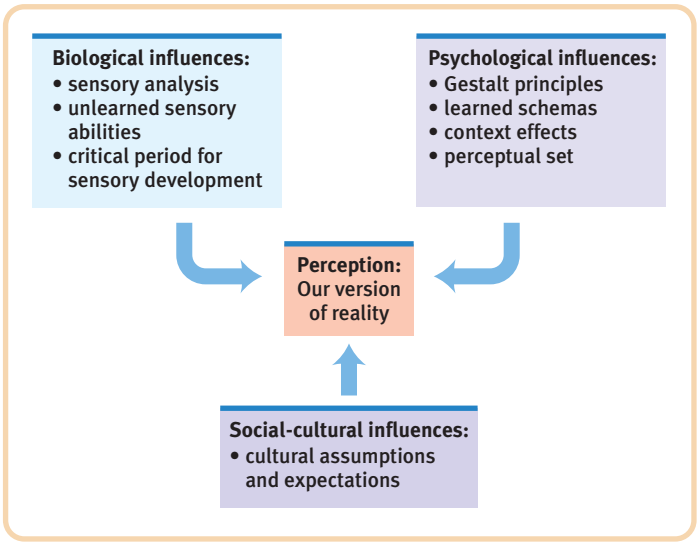


FIGURE 16.21 Perception is a biopsychosocial phenomenon
Psychologists study how we perceive with different levels of analysis, from the biological to the social-cultural.

Without the obvious gender cues of pink or blue, people will struggle over whether to call the new baby "he" or "she." But told an infant is "David," people (especially children) may perceive "him" as bigger and stronger than if the same infant is called "Diana" (Stern & Karraker, 1989). Some differences, it seems, exist merely in the eyes of their beholders.

To return to the question "Is perception innate or learned?" we can answer: It's both. The river of perception is fed by sensation, cognition, and emotion. And that is why we need multiple levels of analysis (**FIGURE 16.21**). "Simple" perceptions are the brain's creative products.

If we accept the statement that perception is the product of sensation and cognition, what can we say about extrasensory perception (ESP), which claims that perception can occur apart from sensory input? For more on that question, see Thinking Critically About: Extrasensory Perception.

"We hear and apprehend only what we already half know."
—Henry David Thoreau, *Journal,* 1860

* * *

To feel awe and to gain a deep reverence for life, we need look no further than our own perceptual system and its capacity for organizing formless nerve impulses into colorful sights, vivid sounds, and evocative smells. As Shakespeare's Hamlet recognized, "There are more things in Heaven and Earth, Horatio, than are dreamt of in your philosophy." Within our ordinary sensory and perceptual experiences lies much that is truly extraordinary—surely much more than has so far been dreamt of in our psychology.

"So, how does the mind work? I don't know. You don't know. Pinker doesn't know. And, I rather suspect, such is the current state of the art, that if God were to tell us, we wouldn't understand."
—Jerry Fodor, "Reply to Steven Pinker," 2005

Culture and context effects What is above the woman's head? In one study, nearly all the East Africans who were questioned said the woman was balancing a metal box or can on her head and that the family was sitting under a tree. Westerners, for whom corners and boxlike architecture are more common, were more likely to perceive the family as being indoors, with the woman sitting under a window. (Adapted from Gregory & Gombrich, 1973.)

Thinking Critically About:

Extrasensory Perception

16-7: What are the claims of ESP, and what have most research psychologists concluded after putting these claims to the test?

Can we perceive only what we sense? Or, as nearly half of Americans believe, are we capable of **extrasensory perception (ESP)** without sensory input (AP, 2007; Moore, 2005)?

Are there indeed people—any people—who can read minds, see through walls, or foretell the future? Several universities—five in Great Britain and one each in Sweden, The Netherlands, and Australia—either have **parapsychology** units or have added faculty chairs or research units for parapsychology (Turpin, 2005). Parapsychologists in such places do experiments that search for possible ESP and other paranormal phenomena.

But other research psychologists and scientists—including 96 percent of the scientists in the U.S. National Academy of Sciences—are skeptical that such phenomena exist (McConnell, 1991). If ESP is real, we would need to overturn the scientific understanding that we are creatures whose minds are tied to our physical brains and whose perceptual experiences of the world are built of sensations. Sometimes new evidence does overturn our scientific preconceptions. Science, as we will see throughout this book, offers us various surprises—about the extent of the unconscious mind, about the effects of emotions on health, about what heals and what doesn't, and much more. Before we evaluate claims of ESP, let's review them.

Claims of ESP

Claims of paranormal phenomena *(psi)* include astrological predictions, psychic healing, communication with the dead, and out-of-body experiences. But the most testable and (for a perception discussion) most relevant claims are for three varieties of ESP:

- *Telepathy,* or mind-to-mind communication: one person sending thoughts to another or perceiving another's thoughts.
- *Clairvoyance,* or perceiving remote events, such as sensing that a friend's house is on fire.
- *Precognition,* or perceiving future events, such as a political leader's death or a sporting event's outcome.

Closely linked with these are claims of *psychokinesis (PK),* or "mind over matter," such as levitating a table or influencing the roll of a die. (The claim is illustrated by the wry request, "Will all those who believe in psychokinesis please raise my hand?")

extrasensory perception (ESP) the controversial claim that perception can occur apart from sensory input; includes telepathy, clairvoyance, and precognition.

parapsychology the study of paranormal phenomena, including ESP and psychokinesis.

SNAPSHOTS

Premonitions or Pretensions?

Can psychics see into the future? Although one might wish for a psychic stock forecaster, the tallied forecasts of "leading psychics" reveal meager accuracy. During the 1990s, the tabloid psychics were all wrong in predicting surprising events. (Madonna did not become a gospel singer, the Statue of Liberty did not lose both its arms in a terrorist blast, Queen Elizabeth did not abdicate her throne to enter a convent.) And the new-century psychics missed the big-news events. Where were the psychics on 9/10 when we needed them? Why, despite a $50 million reward offered, could none of them help locate Osama bin Laden after 9/11 or step forward to predict the impending stock market crashes in 2008? Gene Emery (2004), who has tracked annual psychic forecasts for 26 years, reports that almost never have unusual predictions come true, and virtually never have psychics anticipated any of the year's headline events.

Analyses of psychic visions offered to police departments have revealed that these, too, are no more accurate than guesses made by others (Reiser, 1982). Most police departments are wise to all this. When Jane Ayers Sweat and Mark Durm (1993) asked the police departments of America's 50 largest cities whether they ever used psychics, 65 percent said they never had. Of those that had, not one had found it helpful.

Psychics working with the police do, however, generate hundreds of predictions. This increases the odds of an occasional correct guess, which psychics can then report to the media. Moreover, vague predictions can later be interpreted ("retrofitted") to match events that provide a perceptual set for "understanding" them. Nostradamus, a sixteenth-century French psychic, explained in an unguarded moment that his ambiguous prophecies "could not possibly be understood till they were interpreted after the event and by it."

Dreams are also often interpreted after the event, as we recall or reconstruct those that appear to have come true. Two Harvard psychologists (Murray & Wheeler, 1937) tested the prophetic

"A person who talks a lot is sometimes right."

—Spanish proverb

power of dreams after aviator Charles Lindbergh's baby son was kidnapped and murdered in 1932, but before the body was discovered. When the researchers invited the public to report their dreams about the child, 1300 visionaries submitted dream reports. How many accurately envisioned the child dead? Five percent. How many also correctly anticipated the body's location—buried among trees? Only 4 of the 1300. Although this number was surely no better than chance, to those 4 dreamers the accuracy of their apparent precognitions must have seemed uncanny.

Throughout the day, each of us imagines many events. Given the billions of events in the world each day, and given enough days, some stunning coincidences are sure to occur. By one careful estimate, chance alone would predict that more than a thousand times a day someone on Earth will think of someone and then within the ensuing five minutes will learn of the person's death (Charpak & Broch, 2004). With enough time and people, the improbable becomes inevitable.

That was the experience of comics writer John Byrne (2003). Six months after his Spider-Man story about a New York blackout appeared, New York suffered a massive blackout. A subsequent Spider-Man story line involved a major earthquake in Japan. "And again," he recalled, "the real thing happened in the month the issue hit the stands." Later, when working on a Superman comic book, he "had the Man of Steel fly to the rescue when disaster beset the NASA space shuttle. The *Challenger* tragedy happened almost immediately thereafter" (with time for the issue to be redrawn). "Most recently, and chilling, came when I was writing and drawing Wonder Woman and did a story in which the title character was killed as a prelude to her becoming a goddess." The issue cover "was done as a newspaper front page, with the headline 'Princess Diana Dies.' (Diana is Wonder Woman's real name.) That issue went on sale on a Thursday. The following Saturday . . . I don't have to tell you, do I?"

"At the heart of science is an essential tension between two seemingly contradictory attitudes—an openness to new ideas, no matter how bizarre or counterintuitive they may be, and the most ruthless skeptical scrutiny of all ideas, old and new."

—Carl Sagan (1987)

Putting ESP to Experimental Test

In the past, there have been all kinds of strange ideas—that bumps on the head reveal character traits, that bloodletting is a cure-all, that each sperm cell contains a miniature person. Faced with such claims—or with claims of mind reading or out-of-body travel or communication with the dead—how can we separate bizarre ideas from those that sound bizarre but are true? At the heart of science is a simple answer: *Test them to see if they work.* If they do, so much the better for the ideas. If they don't, so much the better for our skepticism.

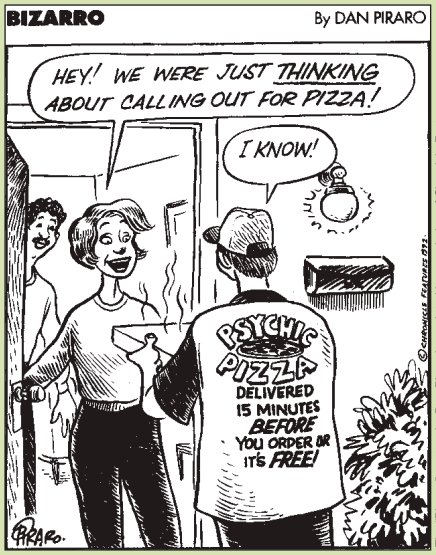
This scientific attitude has led both believers and skeptics to agree that what parapsychology needs is a reproducible phenomenon and a theory to explain it.

Courtesy of Claire Cole

Testing psychic powers in the British population Hertfordshire University psychologist Richard Wiseman created a "mind machine" to see if people can influence or predict a coin toss. Using a touch-sensitive screen, visitors to festivals around the country were given four attempts to call heads or tails. Using a random-number generator, a computer then decided the outcome. When the experiment concluded in January 2000, nearly 28,000 people had predicted 110,972 tosses—with 49.8 percent correct.

Parapsychologist Rhea White (1998) spoke for many in saying that "the image of parapsychology that comes to my mind, based on nearly 44 years in the field, is that of a small airplane [that] has been perpetually taxiing down the runway of the Empirical Science Airport since 1882 . . . its movement punctuated occasionally by lifting a few feet off the ground only to bump back down on the tarmac once again. It has never taken off for any sustained flight."

Seeking a reproducible phenomenon, how might we test ESP claims in a controlled experiment? An experiment differs from a staged demonstration. In the laboratory, the experimenter controls what the "psychic" sees and hears. On stage, the psychic controls what the audience sees and hears. Time and again, skeptics note, so-called psychics have exploited unquestioning audiences with mind-blowing performances in which they *appeared* to communicate with the spirits of the dead, read minds, or levitate objects—only to have it revealed that their acts were nothing more than the illusions of stage magicians.



Which supposed psychic ability does Psychic Pizza claim?

Answer: Telepathy

One set of experiments has invited "senders" to telepathically transmit one of four visual images to "receivers" deprived of sensation in a nearby chamber (Bem & Honorton, 1994). The result? A reported 32 percent accurate response rate, surpassing the chance rate of 25 percent. But follow-up studies have (depending on who was summarizing the results) failed to replicate the phenomenon or produced mixed results (Bem et al., 2001; Milton & Wiseman, 2002; Storm, 2000, 2003).

If ESP nevertheless exists, might it subtly register in the brain? To find out, Harvard researchers Samuel Moulton and Stephen Kosslyn (2008) had a sender try to send one of two pictures telepathically to a receiver lying in an fMRI machine. In these pairs (mostly couples, friends, or twins), the receivers guessed the picture's content correctly at the level of chance (50.0 percent). Moreover, their brains responded no differently when later viewing the actual pictures "sent" by ESP. "These findings," concluded the researchers, "are the strongest evidence yet obtained against the existence of paranormal mental phenomena."

"A psychic is an actor playing the role of a psychic."

—Psychologist-magician Daryl Bem (1984)

From 1998 to 2010, one skeptic, magician James Randi, offered $1 million "to anyone who proves a genuine psychic power under proper observing conditions"

(Randi, 1999, 2008). French, Australian, and Indian groups have made parallel offers of up to 200,000 euros to anyone with demonstrable paranormal abilities (CFI, 2003). Large as these sums are, the scientific seal of approval would be worth far more to anyone whose claims could be authenticated. To refute those who say there is no ESP, one need only produce a single person who can demonstrate a single, reproducible ESP phenomenon. (To refute those who say pigs can't talk would take but one talking pig.) So far, no such person has emerged. Randi's offer was well publicized, and dozens of people were tested, sometimes under the scrutiny of an independent panel of judges. Still, nothing.

"People's desire to believe in the paranormal is stronger than all the evidence that it does not exist."

—Susan Blackmore, "Blackmore's first law," 2004

Perceptual Organization and Interpretation

Module Review

16-1: How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions? Gestalt psychologists described principles by which the brain organizes fragments of sensory data into *gestalts,* or meaningful forms. To recognize an object, we must first perceive it (see it as a *figure*) as distinct from its surroundings (the *ground*). We bring order and form to stimuli by organizing them into meaningful *groups,* following the rules of proximity, similarity, continuity, connectedness, and closure.

16-2: How do we see the world in three dimensions? *Depth perception* is our ability to see objects in three dimensions, which lets us judge distance. The *visual cliff* and other research demonstrates that many species perceive the world in three dimensions at, or very soon after, birth. *Binocular cues,* such as *retinal disparity,* are depth cues that rely on information from both eyes. *Monocular cues* (such as relative size, interposition, relative height, relative motion, linear perspective, and light and shadow) let us judge depth using information transmitted by only one eye.

16-3: How do perceptual constancies help us organize our sensations into meaningful perceptions? *Perceptual constancy* enables us to perceive objects as stable despite the changing image they cast on our retinas. Through shape and size constancies, we perceive familiar objects as unchanging in shape or size despite their changing retinal images. Knowing an object's size gives us clues to its distance; knowing its distance gives clues about its size. Through lightness (or brightness) constancy we perceive an object as having a constant lightness even when the light cast upon it changes, because the brain perceives lightness relative to surrounding objects. *Color constancy* is our ability to perceive consistent color in objects, even though the lighting and wavelengths shift. Our brain constructs our experience of the color of an object through comparisons with surrounding objects.

16-4: What does research on sensory restriction and restored vision reveal about the effects of experience? Both lines of research show there is a critical period for some aspects of sensory and perceptual development. After surgery to restore sight, people who were born blind cannot recognize shapes, forms, and complete faces. After experiencing severely restricted visual input, animals suffer enduring visual handicaps when their visual exposure is returned to normal. Without early stimulation, the brain's neural organization does not develop normally.

16-5: How adaptable is our ability to perceive? *Perceptual adaptation* is evident when people wear glasses that shift the world slightly to the left or right, or even upside-down. Initially disoriented, they manage to adapt to their new context.

16-6: How do our expectations, contexts, and emotions influence our perceptions? *Perceptual set* is a mental predisposition that functions as a lens through which we perceive the world. Our learned concepts (schemas) prime us to organize and interpret ambiguous stimuli in certain ways. The context surrounding a stimulus creates expectations that guide our perceptions.

16-7: What are the claims of ESP, and what have most research psychologists concluded after putting these claims to the test? The three most testable forms of *extrasensory perception (ESP)* are telepathy (mind-to-mind communication), clairvoyance (perceiving remote events), and precognition (perceiving future events). Most research psychologists' skepticism focuses on two points. First, to believe in ESP, you must believe the brain is capable of perceiving without sensory input. Second, psychologists and *parapsychologists* have been unable to replicate (reproduce) ESP phenomena under controlled conditions.

Rehearse It!

1. In listening to a concert, you follow the lead singer and perceive the other musicians as accompaniment; this illustrates the organizing principle of
   a. figure-ground.
   b. shape constancy.
   c. grouping.
   d. depth or distance perception.

2. Our tendencies to fill in the gaps and to perceive a pattern as continuous are two different examples of the organizing principle called
   a. the Ames illusion.
   b. depth perception.
   c. shape constancy.
   d. grouping.

3. Visual cliff experiments on depth perception suggest that
   a. infants have not yet developed depth perception.
   b. crawling infants perceive depth.
   c. we have no way of knowing whether infants can perceive depth.
   d. humans are the only animals that can perceive depth in infancy.

4. Depth perception underlies our ability to
   a. group similar items in a gestalt.
   b. perceive objects as having a constant shape or form.
   c. judge distances.
   d. fill in the gaps in a figure.

5. Examples of monocular cues, which are available to either eye alone, include interposition and
   a. closure.
   b. retinal disparity.
   c. linear perspective.
   d. brightness contrast.

6. Perceiving tomatoes as consistently red, despite shifting illumination, is an example of
   a. form perception.
   b. perceptual constancy.
   c. retinal disparity.
   d. grouping.

7. After surgery to restore vision, patients who had been blind from birth had difficulty
   a. recognizing objects by touch.
   b. recognizing objects by sight.
   c. distinguishing figure from ground.
   d. distinguishing between bright and dim light.

8. Experiments in which volunteers wear glasses that displace or invert their

visual fields show that, after a period of disorientation, people learn to function quite well. This ability is called

a. context effect.
b. perceptual set.
c. sensory interaction.
d. perceptual adaptation.

9. Our perceptual set influences what we perceive. This mental predisposition reflects our

a. experiences, assumptions, and expectations.
b. perceptual adaptation.
c. skill at extrasensory perception.
d. perceptual constancy.

Answers: 1. a, 2. d, 3. b, 4. c, 5. c, 6. b, 7. b, 8. d, 9. a.

Terms and Concepts to Remember

gestalt, p. 217
figure-ground, p. 217
grouping, p. 218
depth perception, p. 219
visual cliff, p. 219
binocular cues, p. 219
retinal disparity, p. 219
monocular cues, p. 220
perceptual constancy, p. 222
color constancy, p. 224
perceptual adaptation, p. 226
perceptual set, p. 227
extrasensory perception (ESP), p. 230
parapsychology, p. 230

Test For Success: Critical Thinking Exercise

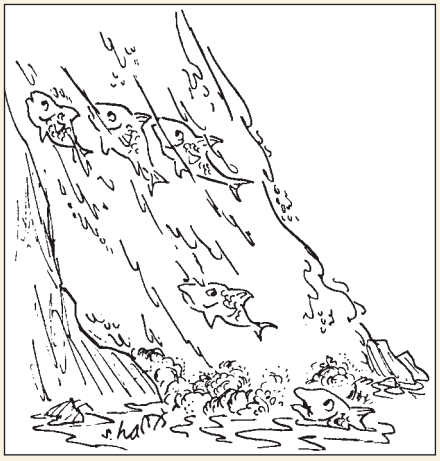
By Amy Himsel, El Camino College

1. Why do you perceive a lemon as the same shade of yellow whether you view it in sunlight or in dim lighting?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Learning



"Actually, sex just isn't that important to me."

"Learning is the eye of the mind."

—Thomas Drake, *Bibliotheca Scholastica Instructissima,* 1633

Learning

When a chinook salmon first emerges from its egg in a stream's gravel bed, its genes provide most of the behavioral instructions it needs for life. It knows instinctively how and where to swim, what to eat, and how to protect itself. Following a built-in plan, the young salmon soon begins its trek to the sea. After some four years in the ocean, the mature salmon returns to its birthplace. It navigates hundreds of miles to the mouth of its home river and then, guided by the scent of its home stream, begins an upstream odyssey to its ancestral spawning ground. Once there, the salmon seeks out the best temperature, gravel, and water flow for breeding. It then mates and, its life mission accomplished, dies.

Unlike salmon, we are not born with a genetic plan for life. Much of what we do we learn from experience. Although we struggle to find the life direction a salmon is born with, our learning gives us more flexibility. We can learn how to build grass huts or snow shelters, submarines or space stations, and thereby adjust to almost any environment. Indeed, nature's most important gift to us may be our *adaptability*—our capacity to learn new behaviors that help us cope with changing circumstances.

Learning breeds hope. What is learnable we can potentially teach—a fact that encourages parents, educators, coaches, and animal trainers. What has been learned we can potentially change by new learning—an assumption that underlies counseling, psychotherapy, and rehabilitation programs. No matter how unhappy, unsuccessful, or unloving we are, that need not be the end of our story.

No topic is closer to the heart of psychology than learning, a *relatively permanent behavior change due to experience.* Psychologists study the learning of a drug's expected effect, of gender roles, and of visual perceptions. They also consider how learning shapes our thought and language, our motivations and emotions, our personalities and attitudes. Modules 17 through 19 examine some of the processes of learning.

How Do We Learn?

17-1: What distinguishes the basic forms of learning?

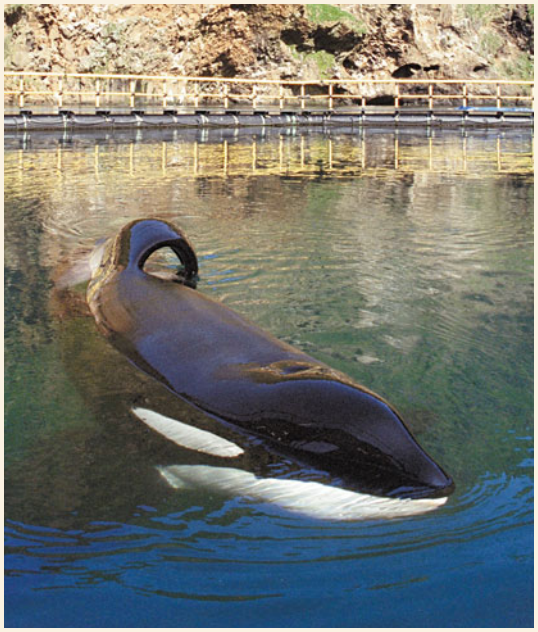
More than 200 years ago, philosophers such as John Locke and David Hume echoed Aristotle's conclusion from 2000 years earlier: We learn by association. Our minds naturally connect events that occur in sequence. Suppose you see and smell freshly baked bread, eat some, and find it satisfying. The next time you see and smell fresh bread, that experience will lead you to expect that eating it will once again be satisfying. So, too, with sounds. If you associate a sound with a frightening consequence, hearing the sound alone may trigger your fear. As one 4-year-old exclaimed after watching a TV character get mugged, "If I had heard that music, I wouldn't have gone around the corner!" (Wells, 1981).

Learned associations also feed our habitual behaviors (Wood & Neal, 2007). As we repeat behaviors in a given context—sleeping in a certain posture in bed, walking the same route on campus, eating popcorn in a movie theater—the behaviors become associated with the contexts. Our next experience of the context then automatically triggers our habitual response. Such associations can make it hard to kick a smoking habit; when back in the smoking context, the urge to light up can be powerful (Siegel, 2005).

Other animals also learn by association. Disturbed by a squirt of water, the sea slug *Aplysia* protectively withdraws its gill. If the squirts continue, as happens naturally in choppy water, the withdrawal response diminishes. (The slug's response *habituates*.) But if the sea slug repeatedly receives an electric shock just after being squirted, its withdrawal response to the squirt instead grows stronger. The animal relates the squirt to the impending shock. Complex animals can

learn to relate their own behavior to its outcomes. Seals in an aquarium will repeat behaviors, such as slapping and barking, that prompt people to toss them a herring.

By linking two events that occur close together, both the sea slug and the seals exhibit *associative learning.* The sea slug associates the squirt with an impending shock; the seal associates slapping and barking with a herring treat. Each animal has learned something important to its survival: predicting the immediate future.


Jouanneau Thomas/CORBIS SYGMA

Nature without appropriate nurture
Keiko—the killer whale of *Free Willy* fame—had all the right genes for being dropped right back into his Icelandic home waters. But lacking life experience, he required caregivers to his life's end in a Norwegian fjord.

The significance of an animal's learning is illustrated by the challenges captive-bred animals face when introduced to the wild. After being bred and raised in captivity, 11 Mexican gray wolves—extinct in the United States since 1977—were released in Arizona's Apache National Forest in 1998. Eight months later, a lone survivor was recaptured. The pen-reared wolves had learned how to hunt—and to move 100 feet away from people—but had not learned to run from a human with a gun. Their story is not unusual. Twentieth-century records document 145 reintroductions of 115 species. Of those, only 11 percent produced self-sustaining populations in the wild. Successful adaptation requires both nature (the needed genetic predispositions) and nurture (a history of appropriate learning).

Conditioning is the process of learning associations. In *classical conditioning,* the topic of Module 17, we learn to associate two stimuli and thus to anticipate events. We learn that a flash of lightning signals an impending crack of thunder, so when lightning flashes nearby, we start to brace ourselves (**FIGURE 1**).

In *operant conditioning,* Module 18's focus, we learn to associate a response (our behavior) and its consequence and thus to repeat acts followed by good results (**FIGURE 2** on the next page) and avoid acts followed by bad results.

Most of us would be unable to name the order of the songs on our favorite CD or playlist. Yet, hearing the end of one piece cues (by association) an anticipation of the next. Likewise, when singing your national anthem, you associate the end of each line with the beginning of the next. (Pick a line out of the middle and notice how much harder it is to recall the previous *line.)*

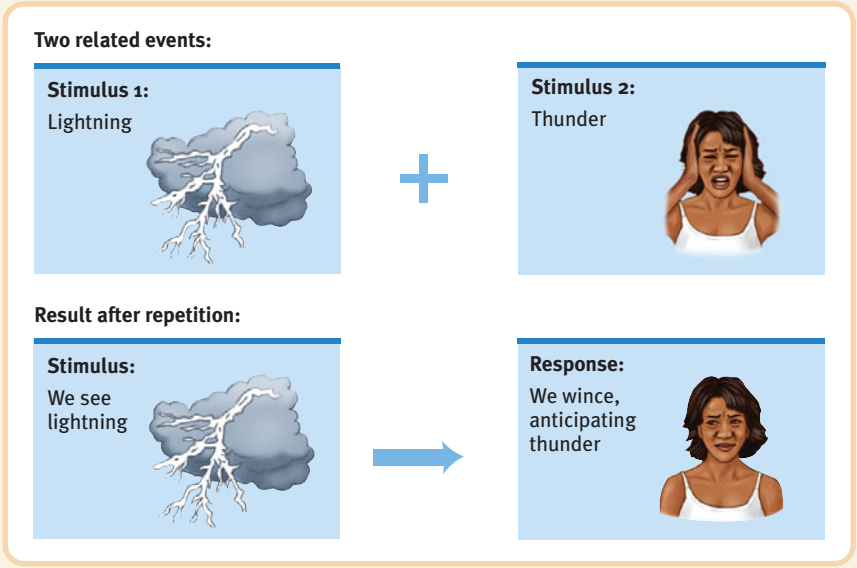


FIGURE 1 Classical conditioning

(a) Response: balancing a ball **(b)** Consequence: receiving food **(c)** Behavior strengthened

FIGURE 2 Operant conditioning

To simplify, we will explore these two types of associative learning separately in Modules 17 and 18. Often, though, they occur together, as on one Japanese cattle ranch, where the clever rancher outfitted his herd with electronic pagers, which he calls from his cell phone. After a week of training, the animals learn to associate two stimuli—the beep on their pager and the arrival of food (classical conditioning). But they also learn to associate their hustling to the food trough with the pleasure of eating (operant conditioning).

The concept of association by conditioning provokes questions: What principles influence the learning and the loss of associations? How can these principles be applied? And what really are the associations: Does the beep on a steer's pager evoke a mental representation of food, to which the steer responds by coming to the trough? Or does it make little sense to explain conditioned associations in terms of cognition? These questions are among the many being studied by researchers exploring how the brain stores and retrieves learning.

Conditioning is not the only form of learning. As Module 19 explains, we also learn from others' experiences, through *observational learning*. Chimpanzees, too, may learn behaviors merely by watching others perform them. If one sees another solve a puzzle and gain a food reward, the observer may perform the trick more quickly.

By conditioning and by observation we humans learn and adapt to our environments. We learn to expect and prepare for significant events such as food or pain *(classical conditioning)*. We also learn to repeat acts that bring good results and to avoid acts that bring bad results *(operant conditioning)*. By watching others we learn new behaviors *(observational learning)*. And through language, we also learn things we have neither experienced nor observed.

MODULE 17

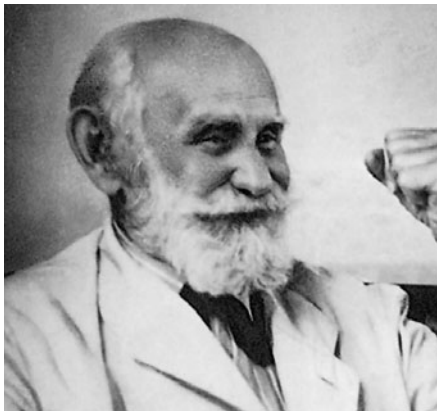
Classical Conditioning

17-2: What is classical conditioning, and how did Pavlov's work influence behaviorism?

Although **associative learning** had long generated philosophical discussion, only in the early twentieth century did psychology's most famous researcher verify it. For many people, the name Ivan Pavlov (1849–1936) rings a bell. His early twentieth-century experiments—now psychology's most famous research—are classics, and the phenomenon he explored we justly call **classical conditioning.**

Pavlov's work also laid the foundation for many of psychologist John B. Watson's ideas, which influenced North American psychology during the first half of the twentieth century, in a movement called **behaviorism.** In searching for laws underlying **learning,** Watson (1913) urged his colleagues to discard reference to inner thoughts, feelings, and motives. The science of psychology should instead study how organisms respond to stimuli in their environments, said Watson: "Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods." Simply said, psychology should be an objective science based on observable behavior.

Watson and Pavlov shared both a disdain for "mentalistic" concepts (such as consciousness) and a belief that the basic laws of learning were the same for all animals, whether dogs or humans. Few researchers today propose that psychology should ignore mental processes, but most now agree that classical conditioning is a basic form of learning by which all organisms adapt to their environment.



Sovfoto

Ivan Pavlov "Experimental investigation . . . should lay a solid foundation for a future true science of psychology" (1927).

Pavlov's Experiments

17-3: How does a neutral stimulus become a conditioned stimulus?

Pavlov was driven by a lifelong passion for research. After setting aside his initial plan to follow his father into the Russian Orthodox priesthood, Pavlov received a medical degree at age 33 and spent the next two decades studying the digestive system. This work earned him Russia's first Nobel Prize in 1904. But it was his novel experiments on learning, to which he devoted the last three decades of his life, that earned this feisty scientist his place in history.

Pavlov's new direction came when his creative mind seized on an incidental observation. Without fail, putting food in a dog's mouth caused the animal to salivate. Moreover, the dog began salivating not only to the taste of the food, but also to the mere sight of the food, or the food dish, or the person delivering the food, or even the sound of that person's approaching footsteps. At first, Pavlov considered these "psychic secretions" an annoyance—until he realized they pointed to a simple but important form of learning.

Pavlov and his assistants tried to imagine what the dog was thinking and feeling as it drooled in anticipation of the food. This only led them into fruitless debates. So, to explore the phenomenon more objectively, they experimented. To eliminate other possible influences, they isolated the dog in a small room, secured it in a harness, and attached a device to divert its saliva to a measuring instrument. From the next room, they presented food—first by sliding in a food bowl, later by blowing meat powder into the dog's mouth at a precise moment. They then paired various **neutral stimuli (NS)**—events the dog could see or hear but didn't associate with food—with food in the dog's mouth. If a sight or sound regularly signaled the arrival of food, would the dog learn the link? If so, would it begin salivating in anticipation of the food?

The answers proved to be *yes* and *yes.* Just before placing food in the dog's mouth to produce salivation, Pavlov sounded a tone. After several pairings of tone and food, the dog, anticipating the meat powder, began salivating to the tone alone.

associative learning learning that certain events occur together. The events may be two stimuli (as in classical conditioning) or a response and its consequences (as in operant conditioning).

classical conditioning a type of learning in which one learns to link two or more stimuli and anticipate events.

behaviorism the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2).

learning a relatively permanent change in an organism's behavior due to experience.

neutral stimulus (NS) in classical conditioning, a stimulus that elicits no response before conditioning.

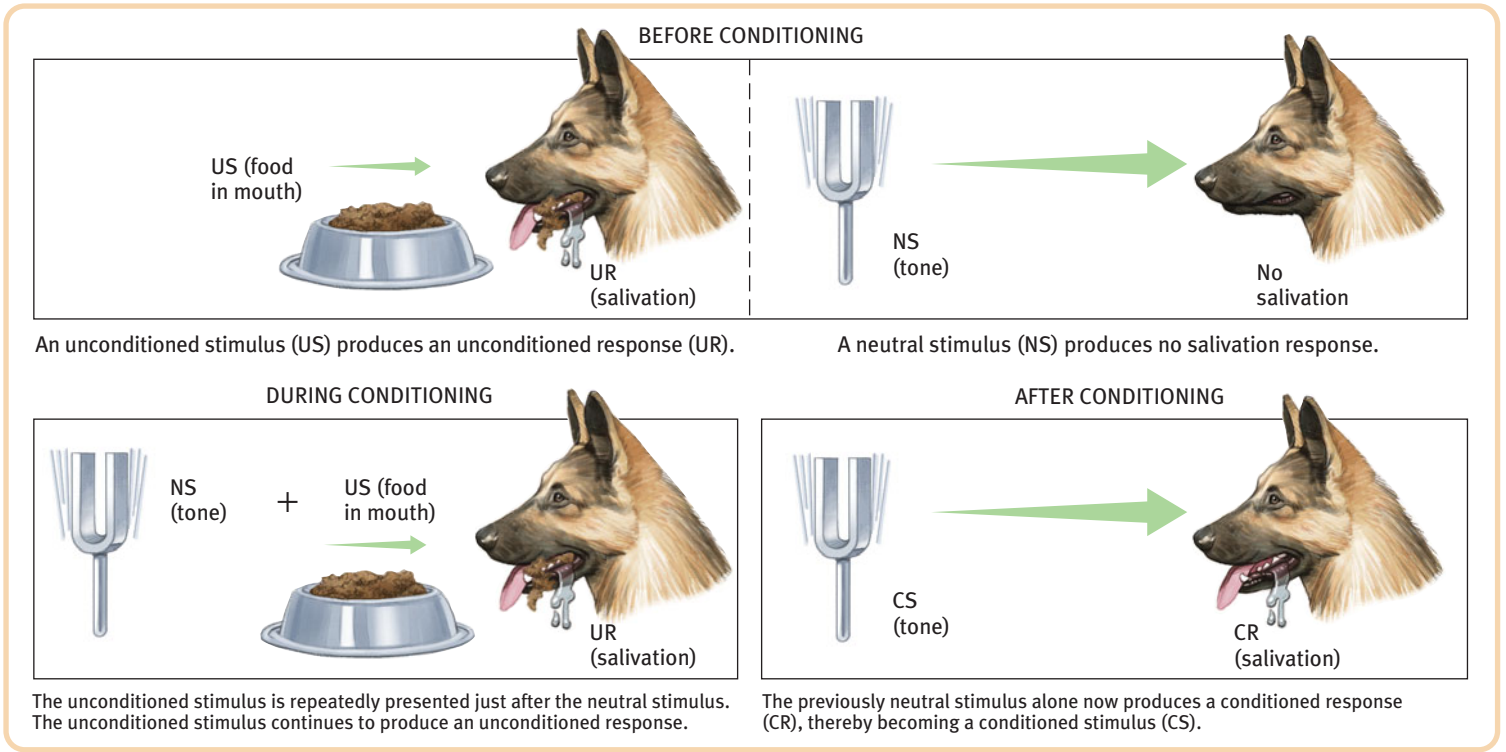


FIGURE 17.1 Pavlov's classic experiment During conditioning, Pavlov presented a neutral stimulus (a tone) just before an unconditioned stimulus (food in mouth). The neutral stimulus then became a conditioned stimulus, producing a conditioned response.

In later experiments, a buzzer, a light, a touch on the leg, even the sight of a circle set off the drooling.[1] (This procedure works with people, too. When hungry young Londoners viewed abstract figures before smelling peanut butter or vanilla, their brain soon responded in anticipation to the abstract images alone [Gottfried et al., 2003]).

Because salivation in response to food in the mouth was unlearned, Pavlov called it an **unconditioned response (UR).** Food in the mouth automatically, *unconditionally,* triggers a dog's salivary reflex (**FIGURE 17.1**). Thus, Pavlov called the food stimulus an **unconditioned stimulus (US).**

Salivation in response to the tone was conditional upon the dog's learning the association between the tone and the food. Today we call this learned response the **conditioned response (CR).** The previously neutral (in this context) tone stimulus that now triggered the conditional salivation we call the **conditioned stimulus (CS).** Distinguishing these two kinds of stimuli and responses is easy: Conditioned = learned; *un*conditioned = *un*learned.

Let's check your understanding with a second example. An experimenter sounds a tone just before delivering an air puff to your blinking eye. After several repetitions, you blink to the tone alone. What is the NS? The US? The UR? The CS? The CR?[2]

If Pavlov's demonstration of associative learning was so simple, what did he do for the next three decades? What discoveries did his research factory publish in his 532 papers on salivary conditioning (Windholz, 1997)? He and his associates explored five major conditioning processes: *acquisition, extinction, spontaneous recovery, generalization,* and *discrimination.*

[1] The "buzzer" (English translation) was perhaps Pavlov's supposed bell—a small electric bell (Tully, 2003).

[2] NS = tone before procedure; US = air puff; UR = blink to air puff; CS = tone after procedure; CR = blink to tone.

Acquisition

17-4: In classical conditioning, what are the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination?

To understand the **acquisition,** or initial learning, of the stimulus-response relationship, Pavlov and his associates had to confront the question of timing: How much time should elapse between presenting the neutral stimulus (the tone, the light, the touch) and the unconditioned stimulus? In most cases, not much—half a second usually works well.

What do you suppose would happen if the food (US) appeared before the tone (NS) rather than after? Would conditioning occur?

Not likely. With but a few exceptions, conditioning doesn't happen when the NS follows the US. Remember, classical conditioning is biologically adaptive because it helps humans and other animals *prepare* for good or bad events. To Pavlov's dogs, the originally neutral tone (NS) becomes a (CS) after signaling an important biological event—the arrival of food (US). To deer in the forest, the snapping of a twig (CS) may signal a predator's approach (US). If the good or bad event had already occurred, the stimulus would not likely signal anything significant.

Michael Domjan (1992, 1994, 2005) showed how a CS can signal another important biological event, by conditioning the sexual arousal of male Japanese quail. Just before presenting an approachable female, the researchers turned on a red light. Over time, as the red light continued to herald the female's arrival, the light caused the male quail to become excited. They developed a preference for their cage's red-light district, and when a female appeared, they mated with her more quickly and released more semen and sperm (Matthews et al., 2007). All in all, the quail's capacity for classical conditioning gives it a reproductive edge. Again we see the larger lesson: *Conditioning helps an animal survive and reproduce—by responding to cues that help it gain food, avoid dangers, locate mates, and produce offspring* (Hollis, 1997).

In humans, too, objects, smells, and sights associated with sexual pleasure—even a geometric figure in one experiment—can become conditioned stimuli for sexual arousal (Byrne, 1982). Psychologist Michael Tirrell (1990) recalled: "My first girlfriend loved onions, so I came to associate onion breath with kissing. Before long, onion breath sent tingles up and down my spine. Oh what a feeling!" (FIGURE 17.2).

Through **higher-order conditioning,** a new neutral stimulus can become a new conditioned stimulus. All that's required is for it to become associated with a previously conditioned stimulus. If a tone regularly signals food and produces salivation, then a light that becomes associated with the tone may also begin to trigger salivation. Although this higher-order conditioning (also called *second-order conditioning*) tends to be weaker than first-stage conditioning, it influences our everyday lives.

Check yourself: If the aroma of cake baking sets your mouth to watering, what is the US? The CS? The CR? See inverted answer below.

Remember:
***US** = **U**nconditioned **S**timulus*
***UR** = **U**nconditioned **R**esponse*
***CS** = **C**onditioned **S**timulus*
***CR** = **C**onditioned **R**esponse*

The cake and its taste are the US. The associated aroma is the CS. Salivation to the aroma is the CR.

unconditioned response (UR) in classical conditioning, the unlearned, naturally occurring response to the unconditioned stimulus (US), such as salivation when food is in the mouth.

unconditioned stimulus (US) in classical conditioning, a stimulus that unconditionally—naturally and automatically—triggers a response.

conditioned response (CR) in classical conditioning, the learned response to a previously neutral (but now conditioned) stimulus (CS).

conditioned stimulus (CS) in classical conditioning, a previously neutral stimulus that, after association with an unconditioned stimulus (US), comes to trigger a conditioned response.

acquisition in classical conditioning, the initial stage, when one links a neutral stimulus and an unconditioned stimulus so that the neutral stimulus begins triggering the conditioned response.

higher-order conditioning a procedure in which the conditioned stimulus in one conditioning experience is paired with a new neutral stimulus, creating a second (often weaker) conditioned stimulus. For example, an animal that has learned that a tone predicts food might then learn that a light predicts the tone and begin responding to the light alone. (Also called *second-order conditioning.*)

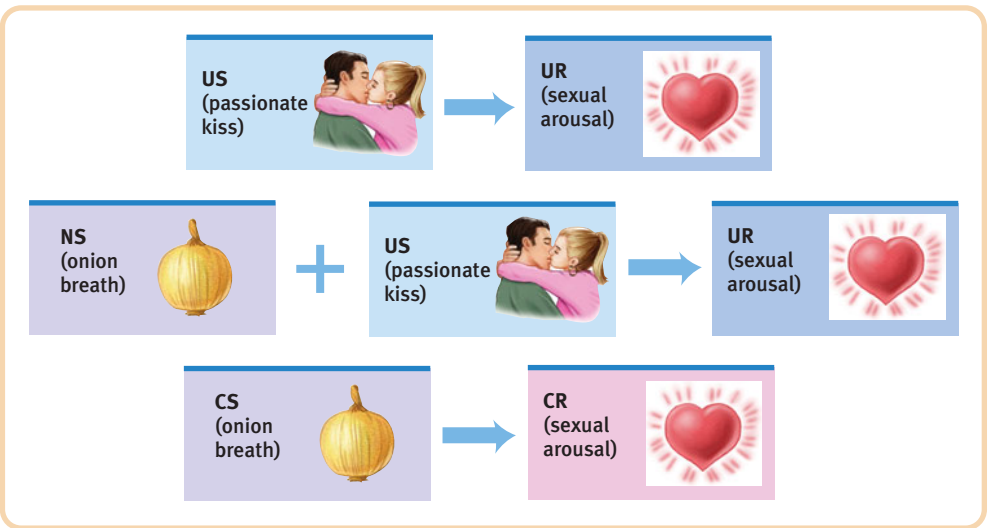


FIGURE 17.2 An unexpected CS Onion breath does not usually produce sexual arousal. But when repeatedly paired with a passionate kiss, it can become a CS and do just that.

extinction the diminishing of a conditioned response; occurs in classical conditioning when an unconditioned stimulus (US) does not follow a conditioned stimulus (CS).

spontaneous recovery the reappearance, after a pause, of an extinguished conditioned response.

generalization the tendency, once a response has been conditioned, for stimuli similar to the conditioned stimulus to elicit similar responses.

Imagine that something makes us very afraid (perhaps a guard dog associated with a previous dog bite). If something else, such as the sound of a barking dog, brings to mind that guard dog, the bark alone may make us feel a little afraid.

Extinction and Spontaneous Recovery

After conditioning, what happens if the CS occurs repeatedly without the US? Will the CS continue to elicit the CR? Pavlov discovered that when he sounded the tone again and again without presenting food, the dogs salivated less and less. Their declining salivation illustrates **extinction,** the diminished responding that occurs when the CS (tone) no longer signals an impending US (food).

Pavlov found, however, that if he allowed several hours to elapse before sounding the tone again, the salivation to the tone would reappear spontaneously (**FIGURE 17.3**). This **spontaneous recovery**—the reappearance of a (weakened) CR after a pause—suggested to Pavlov that extinction was suppressing the CR rather than eliminating it.

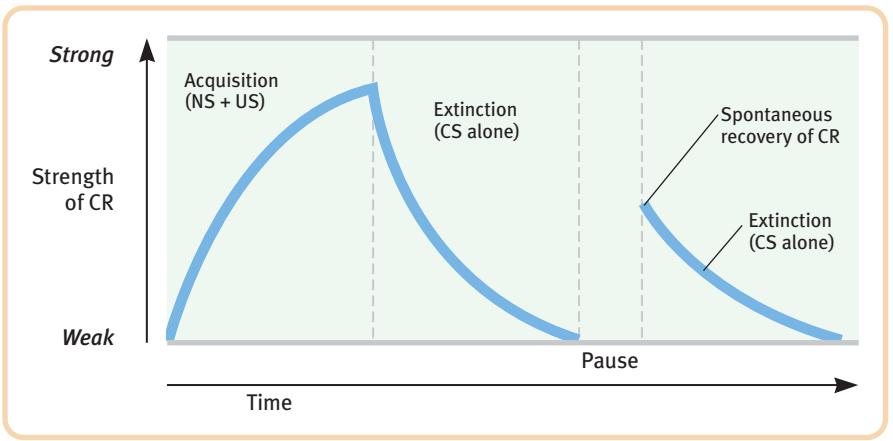


FIGURE 17.3 Idealized curve of acquisition, extinction, and spontaneous recovery The rising curve shows that the CR rapidly grows stronger as the NS and US are repeatedly paired *(acquisition)*, then weakens as the CS is presented alone *(extinction)*. After a pause, the CR reappears *(spontaneous recovery)*.

After breaking up with his fire-breathing heartthrob, Tirrell also experienced extinction and spontaneous recovery. He recalls that "the smell of onion breath (CS), no longer paired with the kissing (US), lost its ability to shiver my timbers. Occasionally, though, after not sensing the aroma for a long while, smelling onion breath awakens a small version of the emotional response I once felt."

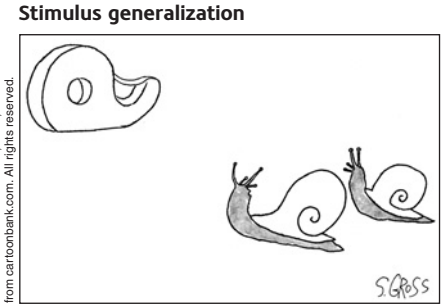
Generalization

Pavlov and his students noticed that a dog conditioned to the sound of one tone also responded somewhat to the sound of a different tone that had never been paired with food. Likewise, a dog conditioned to salivate when rubbed would also drool a bit when scratched (Windholz, 1989) or when touched on a different body part. This tendency to respond to stimuli similar to the CS is called **generalization.**

Generalization can be adaptive, as when toddlers taught to fear moving cars also become afraid of moving trucks and motorcycles. So automatic is generalization that one Argentine writer who underwent torture still recoils with fear when he sees black shoes—his first glimpse of his torturers as they approached his cell. Generalization of anxiety reactions has been demonstrated in laboratory studies comparing abused with nonabused children (**FIGURE 17.4**). Shown an angry face on a computer screen, abused children's brain-wave responses are dramatically stronger and longer lasting (Pollak et al., 1998).

Because of generalization, stimuli similar to naturally disgusting or appealing objects will, by association, evoke some disgust or liking. Normally desirable foods,

Stimulus generalization



"I don't care if she's a tape dispenser. I love her."

such as fudge, are unappealing when shaped to resemble dog feces (Rozin et al., 1986). Adults with childlike facial features (round face, large forehead, small chin, large eyes) are perceived as having childlike warmth, submissiveness, and naiveté (Berry & McArthur, 1986). In both cases, people's emotional reactions to one stimulus generalize to similar stimuli.

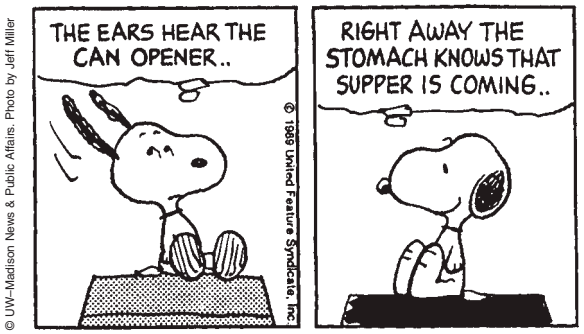


FIGURE 17.4 Child abuse leaves tracks in the brain Seth Pollak (University of Wisconsin–Madison) reports that abused children's sensitized brains react more strongly to angry faces. This generalized anxiety response may help explain why childhood abuse puts children at greater risk of psychological disorder.

Discrimination

Pavlov's dogs also learned to respond to the sound of a particular tone and *not* to other tones. **Discrimination** is the learned ability to *distinguish* between a conditioned stimulus (which predicts the US) and other irrelevant stimuli. Being able to recognize differences is adaptive. Slightly different stimuli can be followed by vastly different consequences. Confronted by a guard dog, your heart may race; confronted by a guide dog, it probably will not.

Extending Pavlov's Understanding

17-5: Do cognitive processes and biological constraints affect classical conditioning?

In their dismissal of "mentalistic" concepts such as consciousness, Pavlov and Watson underestimated the importance of *cognitive processes* (thoughts, perceptions, expectations) and *biological constraints* on an organism's learning capacity.

Cognitive Processes

The early behaviorists believed that rats' and dogs' learned behaviors could be reduced to mindless mechanisms, so there was no need to consider cognition. But Robert Rescorla and Allan Wagner (1972) explained why an animal can learn the *predictability* of an event. If a shock always is preceded by a tone, and then may also be preceded by a light that accompanies the tone, a rat will react with fear to the tone but not to the light. The tone is a better predictor, and the more predictable the association, the stronger the conditioned response. It's as if the animal learns an *expectancy*, an awareness of how likely it is that the US will occur.

"All brains are, in essence, anticipation machines."

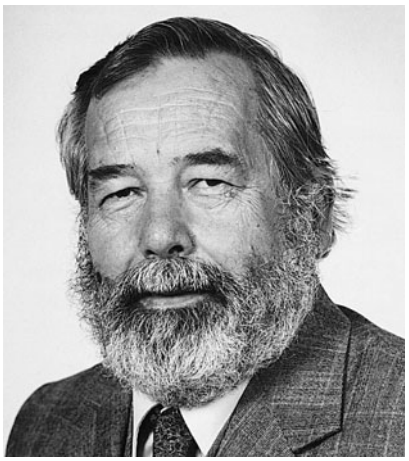
—Daniel C. Dennett, *Consciousness Explained*, 1991

Such experiments help explain why classical conditioning treatments that ignore cognition often have limited success. For example, people receiving therapy for alcohol dependency may be given alcohol spiked with a nauseating drug. Will they then associate alcohol with sickness? If classical conditioning were merely a matter of "stamping in" stimulus associations, we might hope so, and to some extent this does occur. However, the awareness that the nausea is induced by the drug, not the alcohol, often weakens the association between drinking alcohol and feeling sick. So, even in classical conditioning, it is (especially with humans) not simply the CS–US association but also the thought that counts.

Biological Predispositions

Ever since Charles Darwin, scientists have assumed that all animals share a common evolutionary history and thus commonalities in their makeup and functioning. Pavlov and Watson, for example, believed that the basic laws of learning were essentially similar in all animals. So it should make little difference whether one studied pigeons or people. Moreover, it seemed that any natural response could be conditioned to any neutral stimulus. As learning researcher Gregory Kimble proclaimed

discrimination in classical conditioning, the learned ability to distinguish between a conditioned stimulus and stimuli that do not signal an unconditioned stimulus.



Courtesy of John Garcia

John Garcia As the laboring son of California farmworkers, Garcia attended school only in the off-season during his early childhood years. After entering junior college in his late twenties, and earning his Ph.D. in his late forties, he received the American Psychological Association's Distinguished Scientific Contribution Award "for his highly original, pioneering research in conditioning and learning." He was also elected to the National Academy of Sciences.

in 1956, "Just about any activity of which the organism is capable can be conditioned and . . . these responses can be conditioned to any stimulus that the organism can perceive" (p. 195).

Twenty-five years later, Kimble (1981) humbly acknowledged that "half a thousand" scientific reports had proven him wrong. More than the early behaviorists realized, an animal's capacity for conditioning is constrained by its biology. Each species' predispositions prepare it to learn the associations that enhance its survival. Environments are not the whole story.

John Garcia was among those who challenged the prevailing idea that all associations can be learned equally well. While researching the effects of radiation on laboratory animals, Garcia and Robert Koelling (1966) noticed that rats began to avoid drinking water from the plastic bottles in radiation chambers. Could classical conditioning be the culprit? Might the rats have linked the plastic-tasting water (a CS) to the sickness (UR) triggered by the radiation (US)?

To test their hunch, Garcia and Koelling gave the rats a particular taste, sight, or sound and later also gave them radiation or drugs (US) that led to nausea and vomiting (UR). Two startling findings emerged: First, even if sickened as late as several hours after tasting a particular novel flavor, the rats thereafter avoided that flavor. This appeared to violate the notion that for conditioning to occur, the US must immediately follow the CS.

Second, the sickened rats developed aversions to tastes but not to sights or sounds. This contradicted the behaviorists' idea that any perceivable stimulus could serve as a CS. But it made adaptive sense, because for rats the easiest way to identify tainted food is to taste it. (If sickened after sampling a new food, they thereafter avoid the food—which makes it difficult to eradicate a population of "bait-shy" rats by poisoning.)

Humans, too, seem biologically prepared to learn some associations rather than others. If you become violently ill four hours after eating contaminated mussels, you will probably develop an aversion to the taste of mussels but not to the sight of the associated restaurant, its plates, the people you were with, or the music you heard there. In contrast, birds, which hunt by sight, appear biologically primed to develop aversions to the *sight* of tainted food (Nicolaus et al., 1983). Organisms are predisposed to learn associations that help them adapt.

Colin Young-Wolff/PhotoEdit Inc.

Taste aversion If you became violently ill after eating mussels, you probably would have a hard time eating them again. Their smell and taste would have become a CS for nausea. This learning occurs readily because our biology prepares us to learn taste aversions to toxic foods.

Garcia and Koelling's taste-aversion research is but one instance in which psychological experiments that began with the discomfort of some laboratory animals ended by enhancing the welfare of many others. In one well-known conditioned taste-aversion study, coyotes and wolves that were tempted into eating sheep carcasses laced with a sickening poison developed an aversion to sheep meat (Gustavson et al., 1974, 1976). Two wolves later penned with a live sheep seemed actually to fear it. The study not only saved the sheep from their predators, but also saved the sheep-shunning coyotes and wolves from angry ranchers and farmers who had wanted to destroy them. Later applications of Garcia and Koelling's findings have prevented baboons from raiding African gardens, raccoons from attacking chickens, and ravens and crows from feeding on crane eggs—all while preserving predators who occupy an important ecological niche (Garcia & Gustavson, 1997).

All these cases support Darwin's principle that natural selection favors traits that aid survival. Our ancestors who readily learned taste aversions were unlikely to eat the same toxic food again and were more likely to survive and leave descendants. Nausea, like anxiety, pain, and other bad feelings, serves a good purpose. Like a low-oil warning on a car dashboard, each alerts the body to a threat (Neese, 1991).

"Once bitten, twice shy."
—G. F. Northall, *Folk-Phrases,* 1894

"All animals are on a voyage through time, navigating toward futures that promote their survival and away from futures that threaten it. Pleasure and pain are the stars by which they steer."
—Psychologists Daniel T. Gilbert and Timothy D. Wilson, "Prospection: Experiencing the Future," 2007

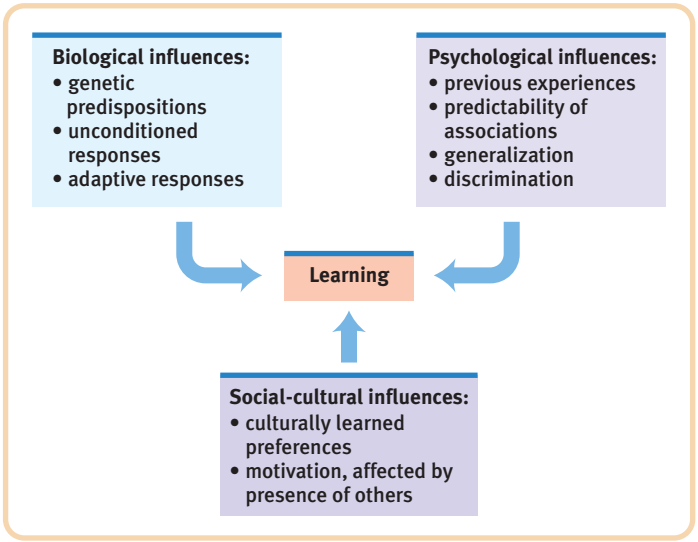
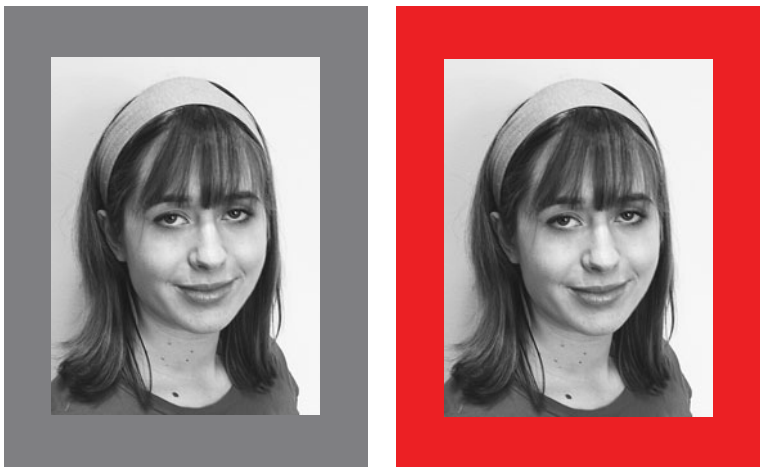


FIGURE 17.5 Biopsychosocial influences on learning Today's learning theorists recognize that our learning results not only from environmental experiences, but also from cognitive and biological influences.

The discovery of biological constraints affirms the value of the biopsychosocial approach, which considers different perspectives, including biological and cognitive influences (**FIGURE 17.5**), in seeking to understand phenomena such as learning. Responding to stimuli that announce significant events, such as food or pain, is adaptive. So is a genetic predisposition to associate a CS with a US that follows predictably and immediately: Causes often immediately precede effects. So once again, we see an important principle at work: *Learning enables organisms to adapt to their environment.*

This may help explain why we humans seem to be naturally disposed to learn associations between the color red and women's sexuality, note Andrew Elliot and Daniela Niesta (2008). Female primates display red when nearing ovulation. In human females, enhanced bloodflow produces the red blush of flirtation and sexual excitation. Does the frequent pairing of red and sex—with Valentine's hearts, red-light districts, and red lipstick—naturally enhance men's attraction to women? Elliot and Niesta's experiments consistently suggest that, without men's awareness, it does (**FIGURE 17.6**).



Courtesy of Kathryn Brownson, Hope College

FIGURE 17.6 Romantic red In a series of experiments that controlled for other factors (such as the brightness of the image), men found women more attractive and sexually desirable when framed in red (Elliot & Niesta, 2008).

Pavlov's Legacy

17-6: Why is Pavlov's work important?

What remains of Pavlov's ideas? A great deal. Most psychologists agree that classical conditioning is a basic form of learning. Judged by today's knowledge of cognitive processes and biological predispositions, Pavlov's ideas were incomplete. But if we see further than Pavlov did, it is because we stand on his shoulders.

Why does Pavlov's work remain so important? If he had merely taught us that old dogs can learn new tricks, his experiments would long ago have been forgotten. Why should we care that dogs can be conditioned to salivate at the sound of a tone? The importance lies first in this finding: *Many other responses to many other stimuli can be classically conditioned in many other organisms*—in fact, in every species tested, from earthworms to fish to dogs to monkeys to people (Schwartz, 1984). Thus, classical conditioning is one way that virtually all organisms learn to adapt to their environment.

"[Psychology's] factual and theoretical developments in this century—which have changed the study of mind and behavior as radically as genetics changed the study of heredity—have all been the product of objective analysis—that is to say, behavioristic analysis."

—Psychologist Donald Hebb (1980)

Second, *Pavlov showed us how a process such as learning can be studied objectively.* He was proud that his methods involved virtually no subjective judgments or guesses about what went on in a dog's mind. The salivary response is a behavior measurable in cubic centimeters of saliva. Pavlov's success therefore suggested a scientific model for how the young discipline of psychology might proceed—by isolating the basic building blocks of complex behaviors and studying them with objective laboratory procedures.

Applications of Classical Conditioning

17-7: What have been some applications of classical conditioning?

In countless areas of psychology, including consciousness, motivation, emotion, health, psychological disorders, and therapy, Pavlov's principles of classical conditioning are now being used to improve human health and well-being. Two examples:

- Former drug users often feel a craving when they are again in the drug-using context—with people or in places they associate with previous highs. Thus, drug counselors advise addicts to steer clear of people and settings that may trigger these cravings (Siegel, 2005).
- Classical conditioning even works on the body's disease-fighting immune system. When a particular taste accompanies a drug that influences immune responses, the taste by itself may come to produce an immune response (Ader & Cohen, 1985).

Pavlov's work also provided a basis for John Watson's (1913) idea that human emotions and behaviors, though biologically influenced, are mainly a bundle of conditioned responses. Working with an 11-month-old named Albert, Watson and Rosalie Rayner (1920; Harris, 1979) showed how specific fears might be conditioned. Like most infants, "Little Albert" feared loud noises but not white rats. Watson and Rayner presented a white rat and, as Little Albert reached to touch it, struck a hammer against a steel bar just behind his head. After seven repeats of seeing the rat and hearing the frightening noise, Albert burst into tears at the mere sight of the rat (an ethically troublesome study by today's standards). What is more, five days later Albert showed generalization of his conditioned response by reacting with fear to a rabbit, a dog, and a sealskin coat, but not to dissimilar objects such as toys.

In Watson and Rayner's experiment, what was the US? The UR? The NS? The CS? The CR? See inverted answer below.

The US was the loud noise; the UR was the startled fear response; the NS was the rat before it was paired with the loud noise; the CS was the rat after being paired with the loud noise; the CR was fear.

Although Little Albert's fate is unknown, Watson's is not. After losing his professorship at Johns Hopkins University over an affair with Rayner (whom he later married), he became the J. Walter Thompson advertising agency's resident psychologist. There he used his knowledge of associative learning to conceive many successful campaigns, including one for Maxwell House that helped make the "coffee break" an American custom (Hunt, 1993).

Brown Brothers

John B. Watson Watson (1924) admitted to "going beyond my facts" when offering his famous boast: "Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors."

Some psychologists, noting that Albert's fear wasn't learned quickly, had difficulty repeating Watson and Rayner's findings with other children. Nevertheless, Little Albert's case has had legendary significance for many psychologists. Some have wondered if each of us might not be a walking repository of conditioned emotions. Might extinction procedures or even new conditioning help us change our unwanted responses to emotion-arousing stimuli? One patient, who for 30 years had feared going into an elevator alone, did just that. Following his therapist's advice, he forced himself to enter 20 elevators a day. Within 10 days, his fear had nearly vanished (Ellis & Becker, 1982). This dramatic turnaround is but one example of how psychologists use behavioral techniques to treat emotional disorders and promote personal growth.

Classical Conditioning

Module Review

17-1: What distinguishes the basic forms of learning? *Learning* is a relatively permanent change in an organism's behavior due to experience. In *associative learning*, we learn to associate two stimuli (as in classical conditioning) or a response and its consequences (as in operant conditioning). In observational learning, we learn by watching others' experiences and examples.

17-2: What is classical conditioning, and how did Pavlov's work influence behaviorism? *Classical conditioning* is a type of learning in which organisms come to associate one stimuli (such as lightning) with another stimuli (thunder). Pavlov's work on classical conditioning laid the foundation for *behaviorism*, the view that psychology should be an objective science that studies behavior without reference to mental processes.

17-3: How does a neutral stimulus become a conditioned stimulus? In classical conditioning, a *UR* is an event that occurs naturally (such as salivation), in response to some stimulus. A *US* is something that naturally and automatically (without learning) triggers the unlearned response (as food in the mouth triggers salivation). An *NS* is a stimulus (such as a bell) that elicits no response before conditioning but, through learning, becomes a *CS* after being associated with some unlearned response (salivating). A *CR* is the learned response (salivating) to the originally irrelevant but now conditioned stimulus.

17-4: In classical conditioning, what are the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination? In classical conditioning, *acquisition* is associating an initial NS with the US. Acquisition transforms an NS into a CS most readily when the stimulus is presented just before (ideally, about a half-second before) a US, thus preparing the organism for the upcoming event. This finding supports the view that classical conditioning is biologically adaptive. In *higher-order conditioning*, the CS in one conditioning experience is paired with a new NS, creating a second (often weaker) CS. *Extinction* is diminished responding when the CS no longer signals an impending US. *Spontaneous recovery* is the reappearance of a formerly extinguished response, following a rest period. *Generalization* is the tendency to respond to stimuli that are similar to a CS. *Discrimination* is the learned ability to distinguish between a CS and other irrelevant stimuli.

17-5: Do cognitive processes and biological constraints affect classical conditioning? Despite early behaviorists' views, research has shown that cognition and biological predispositions place some limits on conditioning. Organisms may learn when to expect a US and may be aware of the link between stimuli and responses. Because of biological predispositions, some associations are easier to learn than others. Learning is adaptive: Each species learns behaviors that aid its survival.

17-6: Why is Pavlov's work important? Pavlov taught us that significant psychological phenomena can be studied objectively, and that classical conditioning is a basic form of learning that applies to all species.

17-7: What have been some applications of classical conditioning? Classical conditioning techniques have been used in drug-abuse treatment programs and in therapy for emotional disorders. The body's immune system also appears to respond to classical conditioning.

Rehearse It!

1. *Learning* is defined as "a relatively permanent change in an organism's behavior due to
   a. instinct."
   b. mental processes."
   c. experience."
   d. formal education."

2. Two forms of associative learning are classical conditioning, in which the organism associates _____, and operant conditioning, in which the organism associates _____.
   a. two responses; a response and a consequence
   b. two stimuli; two responses
   c. two stimuli; a response and a consequence
   d. two responses; two stimuli

3. In Pavlov's experiments, dogs learned to salivate in response to a tone. The tone is therefore a(an)
   a. conditioned stimulus.
   b. unconditioned stimulus.
   c. neutral stimulus.
   d. unconditioned response.

4. Dogs can learn to respond (by salivating, for example) to one kind of stimulus (a circle, for example) and not to another (a square). This process is an example of
   a. generalization.
   b. discrimination.
   c. acquisition.
   d. spontaneous recovery.

5. Early behaviorists believed that for conditioning to occur, the unconditioned stimulus (US) must immediately follow the neutral stimulus (NS). _____ demonstrated this was not always so.
   a. The Little Albert experiment
   b. Pavlov's experiments with dogs
   c. Watson's behaviorism theory
   d. Garcia and Koelling's taste-aversion studies

6. Taste-aversion research has shown that animals develop aversions to certain tastes but not to sights or sounds. This finding supports
   a. Pavlov's demonstration of generalization.
   b. Darwin's principle that natural selection favors traits that aid survival.
   c. Watson's view that study should be limited to observable behavior.
   d. the early behaviorists' view that organisms can be conditioned to any stimulus.

7. After Watson and Rayner classically conditioned a small child named Albert to fear a white rat, the child later showed fear in response to a rabbit, a dog, and a sealskin coat. Little Albert's fear of objects resembling the rat illustrates
   a. extinction.
   b. generalization.
   c. spontaneous recovery.
   d. discrimination between two stimuli.

Answers: 1. c, 2. c, 3. a, 4. b, 5. d, 6. b, 7. b.

Terms and Concepts to Remember

associative learning, p. 239
classical conditioning, p. 239
behaviorism, p. 239
learning, p. 239
neutral stimulus (NS), p. 239
unconditioned response (UR), p. 240
unconditioned stimulus (US), p. 240
conditioned response (CR), p. 240
conditioned stimulus (CS), p. 240
acquisition, p. 241
higher-order conditioning, p. 241
extinction, p. 242
spontaneous recovery, p. 242
generalization, p. 242
discrimination, p. 243

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

1. "Sex sells!" is a common saying in advertising. Using classical conditioning terms, explain how sexual images in advertisements can condition your response to a product.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 18

Operant Conditioning

18-1: What is operant conditioning, and how does it differ from classical conditioning?

It's one thing to classically condition a dog to salivate at the sound of a tone, or a child to fear moving cars. To teach an elephant to walk on its hind legs or a child to say *please,* we must turn to another type of **learning**—operant conditioning.

Classical conditioning and operant conditioning are both forms of **associative learning,** yet their difference is straightforward:

- *Classical conditioning* forms associations between stimuli (a CS and the US it signals). It also involves **respondent behavior**—actions that are automatic responses to a stimulus (such as salivating in response to meat powder and later in response to a tone).
- In **operant conditioning,** organisms associate their own actions with consequences. Actions followed by reinforcers increase; those followed by punishers decrease. Behavior that *operates* on the environment to *produce* rewarding or punishing stimuli is called **operant behavior.**

We can therefore distinguish classical from operant conditioning by asking: *Is the organism learning associations between events it does not control* (classical conditioning)? *Or is it learning associations between its behavior and resulting events* (operant conditioning)?

learning a relatively permanent change in an organism's behavior due to experience.

associative learning learning that certain events (a response and its consequences in operant conditioning) occur together.

respondent behavior behavior that occurs as an automatic response to some stimulus.

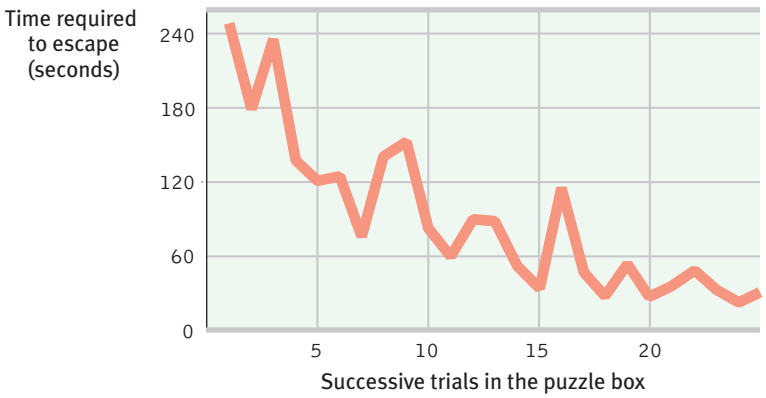
operant conditioning a type of learning in which behavior is strengthened if followed by a reinforcer or diminished if followed by a punisher.

operant behavior behavior that operates on the environment, producing consequences.

law of effect Thorndike's principle that behaviors followed by favorable consequences become more likely.

Skinner's Experiments

B. F. Skinner (1904–1990) was a college English major and an aspiring writer who, seeking a new direction, entered graduate school in psychology. He went on to become modern behaviorism's most influential and controversial figure. Skinner's work elaborated what psychologist Edward L. Thorndike (1874–1949) called the **law of effect:** Rewarded behavior is likely to recur (**FIGURE 18.1**). Using Thorndike's law of effect as a starting point, Skinner developed a *behavioral technology* that revealed principles of *behavior control.* These principles also enabled him to teach pigeons such unpigeonlike behaviors as walking in a figure 8, playing Ping-Pong, and keeping a missile on course by pecking at a screen target.



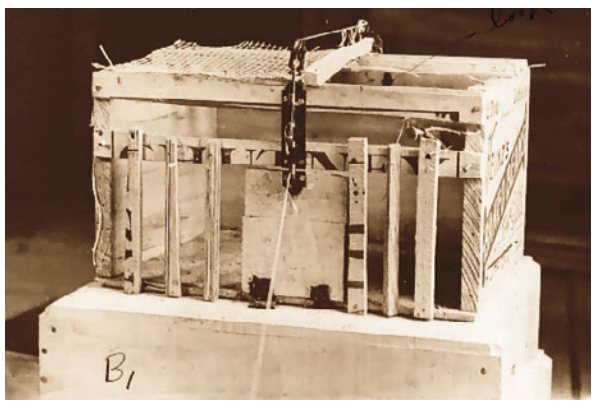


FIGURE 18.1 Cat in a puzzle box
Thorndike (1898) used a fish reward to entice cats to find their way out of a puzzle box (right) through a series of maneuvers. The cats' performance tended to improve with successive trials (left), illustrating Thorndike's *law of effect.* (Adapted from Thorndike, 1898.)

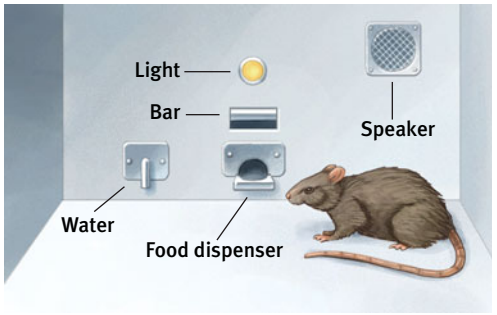


FIGURE 18.2 A Skinner box Inside the box, the rat presses a bar for a food reward. Outside, a measuring device (not shown here) records the animal's accumulated responses.

For his pioneering studies, Skinner designed an **operant chamber,** popularly known as a *Skinner box* (**FIGURE 18.2**). The box has a bar (a lever) that an animal presses—or a key (a disc) that an animal pecks—to release a reward of food or water, and a device that records these responses. Operant conditioning experiments have done far more than teach us how to pull habits out of a rat. They have explored the precise conditions that foster efficient and enduring learning.

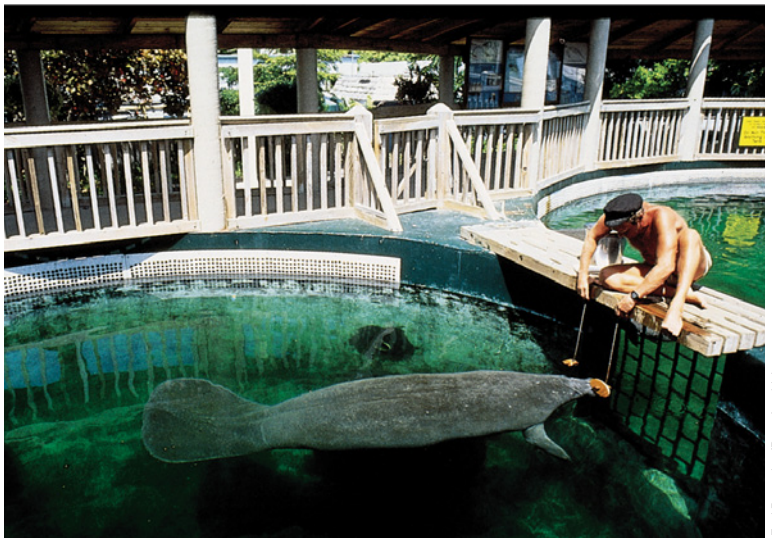
Shaping Behavior

In his experiments, Skinner used **shaping,** a procedure in which *reinforcers,* such as food, gradually guide an animal's actions toward a desired behavior. Imagine that you wanted to condition a hungry rat to press a bar. First, you would watch how the animal naturally behaves, so that you could build on its existing behaviors. You might give the rat a food reward each time it approaches the bar. Once the rat is approaching regularly, you would require it to move closer before rewarding it, then closer still. Finally, you would require it to touch the bar before you gave it the food. With this method of *successive approximations,* you reward responses that are ever-closer to the final desired behavior, and you ignore all other responses. By making rewards contingent on desired behaviors, researchers and animal trainers gradually shape complex behaviors.

Shaping can also help us understand what nonverbal organisms perceive. Can a dog distinguish red and green? Can a baby hear the difference between lower- and higher-pitched tones? If we can shape them to respond to one stimulus and not to another, then we know they can perceive the difference. Such experiments have even shown that some animals can form concepts. If an experimenter reinforces a pigeon for pecking after seeing a human face, but not after seeing other images, the pigeon learns to recognize human faces (Herrnstein & Loveland, 1964). In this experiment, a face is a *discriminative stimulus;* like a green traffic light, it signals that a response will be reinforced. After being trained to discriminate among flowers, people, cars, and chairs, pigeons can usually identify the category in which a new pictured object belongs (Bhatt et al., 1988; Wasserman, 1993). They have even been trained to discriminate between Bach's music and Stravinsky's (Porter & Neuringer, 1984).

Shaping rats to save lives A Gambian giant pouched rat, having been shaped to sniff out land mines, receives a bite of banana after successfully locating a mine during training in Mozambique.

Khamis Ramadhan/Panapress/Getty Images



Fred Bavendam/Peter Arnold, Inc.

A discriminating creature University of Windsor psychologist Dale Woodyard uses a food reward to train this manatee to discriminate between objects of different shapes, colors, and sizes. Manatees remember such responses for a year or more.

In everyday life, we continually reward and shape others' behavior, said Skinner, but we often do so unintentionally. Billy's whining, for example, annoys his mystified parents, but look how they typically deal with Billy:

Billy: *Could you tie my shoes?*
Father: (Continues reading paper.)
Billy: *Dad, I need my shoes tied.*
Father: *Uh, yeah, just a minute.*
Billy: *DAAAAD! TIE MY SHOES!*
Father: *How many times have I told you not to whine? Now, which shoe do we do first?*

Billy's whining is reinforced, because he gets something desirable—his dad's attention. Dad's response is reinforced because it gets rid of something aversive—Billy's whining.

Or consider a teacher who pastes gold stars on a wall chart after the names of children scoring 100 percent on spelling tests. As everyone can then see, some children consistently do perfect work. The others, who take the same test and may have worked harder than the academic all-stars, get no rewards. The teacher would be better advised to apply the principles of operant conditioning—to reinforce all spellers for gradual improvements (successive approximations toward perfect spelling of words they find challenging).

operant chamber in operant conditioning research, a chamber (also known as a *Skinner box*) containing a bar or key that an animal can manipulate to obtain a food or water reinforcer; attached devices record the animal's rate of bar pressing or key pecking.

shaping an operant conditioning procedure in which reinforcers guide behavior toward closer and closer approximations of the desired behavior.

reinforcer in operant conditioning, any event that *strengthens* the behavior it follows.

positive reinforcement increasing behaviors by presenting positive stimuli, such as food. A positive reinforcer is any stimulus that, when *presented* after a response, strengthens the response.

negative reinforcement increasing behaviors by stopping or reducing negative stimuli. A negative reinforcer is any stimulus that, when *removed* after a response, strengthens the response. (Note: negative reinforcement is *not* punishment.)

Types of Reinforcers

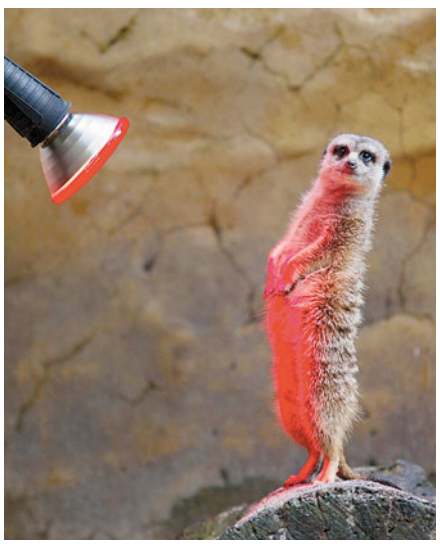
18-2: What are the basic types of reinforcers?

People often refer rather loosely to the power of "rewards." This idea gains a more precise meaning in Skinner's concept of a **reinforcer:** any event that strengthens (increases the frequency of) a preceding response. A reinforcer may be a tangible reward, such as food or money. It may be praise or attention—even being yelled at, for a child hungry for attention. Or it may be an activity—borrowing the family car after doing the dishes, or taking a break after an hour of study.

Although anything that serves to increase behavior is a reinforcer, reinforcers vary with circumstances. What's reinforcing to one person (rock concert tickets) may not be to another. What's reinforcing in one situation (food when hungry) may not be in another.

Up to now, we've really been discussing **positive reinforcement,** which strengthens a response by *presenting* a typically pleasurable stimulus after a response. But there are *two* basic kinds of reinforcement (**TABLE 18.1** on the next page). **Negative reinforcement** *strengthens* a response by *reducing* or *removing* something undesirable or unpleasant, as when an organism escapes an aversive situation. Taking aspirin may relieve your headache, and pushing the snooze button will silence your annoying alarm. These welcome results (end of pain, end of alarm) provide negative reinforcement and increase the odds that you will repeat these behaviors. For drug addicts, the negative reinforcement of ending withdrawal pangs can be a compelling reason to resume using (Baker et al., 2004).

Positive reinforcement A heat lamp positively reinforces this Taronga Zoo meerkat's behavior during a cold snap in Sydney, Australia.



Reuters/Corbis

TABLE 18.1 Ways to Increase Behavior

Operant Conditioning Term	Description	Examples
Positive reinforcement	Add a desirable stimulus	Getting a hug; receiving a paycheck
Negative reinforcement	Remove an aversive stimulus	Fastening seatbelt to turn off beeping

Note that contrary to popular usage, *negative reinforcement is not punishment.* (*Advice:* Repeat the last five words in your mind, because this is one of psychology's most often misunderstood concepts.) Rather, negative reinforcement *removes* a punishing (aversive) event.

Sometimes negative and positive reinforcement coincide. Imagine a worried student who, after goofing off and getting a bad exam grade, studies harder for the next exam. This increased effort may be negatively reinforced by reducing anxiety, and positively reinforced by receiving a better grade. Whether it works by reducing something aversive, or by giving something desirable, *reinforcement is any consequence that strengthens behavior.*

Remember whining Billy? In that example, whose behavior was positively reinforced and whose was negatively reinforced? See inverted answer below.

Billy's whining was positively *reinforced, because Billy got something desirable—his father's attention. His dad's response to the whining (doing what Billy wanted) was* negatively *reinforced, because it got rid of Billy's annoying whining.*

Primary and Conditioned Reinforcers

Primary reinforcers—getting food when hungry or having a painful headache go away—are unlearned. They are innately satisfying. **Conditioned reinforcers,** also called *secondary reinforcers,* get their power through learned association with primary reinforcers. If a rat in a Skinner box learns that a light reliably signals that food is coming, the rat will work to turn on the light. The light has become a conditioned reinforcer associated with food. Our lives are filled with conditioned reinforcers—money, good grades, a pleasant tone of voice—each of which has been linked with more basic rewards. If money is a conditioned reinforcer—if people's desire for money is derived from their desire for food—then hunger should also make people more money-hungry, reasoned one European research team (Briers et al., 2006). Indeed, in their experiments, people were less likely to donate to charity when food deprived, and less likely to share money with fellow participants when in a room with hunger-arousing aromas.

Immediate and Delayed Reinforcers

Let's return to the imaginary shaping experiment in which you were conditioning a rat to press a bar. Before performing this "wanted" behavior, the hungry rat will engage in a sequence of "unwanted" behaviors—scratching, sniffing, and moving around. If you present food immediately after any one of these behaviors, the rat will likely repeat that rewarded behavior. But what if the rat presses the bar while you are distracted, and you delay giving the reinforcer? If the delay lasts longer than 30 seconds, the rat will not learn to press the bar. You will have reinforced other incidental behaviors—more sniffing and moving—that intervened after the bar press.

"Oh, not bad. The light comes on, I press the bar, they write me a check. How about you?"

Unlike rats, humans do respond to delayed reinforcers: the paycheck at the end of the week, the good grade at the end of the semester, the trophy at the end of the season. Indeed, to function effectively we must learn to delay gratification. In laboratory testing, some 4-year-olds show this ability. In choosing a candy, they prefer having a big reward tomorrow to munching on a small one right now. Learning to control our impulses in order to achieve more valued rewards is a big step toward maturity (Logue, 1998a,b). No wonder children who make such choices have tended to become socially competent and high-achieving adults (Mischel et al., 1989).

But to our detriment, small but immediate consequences (the enjoyment of watching late-night TV, for example) are sometimes more alluring than big but delayed consequences (feeling alert tomorrow). For many teens, the immediate gratification of risky, unprotected sex in passionate moments prevails over the delayed gratifications of safe sex or saved sex (Loewenstein & Furstenberg, 1991). And for

too many of us, the immediate rewards of today's gas-guzzling vehicles, air travel, and air conditioning have prevailed over the bigger future consequences of global climate change, rising seas, and extreme weather.

Reinforcement Schedules

18-3: How do different reinforcement schedules affect behavior?

So far, most of our examples have assumed **continuous reinforcement:** Reinforcing the desired response every time it occurs. Under such conditions, learning occurs rapidly, which makes continuous reinforcement preferable until a behavior is mastered. But extinction also occurs rapidly. When reinforcement stops—when we stop delivering food after the rat presses the bar—the behavior soon stops. If a normally dependable candy machine fails to deliver a chocolate bar twice in a row, we stop putting money into it (although a week later we may exhibit spontaneous recovery by trying again).

Real life rarely provides continuous reinforcement. Salespeople do not make a sale with every pitch, nor do anglers get a bite with every cast. But they persist because their efforts are occasionally rewarded. This persistence is typical with **partial (intermittent) reinforcement** schedules, in which responses are sometimes reinforced, sometimes not. Although initial learning is slower, intermittent reinforcement produces greater *resistance to extinction* than is found with continuous reinforcement. Imagine a pigeon that has learned to peck a key to obtain food. When the experimenter gradually phases out the delivery of food until it occurs only rarely and unpredictably, pigeons may peck 150,000 times without a reward (Skinner, 1953). Slot machines reward gamblers in much the same way—occasionally and unpredictably. And like pigeons, slot players keep trying, time and time again. With intermittent reinforcement, hope springs eternal.

Lesson for parents: Partial reinforcement also works with children. *Occasionally* giving in to children's tantrums for the sake of peace and quiet intermittently reinforces the tantrums. This is the very best procedure for making a behavior persist.

Skinner (1961) and his collaborators compared four schedules of partial reinforcement. Some are rigidly fixed, some unpredictably variable.

Fixed-ratio schedules reinforce behavior after a set number of responses. Just as coffee shops reward us with a free drink after every 10 purchased, laboratory animals may be reinforced on a fixed ratio of, say, one reinforcer for every 30 responses. Once conditioned, the animal will pause only briefly after a reinforcer and will then return to a high rate of responding (**FIGURE 18.3**).

primary reinforcer an innately reinforcing stimulus, such as one that satisfies a biological need.

conditioned reinforcer a stimulus that gains its reinforcing power through its association with a primary reinforcer; also known as a *secondary reinforcer.*

continuous reinforcement reinforcing the desired response every time it occurs.

partial (intermittent) reinforcement reinforcing a response only part of the time; results in slower acquisition of a response but much greater resistance to extinction than does continuous reinforcement.

fixed-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified number of responses.

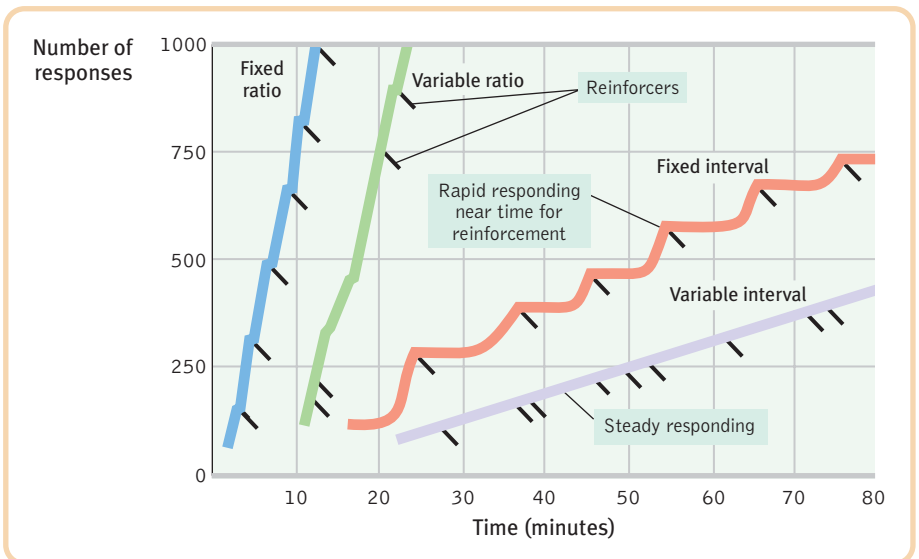


FIGURE 18.3 Intermittent reinforcement schedules Skinner's laboratory pigeons produced these response patterns to each of four reinforcement schedules. (Reinforcers are indicated by diagonal marks.) For people, as for pigeons, reinforcement linked to number of responses (a *ratio schedule*) produces a higher response rate than reinforcement linked to amount of time elapsed (an *interval schedule*). But the predictability of the reward also matters. An unpredictable (*variable*) schedule produces more consistent responding than does a predictable (*fixed*) schedule.

"The charm of fishing is that it is the pursuit of what is elusive but attainable, a perpetual series of occasions for hope."

—Scottish author John Buchan (1875–1940)

Door-to-door salespeople are reinforced by which schedule? People checking the oven every 2 minutes to see if the cookies are done are on which schedule? Frequent-flyer programs offering a free flight after every 25,000 travel miles are using which reinforcement schedule? See inverted answers below.

Door-to-door salespeople are reinforced on a variable-ratio schedule (after varying numbers of rings). Cookie checkers are reinforced on a fixed-interval schedule. Frequent-flyer programs use a fixed-ratio schedule.

Variable-ratio schedules provide reinforcers after an unpredictable number of responses. This is what slot-machine players and fly-casting anglers experience—unpredictable reinforcement—and what makes gambling and fly fishing so hard to extinguish even when both are getting nothing for something. Like the fixed-ratio schedule, the variable-ratio schedule produces high rates of responding, because reinforcers increase as the number of responses increases.

Fixed-interval schedules reinforce the first response after a fixed time period. Like people checking more frequently for the mail as the delivery time approaches, or checking to see if the Jell-O has set, pigeons on a fixed-interval schedule peck a key more frequently as the anticipated time for reward draws near, producing a choppy stop-start pattern (see Figure 18.3) rather than a steady rate of response.

Variable-interval schedules reinforce the first response after *varying* time intervals. Like the "You've got mail" that finally rewards persistence in rechecking for e-mail, variable-interval schedules tend to produce slow, steady responding. This makes sense, because there is no knowing when the waiting will be over (**TABLE 18.2**).

TABLE 18.2 Schedules of Reinforcement

	Fixed	Variable
Ratio	*Every so many:* reinforcement after every *nth* behavior, such as buy 10 coffees, get 1 free, or pay per product unit produced	*After an unpredictable number:* reinforcement after a random number of behaviors, as when playing slot machines or fly-casting
Interval	*Every so often:* reinforcement for behavior after a fixed time, such as Tuesday discount prices	*Unpredictably often:* reinforcement for behavior after a random amount of time, as in checking for texts

Animal behaviors differ, yet Skinner (1956) contended that the reinforcement principles of operant conditioning are universal. It matters little, he said, what response, what reinforcer, or what species you use. The effect of a given reinforcement schedule is pretty much the same: "Pigeon, rat, monkey, which is which? It doesn't matter. . . . Behavior shows astonishingly similar properties."

Punishment

18-4: How does punishment affect behavior?

Reinforcement increases a behavior; **punishment** does the opposite. A *punisher* is any consequence that *decreases* the frequency of a preceding behavior (see **TABLE 18.3**).

Swift and sure punishers can powerfully restrain unwanted behavior. The rat that is shocked after touching a forbidden object and the child who loses a treat after running into the street will learn not to repeat the behavior. Some punishments, though unintentional, are nevertheless quite effective: A dog that has learned to come running at the sound of an electric can opener will stop coming if its owner starts running the machine to attract the dog and banish it to the basement.

TABLE 18.3 Ways to Decrease Behavior

Type of Punisher	Description	Possible Examples
Positive punishment	Administer an aversive stimulus	Spanking; receiving a parking ticket
Negative punishment	Withdraw a desirable stimulus	Time-out from privileges (such as time with friends); revoked driver's license

variable-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response after an unpredictable number of responses.

fixed-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified time has elapsed.

variable-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response at unpredictable time intervals.

punishment an event that *decreases* the behavior it follows.

So, how should we interpret the punishment studies in relation to parenting practices? Many psychologists and supporters of nonviolent parenting note four drawbacks of physically punishing children (Gershoff, 2002; Marshall, 2002).

1. *Punished behavior is suppressed, not forgotten.* This suppression, though temporary, may (negatively) reinforce parents' punishing behavior. The child swears, the parent swats, the parent hears no more swearing and feels the punishment successfully stopped the behavior. No wonder spanking is a hit with so many U.S. parents of 3- and 4-year-olds—more than 9 in 10 of whom have acknowledged spanking their children (Kazdin & Benjet, 2003).
2. *Punishment teaches discrimination.* Was the punishment effective in putting an end to the swearing? Or did the child simply learn that it's not okay to swear around the house, but it is okay to swear elsewhere?
3. *Punishment can teach fear.* The child may generalize what has been learned, associating fear not only with the undesirable behavior but also with the person delivering the punishment or the place it occurred. Thus, children may learn to fear a punishing teacher and try to avoid school. For such reasons, most European countries have banned hitting children in schools and child-care institutions (Leach, 1993, 1994). Eleven countries, including those in Scandinavia, have further outlawed hitting by parents, giving children the same legal protection given to spouses (EPOCH, 2000).
4. *Physical punishment may increase aggressiveness by modeling aggression as a way to cope with problems.* Many aggressive delinquents and abusive parents come from abusive families (Straus & Gelles, 1980; Straus et al., 1997). Some researchers dispute this drawback. They agree that spanked children are at increased risk for aggression. Likewise, they say, people who have undergone psychotherapy are more likely to suffer depression—because they had preexisting problems that triggered the treatments (Larzelere, 2000, 2004). Which is the chicken and which is the egg? The correlations don't hand us an answer.

In operant conditioning, discrimination *occurs when an organism learns that certain responses, but not others, will be reinforced.*

In operant conditioning, generalization *occurs when an organism's response to similar stimuli is also reinforced.*

If one adjusts for preexisting antisocial behavior, then an occasional single swat or two to misbehaving 2- to 6-year-olds looks more effective (Baumrind et al., 2002; Larzelere & Kuhn, 2005). That is especially so if the swat is used only as a backup when milder disciplinary tactics (such as a *time-out,* removing them from reinforcing surroundings) fail, and when the swat is combined with a generous dose of reasoning and reinforcing. Remember: *Punishment tells you what not to do; reinforcement tells you what to do.* This dual approach can be effective. When children with self-destructive behaviors bite themselves or bang their heads, they may be mildly punished (say, with a squirt of water in the face), but they may also be rewarded (with positive attention and food) when they behave well. In high school classrooms, teachers can give feedback on papers by saying, "No, but try this . . ." and "Yes, that's it!" Such responses reduce unwanted behavior while reinforcing more desirable alternatives.

Parents of delinquent youth are often unaware of how to achieve desirable behaviors without screaming or hitting their children (Patterson et al., 1982, 2005). Training programs can help reframe contingencies from dire threats to positive incentives—turning "You clean up your room this minute or no dinner!" to "You're welcome at the dinner table after you get your room cleaned up." When you stop to think about it, many threats of punishment are just as forceful, and perhaps more effective, if rephrased positively. Thus, "If you don't get your homework done, there'll be no car" would better be phrased as . . .

What punishment often teaches, said Skinner, is how to avoid it. Most psychologists now favor an emphasis on reinforcement: Catch people behaving well and affirm them for it.

David Strickler/The Image Works

Children see, children do? Children who often experience physical punishment tend to display more aggression.

cognitive map a mental representation of the layout of one's environment. For example, after exploring a maze, rats act as if they have learned a cognitive map of it.

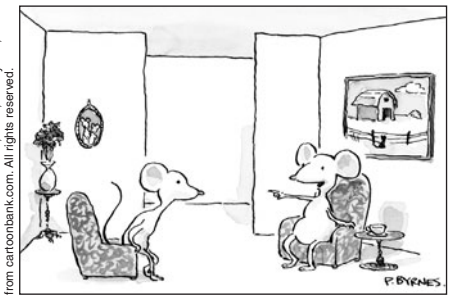
latent learning learning that occurs but is not apparent until there is an incentive to demonstrate it.

Extending Skinner's Understanding

18-5: Do cognitive processes and biological constraints affect operant conditioning?

Skinner granted the existence of private thought processes and the biological underpinnings of behavior. Nevertheless, many psychologists criticized him for discounting the importance of these influences.

Cognition and Operant Conditioning



"Bathroom? Sure, it's just down the hall to the left, jog right, left, another left, straight past two more lefts, then right, and it's at the end of the third corridor on your right."

A mere eight days before dying of leukemia, Skinner (1990) stood before the American Psychological Association convention for one final critique of "cognitive science," which he viewed as a throwback to early twentieth-century introspectionism. Skinner died resisting the growing belief that cognitive processes—thoughts, perceptions, expectations—have a necessary place in the science of psychology and even in our understanding of conditioning. (He regarded thoughts and emotions as behaviors that follow the same laws as other behaviors.) Yet we have seen several hints that cognitive processes might be at work in operant learning. For example, animals on a fixed-interval reinforcement schedule respond more and more frequently as the time approaches when a response will produce a reinforcer. Although a strict behaviorist would object to talk of "expectations," the animals behave as if they expected that repeating the response would soon produce the reward.

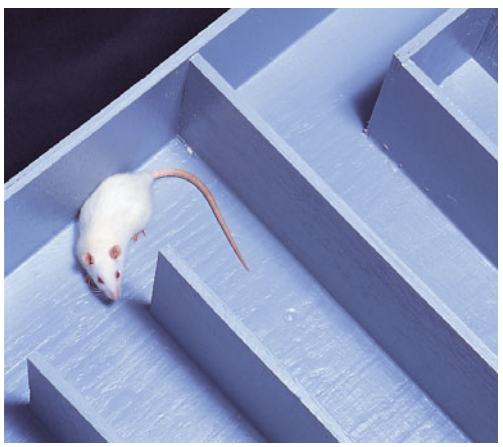
Evidence of cognitive processes has also come from studying rats in mazes. Rats exploring a maze, with no obvious reward, are like people sightseeing in a new town. They seem to develop a **cognitive map,** a mental representation of the maze. When an experimenter then places food in the maze's goal box, the rats very soon run the maze as quickly as rats that have been reinforced with food for running the maze.

During their explorations, the rats have seemingly experienced **latent learning**—learning that becomes apparent only when there is some incentive to demonstrate it. Children, too, may learn from watching a parent but demonstrate the learning only much later, as needed. The point to remember: *There is more to learning than associating a response with a consequence; there is also cognition.* Psychologists have presented some striking evidence of animals' cognitive abilities in solving problems and in using aspects of language.

Biological Predispositions

As with classical conditioning, an animal's natural predispositions constrain its capacity for operant conditioning. Using food as a reinforcer, you can easily condition a hamster to dig or to rear up because these actions are among the animal's natural food-searching behaviors. But you won't be so successful if you use food as a reinforcer to shape other hamster behaviors, such as face washing, that aren't normally associated with food or hunger (Shettleworth, 1973). Similarly, you could easily teach pigeons to flap their wings to avoid being shocked, and to peck to obtain food, because fleeing with their wings and eating with their beaks are natural pigeon behaviors. However, they would have a hard time learning to peck to avoid a shock, or to flap their wings to obtain food (Foree & LoLordo, 1973). The principle: *Biological constraints predispose organisms to learn associations that are naturally adaptive.*

After witnessing the power of operant learning, Skinner's students Keller Breland and Marian Breland (1961; Bailey & Gillaspy, 2005) began training dogs, cats, chickens, parakeets, turkeys, pigs, ducks, and hamsters, and they eventually left



Will and Deni McIntyre/Photo Researchers

Latent learning Animals, like people, can learn from experience, with or without reinforcement. After exploring a maze for 10 days, rats received a food reward at the end of the maze. They quickly demonstrated their prior learning of the maze—by immediately completing it as quickly as (and even faster than) rats that had been reinforced each time they ran the maze. (From Tolman & Honzik, 1930.)

Saola/Gamma Liaison/Getty Images

Natural athletes Animals can most easily learn and retain behaviors that draw on their biological predispositions, such as cats' inborn tendency to leap high and land on their feet.

their graduate studies to form an animal training company. Over the ensuing 47 years they trained more than 15,000 animals from 140 species for movies, traveling shows, corporations, amusement parks, and the government. They also trained animal trainers, including Sea World's first director of training.

At first, the Brelands presumed that operant principles would work on almost any response an animal could make. But along the way, they confronted the constraints of biological predispositions. In one act, pigs trained to pick up large wooden "dollars" and deposit them in a piggy bank began to drift back to their natural ways. They would drop the coin, push it with their snouts as pigs are prone to do, pick it up again, and then repeat the sequence—delaying their food reinforcer. This *instinctive drift* occurred as the animals reverted to their biologically predisposed patterns. Operant training works best when it builds on an animal's natural behavior tendencies.

For more information on animal behavior, see books by (I am not making this up) Robin Fox and Lionel Tiger.

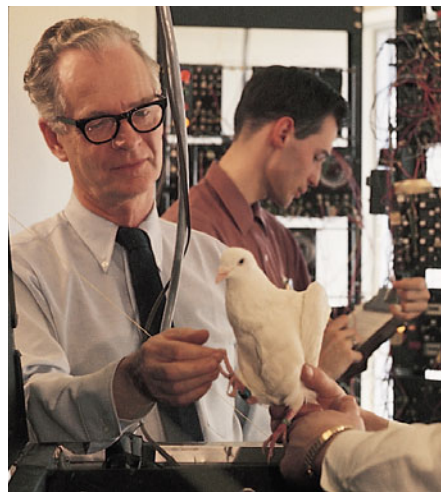
"Never try to teach a pig to sing. It wastes your time and annoys the pig."
—Mark Twain (1835–1910)

Skinner's Legacy

B. F. Skinner was one of the most controversial intellectual figures of the late twentieth century. He stirred a hornet's nest with his outspoken beliefs. He repeatedly insisted that external influences (not internal thoughts and feelings) shape behavior. And he urged people to use operant principles to influence others' behavior at school, work, and home. Knowing that behavior is shaped by its results, he said we should use rewards to evoke more desirable behavior.

Skinner's critics objected, saying that he dehumanized people by neglecting their personal freedom and by seeking to control their actions. Skinner's reply: External consequences already haphazardly control people's behavior. Why not administer those consequences toward human betterment? Wouldn't reinforcers be more humane than the punishments used in homes, schools, and prisons? And if it is humbling to think that our history has shaped us, doesn't this very idea also give us hope that we can shape our future?

B. F. Skinner "I am sometimes asked, 'Do you think of yourself as you think of the organisms you study?' The answer is yes. So far as I know, my behavior at any given moment has been nothing more than the product of my genetic endowment, my personal history, and the current setting" (1983).



Falk/Photo Researchers, Inc.

Applications of Operant Conditioning

18-6: How might operant conditioning principles be applied at school, in sports, at work, and at home?

Psychologists are applying operant conditioning principles to help people with a variety of challenges, from moderating high blood pressure to gaining social skills. Reinforcement technologies are also at work in schools, sports, workplaces, and homes (Flora, 2004).

Computer-assisted learning Computers have helped realize Skinner's goal of individually paced instruction with immediate feedback.

At School

A generation ago, Skinner and others worked toward a day when teaching machines and textbooks would shape learning in small steps, immediately reinforcing correct responses. Such machines and texts, they said, would revolutionize education and free teachers to focus on each student's special needs.

Stand in Skinner's shoes for a moment and imagine two math teachers, each with a class of students ranging from whiz kids to slow learners. Teacher A gives the whole class the same lesson, knowing that the bright kids will breeze through the math concepts, and the slower ones will be frustrated and fail. With so many different children, how could one teacher guide them individually? Teacher B, faced with a similar class, paces the material according to each student's rate of learning and provides prompt feedback, with positive reinforcement, to both the slow and the fast learners. Thinking as Skinner did, how might you achieve the individualized instruction of Teacher B?

Computers were Skinner's final hope. "Good instruction demands two things," he said. "Students must be told immediately whether what they do is right or wrong and, when right, they must be directed to the step to be taken next." Thus, the computer could be Teacher B—pacing math drills to the student's rate of learning, quizzing the student to find gaps in understanding, giving immediate feedback, and keeping flawless records. To the end of his life, Skinner (1986, 1988, 1989) believed his ideal was achievable. Although the predicted education revolution has not occurred, today's interactive student software, Web-based learning, and online testing bring us closer than ever before to achieving his ideal.

In Sports

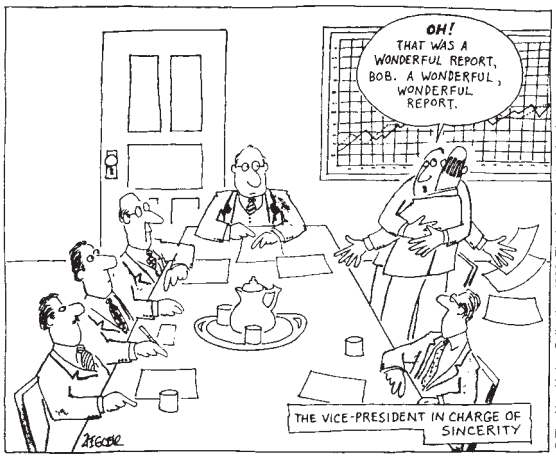
Reinforcement principles can enhance athletic performance as well. Again, the key is to shape behavior, by first reinforcing small successes and then gradually increasing the challenge. Thomas Simek and Richard O'Brien (1981, 1988) applied these principles to teaching golf and baseball by starting with easily reinforced responses. Golf students learn putting by starting with very short putts. As they build mastery, they eventually step back farther and farther. Likewise, novice batters begin with half swings at an oversized ball pitched from 10 feet away, giving them the immediate pleasure of smacking the ball. As the hitters' confidence builds with their success and they achieve mastery at each level, the pitcher gradually moves back—to 15, then 22, 30, and 40.5 feet—and eventually introduces a standard baseball. Compared with children taught by conventional methods, those trained by this behavioral method show, in both testing and game situations, faster skill improvement.

At Work

Skinner's ideas have also shown up in the workplace. Knowing that reinforcers influence productivity, many organizations have invited employees to share the risks and rewards of company ownership. Others focus on reinforcing a job well done. Rewards are most likely to increase productivity if the desired performance has been well-defined and is achievable. The message for managers? *Reward specific, achievable behaviors, not vaguely defined "merit."* Even criticism triggers the least resentment and the greatest performance boost when specific and considerate (Baron, 1988).

Operant conditioning also reminds us that reinforcement should be *immediate*. IBM legend Thomas Watson understood. When he observed an achievement, he wrote the employee a check on the spot (Peters & Waterman, 1982). But rewards need not be material, or lavish. An effective manager may simply walk the floor and sincerely affirm people for good work, or write notes of appreciation for a completed project. As Skinner said, "How much richer would the whole world be if the reinforcers in daily life were more effectively contingent on productive work?"

At Home



As we have seen, parents can apply operant conditioning practices. Parent-training researchers remind us that parents who say "Get ready for bed" but cave in to protests or defiance reinforce whining and arguing (Wierson & Forehand, 1994). Exasperated, they may then yell or gesture menacingly. When the child, now frightened, obeys, that in turn reinforces the parents' angry behavior. Over time, a destructive parent-child relationship develops.

To disrupt this cycle, parents should remember the basic rule of shaping: *Notice people doing something right and affirm them for it.* Give children attention and other reinforcers when they are behaving *well* (Wierson & Forehand, 1994). Target a specific behavior, reward it, and watch it increase. When children misbehave or are defiant, don't yell at them or hit them. Simply explain the misbehavior and give them a time-out.

Finally, we can use operant conditioning in our own lives (see Close-Up: Training Our Partners). To reinforce your own desired behaviors and extinguish the undesired ones, psychologists suggest taking these steps:

1. *State your goal*—to stop smoking, eat less, or study or exercise more—in measurable terms, and announce it. You might, for example, aim to boost your study time by an hour a day and share that goal with some close friends.
2. *Monitor how often you engage in your desired behavior.* You might log your current study time, noting under what conditions you do and don't study. (When I began writing textbooks, I logged how I spent my time each day and was amazed to discover how much time I was wasting.)
3. *Reinforce the desired behavior.* To increase your study time, give yourself a reward (a snack or some activity you enjoy) only after you finish your extra hour of study. Agree with your friends that you will join them for weekend activities only if you have met your realistic weekly studying goal.
4. *Reduce the rewards gradually.* As your new behaviors become more habitual, give yourself a mental pat on the back instead of a cookie.

"I wrote another five hundred words. Can I have another cookie?"

Close-Up:

Training Our Partners

By Amy Sutherland

For a book I was writing about a school for exotic animal trainers, I started commuting from Maine to California, where I spent my days watching students do the seemingly impossible: teaching hyenas to pirouette on command, cougars to offer their paws for a nail clipping, and baboons to skateboard.

I listened, rapt, as professional trainers explained how they taught dolphins to flip and elephants to paint. Eventually it hit me that the same techniques might work on that stubborn but lovable species, the American husband.

The central lesson I learned from exotic animal trainers is that I should reward behavior I like and ignore behavior I don't. After all, you don't get a sea lion to balance a ball on the end of its nose by nagging. The same goes for the American husband.

Back in Maine, I began thanking Scott if he threw one dirty shirt into the hamper. If he threw in two, I'd kiss him. Meanwhile, I would step over any soiled clothes on the floor without one sharp word, though I did sometimes kick them under the bed. But as he basked in my appreciation, the piles became smaller.

I was using what trainers call "approximations," rewarding the small steps toward learning a whole new behavior. . . . Once I started thinking this way, I couldn't stop. At the school in California, I'd be scribbling notes on how to walk an emu or have a wolf accept you as a pack member, but I'd be thinking, "I can't wait to try this on Scott. . . ."

After two years of exotic animal training, my marriage is far smoother, my husband much easier to love. I used to take his faults personally; his dirty clothes on the floor were an affront, a symbol of how he didn't care enough about me. But thinking of my husband as an exotic species gave me the distance I needed to consider our differences more objectively.

Excerpted with permission from Sutherland, A., (2006, June 25). What Shamu taught me about a happy marriage, *New York Times.*

Contrasting Classical and Operant Conditioning

"O! This learning, what a thing it is."
—William Shakespeare, *The Taming of the Shrew,* 1597

Both classical and operant conditioning are forms of associative learning, and both involve acquisition, extinction, spontaneous recovery, generalization, and discrimination. The similarities are sufficient to make some researchers wonder if a single stimulus-response learning process might explain them both (Donahoe & Vegas, 2004). Their procedural difference is this: Through classical (Pavlovian) conditioning, an organism associates different stimuli that it does not control and responds automatically (respondent behaviors) (**TABLE 18.4**). Through operant conditioning, an organism associates its operant behaviors—those that act on its environment to produce rewarding or punishing stimuli—with their consequences. Cognitive processes and biological predispositions influence both classical and operant conditioning.

TABLE 18.4 Comparison of Classical and Operant Conditioning

	Classical Conditioning	Operant Conditioning
Basic idea	Organism learns associations between events it doesn't control.	Organism learns associations between its behavior and resulting events.
Response	Involuntary, automatic.	Voluntary, operates on environment.
Acquisition	Associating events; NS is paired with US and becomes CS.	Associating response with a consequence (reinforcer or punisher).
Extinction	CR decreases when CS is repeatedly presented alone.	Responding decreases when reinforcement stops.
Spontaneous recovery	The reappearance, after a rest period, of an extinguished CR.	The reappearance, after a rest period, of an extinguished response.
Generalization	The tendency to respond to stimuli similar to the CS.	Organism's response to similar stimuli is also reinforced.
Discrimination	The learned ability to distinguish between a CS and other stimuli that do not signal a US.	Organism learns that certain responses, but not others, will be reinforced.
Cognitive processes	Organisms develop expectation that CS signals the arrival of US.	Organisms develop expectation that a response will be reinforced or punished; they also exhibit latent learning, without reinforcement.
Biological predispositions	Natural predispositions constrain what stimuli and responses can easily be associated.	Organisms best learn behaviors similar to their natural behaviors; unnatural behaviors instinctively drift back toward natural ones.

REVIEWING

Operant Conditioning

Module Review

18-1: What is operant conditioning, and how does it differ from classical conditioning? In *operant conditioning*, an organism learns associations between its own behavior and resulting events; this form of *associative learning* involves *operant behavior* (behavior that operates on the environment, producing consequences). In classical conditioning, the organism forms associations between stimuli—behaviors it does not control; this *learning* involves *respondent behavior* (automatic responses to some stimulus).

Expanding on Thorndike's *law of effect*, Skinner and others found that the behavior of rats or pigeons placed in an *operant chamber* (Skinner box) can be *shaped* by reinforcing closer and closer approximations of the desired behavior.

18-2: What are the basic types of reinforcers? A *reinforcer* is anything that strengthens the behavior it follows. *Positive reinforcement* adds something desirable to increase the frequency of a behavior. *Negative reinforcement* removes something undesirable to increase the frequency of a behavior. *Primary reinforcers* (receiving food when hungry, or having a headache go away) are innately satisfying—no learning is required. *Conditioned* (or secondary) *reinforcers* (such as cash) are satisfying because we have learned to associate them with more basic rewards (such as the food or medicine we buy with them). Immediate reinforcers (watching late-night TV) offer immediate payback; delayed reinforcers (feeling rested tomorrow) require the ability to delay gratification.

18-3: How do different reinforcement schedules affect behavior? In *continuous reinforcement* (reinforcing desired responses every time they occur), learning is rapid, but so is extinction if rewards cease. In *partial (intermittent) reinforcement,* initial learning is slower, but resistance to extinction is greater. *Fixed-ratio schedules* offer rewards after a set number of responses; *variable-ratio schedules,* after an unpredictable number. *Fixed-interval schedules* offer rewards after set time periods; *variable-interval schedules,* after unpredictable time periods.

18-4: How does punishment affect behavior? *Punishment* attempts to decrease the frequency of a behavior (a child's disobedience) by administering an undesirable consequence (spanking) or withdrawing something desirable (taking away a favorite toy). Undesirable side effects of physical punishment can include suppressing rather than changing unwanted behaviors, encouraging discrimination (the undesirable behavior appears when the punisher is not present), generalizing fear, and teaching aggression.

18-5: Do cognitive processes and biological constraints affect operant conditioning? Skinner underestimated the limits that cognitive and biological constraints place on conditioning. Research on *cognitive maps* and *latent learning* demonstrate the importance of cognitive processes in learning. And when training attempts to override biological constraints, instinctive drift occurs as animals revert to predisposed patterns.

18-6: How might operant conditioning principles be applied at school, in sports, at work, and at home? In school, teachers can use shaping techniques to guide students' behaviors, and they can use interactive software and Web sites to provide immediate feedback. In sports, coaches can build players' skills and self-confidence by rewarding small improvements. At work, managers can boost productivity and morale by rewarding well-defined and achievable behaviors. At home, parents can reward desirable behaviors, but not undesirable ones. We can shape our own behaviors by stating our goals, monitoring the frequency of desired behaviors, reinforcing desired behaviors, and gradually reducing incentives as the desired behaviors become habitual.

Rehearse It!

1. Salivating in response to a tone paired with food is a (an) _____; pressing a bar to obtain food is a (an) _____.
   a. primary reinforcer; conditioned reinforcer
   b. conditioned reinforcer; primary reinforcer
   c. operant behavior; respondent behavior
   d. respondent behavior; operant behavior

2. Thorndike's law of effect became the basis for operant conditioning and the "behavioral technology" developed by
   a. Ivan Pavlov.
   b. John Garcia.
   c. B. F. Skinner.
   d. John B. Watson.

3. One way to change behavior is to reward natural behaviors in small steps, as they get closer and closer to the desired behavior. This process is called
   a. shaping.
   b. punishment.
   c. taste aversion.
   d. classical conditioning.

4. Your dog is barking so loudly that it's making your ears ring. You clap your hands, the dog stops barking, your ears stop ringing, and you think to yourself, "I'll have to do that when he barks again." The end of the barking was for you a
   a. positive reinforcer.
   b. negative reinforcer.
   c. punishment.
   d. primary reinforcer.

5. The partial reinforcement schedule that reinforces a response at unpredictable times is a
   a. fixed-interval schedule.
   b. variable-interval schedule.
   c. fixed-ratio schedule.
   d. variable-ratio schedule.

6. A medieval proverb notes that "a burnt child dreads the fire." In operant conditioning, the burning would be an example of a
   a. primary reinforcer.
   b. negative reinforcer.
   c. punisher.
   d. positive reinforcer.

7. We now know that cognitive processes (thoughts, perceptions, and expectations) play an important role in learning. Evidence comes from studies in which rats
   a. spontaneously recover previously learned behavior.
   b. develop cognitive maps.
   c. exhibit respondent behavior.
   d. generalize responses.

8. Rats carried passively through a maze and given no reward later ran the maze as well as rats that had received food rewards for running the maze. The rats that had learned without reinforcement demonstrate
   a. modeling.
   b. biological predisposition.
   c. shaping.
   d. latent learning.

Answers: 1. d, 2. c, 3. a, 4. b, 5. b, 6. c, 7. b, 8. d.

Terms and Concepts to Remember

learning, p. 249
associative learning, p.249
respondent behavior, p. 249
operant conditioning, p. 249
operant behavior, p. 249
law of effect, p. 249
operant chamber, p. 250
shaping, p. 250
reinforcer, p. 251
positive reinforcement, p. 251
negative reinforcement, p. 251
primary reinforcer, p. 252
conditioned reinforcer, p. 252
continuous reinforcement, p. 253
partial (intermittent) reinforcement, p. 253
fixed-ratio schedule, p. 253
variable-ratio schedule, p. 254
fixed-interval schedule, p. 254
variable-interval schedule, p. 254
punishment, p. 254
cognitive map, p. 256
latent learning, p. 256

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Ethan constantly misbehaves at preschool even though his teacher scolds him several times each day. Why does his misbehavior continue, and what can his teacher do to stop it?
2. How could your psychology instructor use negative reinforcement to encourage your attentive behavior during class?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 19

Learning by Observation

19-1: What is observational learning, and how is it enabled by mirror neurons?

From drooling dogs, running rats, and pecking pigeons we have learned much about the basic processes of **learning.** But conditioning principles don't tell us the whole story. Higher animals, especially humans, can learn without direct experience, through **observational learning,** by observing and imitating others. A child who sees his sister burn her fingers on a hot stove learns not to touch it. And a monkey watching another selecting certain pictures to gain treats learns to imitate that behavior (FIGURE 19.1). We learn all kinds of specific behaviors by observing and imitating models, a process called **modeling.** Lord Chesterfield (1694–1773) had the idea: "We are, in truth, more than half what we are by imitation."

Imitation occurs in various animal species—monkey see, monkey do—but is most striking in humans. Our catch-phrases, hem lengths, ceremonies, foods, traditions, vices, and fads all spread by one person copying another. Even as 2½-year-olds, when many of our mental abilities were near those of chimpanzees, we considerably surpassed chimps at social tasks such as imitating another's solution to a problem (Hermann et al., 2007).

Mirrors in the Brain

On a 1991 hot summer day in Parma, Italy, a lab monkey awaited its researchers' return from lunch. The researchers had implanted wires next to its motor cortex, in a frontal lobe brain region that enabled the monkey to plan and enact movements. When the monkey moved a peanut into its mouth, for example, the monitoring device would buzz. That day, as one of the researchers reentered the lab, ice cream cone in hand, the monkey stared at him. As the student raised the cone to lick it, the monkey's monitor again buzzed—as if the motionless monkey had itself moved (Blakeslee, 2006; Iacoboni, 2008).

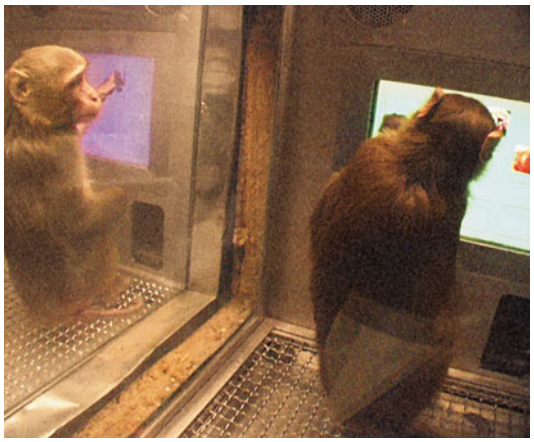
Having earlier observed the same weird result when the monkey watched humans or other monkeys move peanuts to their mouths, the flabbergasted researchers, led by Giacomo Rizzolatti (2002, 2006), eventually surmised that they had stumbled onto a previously unknown type of neuron: **mirror neurons,** whose activity provides a neural basis for imitation and observational learning. When a monkey grasps, holds, or tears something, these neurons fire. And they likewise fire when the monkey observes another doing so. When one monkey sees, these neurons mirror what another monkey does.

learning a relatively permanent change in an organism's behavior due to experience.

observational learning learning by observing others.

modeling the process of observing and imitating a specific behavior.

mirror neurons frontal lobe neurons that fire when performing certain actions or when observing another doing so. The brain's mirroring of another's action may enable imitation and empathy.



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Monkey A's screen Monkey B's screen

FIGURE 19.1 Cognitive imitation When Monkey A (below left) sees Monkey B touch four pictures on a display screen in a certain order to gain a banana, Monkey A learns to imitate that order, even when shown a different configuration (Subiaul et al., 2004).

"Children need models more than they need critics."

—Joseph Joubert, *Pensées,* 1842

It's not just monkey business. Imitation shapes even very young humans' behavior. Shortly after birth, a baby may imitate an adult who sticks out his tongue. By 8 to 16 months, infants imitate various novel gestures (Jones, 2007). By age 12 months, they begin looking where an adult is looking (Brooks & Meltzoff, 2005). And by age 14 months (**FIGURE 19.2**), children imitate acts modeled on TV (Meltzoff, 1988; Meltzoff & Moore, 1989, 1997). Children see, children do.

PET scans of different brain areas reveal that humans, like monkeys, have a mirror neuron system that supports empathy and imitation (Iacoboni, 2008). As we observe another's action, our brain generates an inner simulation, enabling us to experience the other's experience within ourselves. Mirror neurons help give rise to children's empathy and to their ability to infer another's mental state, an ability called *theory of mind*. People with autism display reduced imitative yawning and mirror neuron activity—"broken mirrors," some have said (Ramachandran & Oberman, 2006; Senju et al., 2007; Williams et al., 2006).

For most of us, however, our mirror neurons make emotions contagious. We grasp others' states of mind—often feeling what they feel—by mental simulation. We find it harder to frown when viewing a smile than when viewing a frown (Dimberg et al., 2000, 2002). We find ourselves yawning after observing another's yawn, laughing when others laugh. When watching a film of a scorpion crawling up someone's leg, we tighten up; observing a passionate kiss, we may notice our own lips puckering. Seeing a loved one's pain, our face mirrors their emotion. As **FIGURE 19.3** shows, so does our brain. In this fMRI scan, the pain imagined by an empathic romantic partner has triggered some of the same brain activity experienced by the loved one actually having the pain (Singer et al., 2004). Even fiction reading may trigger such activity, as we mentally simulate the experiences described (Mar & Oatley, 2008). The bottom line: *Our brain's mirror neurons underlie our intensely social nature.*

Meltzoff, A. N. (1988). Imitation of televised models by infants. *Child Development, 59,* 1221–1229. Photos courtesy of A. N. Meltzoff and M. Hanuk.

FIGURE 19.2 Learning from observation This 14-month-old boy in Andrew Meltzoff's laboratory is imitating behavior he has seen on TV. In the top photo the infant leans forward and carefully watches the adult pull apart a toy. In the middle photo he has been given the toy. In the bottom photo he pulls the toy apart, imitating what he has seen the adult do.

Bandura's Experiments

Picture this scene from a famous experiment by Albert Bandura, the pioneering researcher of observational learning (Bandura et al., 1961). A preschool child works on a drawing. An adult in another part of the room is building with Tinkertoys. As the child watches, the adult gets up and for nearly 10 minutes pounds, kicks, and throws around the room a large inflated Bobo doll, yelling, "Sock him in the nose. . . . Hit him down. . . . Kick him."

The child is then taken to another room filled with appealing toys. Soon the experimenter returns and tells the child she has decided to save these good toys "for the other children." She takes the now-frustrated child to a third adjacent room containing a few toys, including a Bobo doll. Left alone, what does the child do?

Compared with children not exposed to the adult model, those who viewed the model's actions were much more likely to lash out at the doll. Apparently, observing

prosocial behavior positive, constructive, helpful behavior. The opposite of antisocial behavior.

Pain

Empathy

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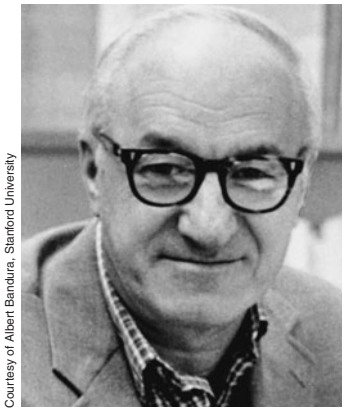
FIGURE 19.3 Experienced and imagined pain in the brain Brain activity related to actual pain (left) is mirrored in the brain of an observing loved one (right). Empathy in the brain shows up in emotional brain areas, but not in the somatosensory cortex, which receives the physical pain input.

the aggressive outburst lowered their inhibitions. But something more was also at work, for the children imitated the very acts they had observed and used the very words they had heard (**FIGURE 19.4**).

What determines whether we will imitate a model? Bandura believes part of the answer is reinforcements and punishments—those received by the model as well as by the imitator. By watching, we learn to anticipate a behavior's consequences in situations like those we are observing. We are especially likely to imitate people we perceive as similar to ourselves, as successful, or as admirable.



Courtesy of Albert Bandura, Stanford University

Albert Bandura "The Bobo doll follows me wherever I go. The photographs are published in every introductory psychology text and virtually every undergraduate takes introductory psychology. I recently checked into a Washington hotel. The clerk at the desk asked, 'Aren't you the psychologist who did the Bobo doll experiment?' I answered, 'I am afraid that will be my legacy.' He replied, 'That deserves an upgrade. I will put you in a suite in the quiet part of the hotel'" (2005).

Courtesy of Albert Bandura, Stanford University

FIGURE 19.4 The famous Bobo doll experiment Notice how the children's actions directly imitate the adult's.

Applications of Observational Learning

The big news from Bandura's studies is that we look and we learn. Models—in one's family or neighborhood, or on TV—may have effects, good or bad. Many business organizations effectively use *behavior modeling* to train communications, sales, and customer service skills (Taylor et al., 2005). Trainees gain skills faster when they not only are told the needed skills but also are able to observe the skills being modeled effectively by experienced workers (or actors simulating them).

Prosocial Observational Learning

19-2: What is the impact of prosocial modeling and of antisocial modeling?

The good news is that **prosocial** (positive, helpful) models can have prosocial effects. To encourage children to read, read to them and surround them with books and people who read. To increase the odds that your children will practice your religion, worship and attend religious activities with them. People who exemplify nonviolent, helpful behavior can prompt similar behavior in others. India's Mahatma Gandhi and America's Martin Luther King, Jr., both drew on the power of modeling, making nonviolent action a powerful force for social change in both countries. Parents are also powerful models. European Christians who risked their lives to rescue Jews from the Nazis usually had a close relationship with at least one parent who modeled a strong moral or humanitarian concern; this was also true for U.S. civil rights activists in the 1960s (London, 1970; Oliner & Oliner, 1988). The observational learning of morality begins early. Socially responsive toddlers who readily imitate their parents tend to become preschoolers with a strong internalized conscience (Forman et al., 2004).

A model grandma This boy is learning to cook by observing his grandmother. As the sixteenth-century proverb states, "Example is better than precept."

Bob Daemmrich/The Image Works

Models are most effective when their actions and words are consistent. Sometimes, however, models say one thing and do another. Many parents seem to operate according to the principle "Do as I *say,* not as I do." Experiments have suggested that children learn to do both (Rice & Grusec, 1975; Rushton, 1975). Exposed to a hypocrite, they tend to imitate the hypocrisy by doing what the model did and saying what the model said.

Antisocial Observational Learning

The bad news is that observational learning may also have *antisocial effects*. This helps us understand why abusive parents might have aggressive children, and why many men who beat their wives had wife-battering fathers (Stith et al., 2000). Critics note that being aggressive could be passed along by parents' genes. But with monkeys we know it can be environmental. In study after study, young monkeys separated from their mothers and subjected to high levels of aggression have grown up to be aggressive themselves (Chamove, 1980). The lessons we learn as children are not easily unlearned as adults, and they are sometimes visited on future generations.

"The problem with television is that the people must sit and keep their eyes glued to a screen: The average American family hasn't time for it. Therefore the showmen are convinced that . . . television will never be a serious competitor of [radio] broadcasting."

—*New York Times,* 1939

Television is a powerful source of observational learning. While watching TV, children may "learn" that bullying is an effective way to control others, that free and easy sex brings pleasure without later misery or disease, or that men should be tough and women gentle. And they have ample time to learn such lessons. During their first 18 years, most children in developed countries spend more time watching TV than they spend in school. In the United States, where 9 in 10 teens watch TV daily, someone who lives to age 75 will have spent 9 years staring at the tube (Gallup, 2002; Kubey & Csikszentmihalyi, 2002). With more than 1 billion TV sets playing in homes worldwide, CNN reaching 150 countries, and MTV broadcasting in 17 languages, television has created a global pop culture (Gunderson, 2001; Lippman, 1992).

TV viewers are learning about life from a rather peculiar storyteller, one that reflects the culture's mythology but not its reality. During the late twentieth century, the average child viewed some 8000 TV murders and 100,000 other acts of violence before finishing elementary school (Huston et al., 1992). If we include cable programming and video rentals, the violence numbers escalate. An analysis of more than 3000 network and cable programs aired in the 1996–1997 season revealed that nearly 6 in 10 featured violence, that 74 percent of the violence went unpunished, that 58 percent did not show the victims' pain, that nearly half the incidents involved "justified" violence, and that nearly half involved an attractive perpetrator. These conditions define the recipe for the *violence-viewing effect* described in many studies (Donnerstein, 1998).

TV's greatest effect may stem from what it displaces. Children and adults who spend 4 hours a day watching TV spend 4 fewer hours in active pursuits—talking, studying, playing, reading, or socializing with friends. What would you have done with your extra time if you had never watched TV, and how might you therefore be different?

How much are we affected by repeated exposure to violent programs? Was the judge who in 1993 tried two British 10-year-olds for murdering a 2-year-old right to suspect that the pair had been influenced by "violent video films"? Were the American media right to think that the teen assassins who killed 13 of their Columbine High School classmates had been influenced by repeated exposure to *Natural Born Killers* and first-person shooter games such as *Doom?* To understand whether violence viewing leads to violent behavior, researchers have done some 600 correlational and experimental studies (Anderson & Gentile, 2008; Comstock, 2008; Murray, 2008).

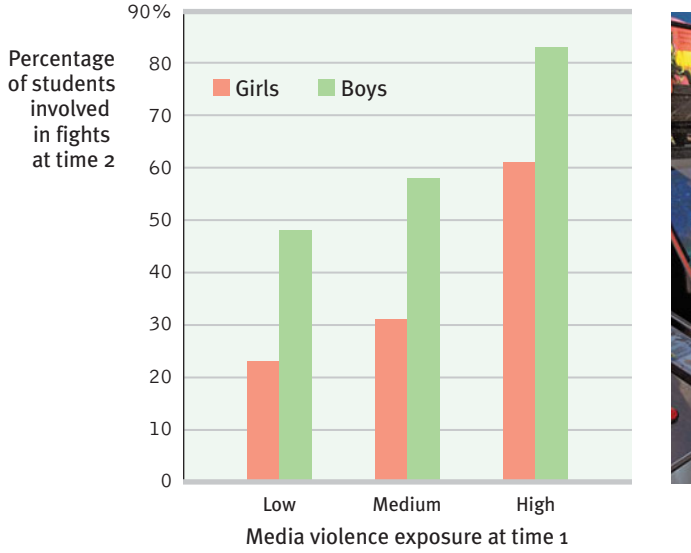
Correlational studies do support this link:

- In the United States and Canada, homicide rates doubled between 1957 and 1974, just when TV was introduced and spreading. Moreover, census regions with later dates for TV service also had homicide rates that jumped later.
- White South Africans were first introduced to TV in 1975. A similar near-doubling of the homicide rate began after 1975 (Centerwall, 1989).
- Elementary schoolchildren with heavy exposure to media violence (via TV, videos, and video games) also tend to get into more fights (**FIGURE 19.5**).

"Thirty seconds worth of glorification of a soap bar sells soap. Twenty-five minutes worth of glorification of violence sells violence."

—U.S. Senator Paul Simon, Remarks to the Communitarian Network, 1993

But remember: Correlation does not imply causation. This is one reason why some researchers believe these studies do not prove that viewing violence causes aggression



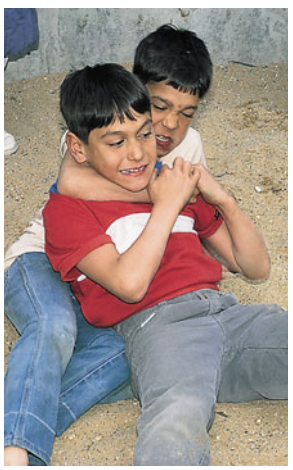
Ron Chapple/Taxi/Getty Images

FIGURE 19.5 Media violence viewing predicts future aggressive behavior Douglas Gentile and his colleagues (2004) studied more than 400 third to fifth graders. After controlling for existing differences in hostility and aggression, the researchers reported increased aggression in those heavily exposed to violent television, videos, and video games.

(Ferguson & Kilburn, 2009; Freedman, 1988). Maybe aggressive children prefer violent programs. Maybe abused or neglected children are both more aggressive and more often left in front of the TV. Maybe violent programs simply reflect, rather than affect, violent trends.

To pin down causation, psychologists use experiments. In this case, researchers randomly assigned some viewers to observe violence and others to watch entertaining nonviolence. Does viewing cruelty prepare people, when irritated, to react more cruelly? To some extent, it does. "The consensus among most of the research community," reported the National Institute of Mental Health (1982), "is that violence on television does lead to aggressive behavior by children and teenagers who watch the programs." This is especially so when an attractive person commits seemingly justified, realistic violence that goes unpunished and causes no visible pain or harm (Donnerstein, 1998).

Bob Daemmrich/The Image Works



Glassman/The Image Works

Violence viewing leads to violent play Research has shown that viewing media violence does lead to increased expression of aggression in the viewers, as with these boys imitating pro wrestlers.

The violence-viewing effect seems to stem from at least two factors. One is *imitation* (Geen & Thomas, 1986). As we noted earlier, children as young as 14 months will imitate acts they observe on TV. As they watch, their mirror neurons simulate the behavior, and after this inner rehearsal they become more likely to act it out. One research team observed a sevenfold increase in violent play immediately after children viewed *Power Rangers* (Boyatzis et al., 1995). These children, like those we saw earlier in the Bobo doll experiment, often precisely imitated the models' violent acts, including flying karate kicks. Imitation may also have played a role in the first eight days after the 1999 Columbine High School massacre, when every U.S. state except Vermont had to deal with copycat threats or incidents. Pennsylvania alone had 60 threats of school violence (Cooper, 1999).

Gallup surveys asked American teens (Mazzuca, 2002): "Do you feel there is too much violence in the movies, or not?"
1977: 42 percent said yes.
1999: 23 percent said yes.

Prolonged exposure to violence also *desensitizes* viewers; they become more indifferent to it when later viewing a brawl, whether on TV or in real life (Rule & Ferguson, 1986). Adult males who spent three evenings watching sexually violent movies became progressively less bothered by the rapes and slashings. Compared with those in a control group, the film watchers later expressed less sympathy for domestic violence victims, and they rated the victims' injuries as less severe (Mullin & Linz, 1995).

Indeed, suggested Edward Donnerstein and his co-researchers (1987), an evil psychologist could hardly imagine a better way to make people indifferent to brutality than to expose them to a graded series of scenes, from fights to killings to the mutilations in slasher movies. Watching cruelty fosters indifference.

* * *

Bandura's work—like that of Ivan Pavlov, John Watson, B. F. Skinner, and thousands of others who advanced our knowledge of learning principles—illustrates the impact that can result from single-minded devotion to a few well-defined problems and ideas. All these researchers defined the issues and impressed on us the importance of learning. As their legacy demonstrates, intellectual history is often made by people who risk going to extremes in pushing ideas to their limits (Simonton, 2000).

REVIEWING

Learning by Observation

Module Review

19-1: What is observational learning, and how is it enabled by mirror neurons? In *observational learning*, we *model* others' behavior—we observe and imitate them. *Mirror neurons*, located in the brain's frontal lobes, demonstrate a neural basis for observational learning. They fire when we perform certain actions (such as yawning) or when we observe someone else performing those actions.

19-2: What is the impact of prosocial modeling and of antisocial modeling? Children tend to imitate what a model does and says, whether the modeled behavior is *prosocial* (positive, constructive, and helpful) or antisocial. If a model's actions and words are inconsistent, children may imitate the hypocrisy they observe.

Rehearse It!

1. Children learn many social behaviors by imitating parents and other models. This type of learning is called
   a. observational learning.
   b. reinforced learning.
   c. operant conditioning.
   d. classical conditioning.
2. Parents are powerful models of behavior. They are most effective in getting their children to imitate them if
   a. their words and actions are consistent.
   b. they have outgoing personalities.
   c. one parent works and the other stays home to care for the children.
   d. they carefully explain why a behavior is acceptable in adults but not in children.
3. Bandura believes that modeling is not automatic. Whether a child will imitate a model depends in part on the
   a. child's family connections to the model.
   b. child's ability to distinguish right from wrong.
   c. rewards and punishments received by the model.
   d. child's age in relation to that of the model.
4. There is considerable controversy about the effects of heavy exposure to TV programs showing violence. However, most experts agree that repeated viewing of TV violence
   a. makes all viewers significantly more aggressive.
   b. has little effect on viewers.
   c. dulls the viewer's sensitivity to violence.
   d. makes viewers angry and frustrated.

Answers: 1. a, 2. a, 3. c, 4. c.

Terms and Concepts to Remember

learning, p. 263
observational learning, p. 263
modeling, p. 263
mirror neurons, p. 263
prosocial behavior, p. 265

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Why might a gymnastics coach encourage her students to improve their routines by watching recordings of Olympic gold medal gymnastics performances?
2. Jason's parents and older friends all smoke, but they advise him not to. Juan's parents and friends don't smoke, but they say nothing to deter him from doing so. Will Jason or Juan be more likely to start smoking?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

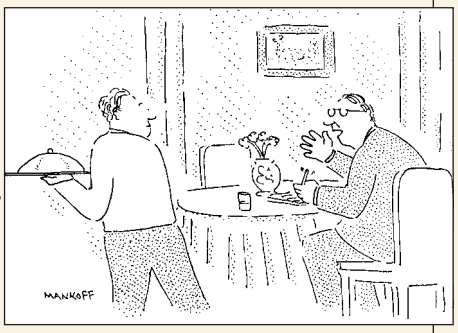
Memory

Memory

Be thankful for memory. We take it for granted, except when it malfunctions. But it is our memory that accounts for time and defines our life. It is our memory that enables us to recognize family, speak our language, find our way home, and locate food and water. It is our memory that enables us to enjoy an experience and then mentally replay and enjoy it again. And it is our memory that occasionally pits us against those whose offenses we cannot forget.

In large part, you are what you remember. Without memory, your storehouse of accumulated learning, there would be no savoring of past joys, no guilt or anger over painful recollections. You would instead live in an enduring present, each moment fresh. But each person would be a stranger, every language foreign, every task—dressing, cooking, biking—a new challenge. You would even be a stranger to yourself, lacking that continuous sense of self that extends from your distant past to your momentary present. "If you lose the ability to recall your old memories then you have no life," suggested memory researcher James McGaugh (2003). "You might as well be a rutabaga or a cabbage."

To think about memory, we first need a model of how it works. Module 20 introduces a modified version of Richard Atkinson and Richard Shiffrin's classic and influential three-stage model of memory. In that module, we also examine sensory memory, short-term/working memory, and long-term memory—thus reviewing how we move information into our memories, retain it, and later retrieve it. Module 21 looks at what happens when our memories fail us (as when we forget information, misremember it, or create false memories). That module concludes with some tips on how you can apply memory researchers' findings to your own education.



"Waiter, I'd like to order, unless I've eaten, in which case bring me the check."

MODULE 20

Information Processing

The Phenomenon of Memory

To a psychologist, **memory** is learning that has persisted over time, information that has been stored and can be retrieved.

Research on memory's extremes has helped us understand how memory works. At age 92, my father suffered a small stroke that had but one peculiar effect. His genial personality was intact. He was as mobile as before. He knew us and while poring over family photo albums could reminisce in detail about his past. But he had lost most of his ability to lay down new memories of conversations and everyday episodes. He could not tell me what day of the week it was. Told repeatedly of his brother-in-law's death, he expressed surprise each time he heard the news.

At the other extreme are people who would be medal winners in a memory Olympics, such as Russian journalist Shereshevskii, or S, who had merely to listen while other reporters scribbled notes (Luria, 1968). Where you and I could parrot back a string of about 7—maybe even 9—digits, S could repeat up to 70, provided they were read about 3 seconds apart in an otherwise silent room. Moreover, he could recall digits or words backward as easily as forward. His accuracy was unerring, even when recalling a list as much as 15 years later, after having memorized hundreds of others. "Yes, yes," he might recall. "This was a series you gave me once when we were in your apartment. . . . You were sitting at the table and I in the rocking chair. . . . You were wearing a gray suit and you looked at me like this. . . ."

Amazing? Yes, but consider your own pretty staggering capacity for remembering countless voices, sounds, and songs; tastes, smells, and textures; faces, places, and happenings. Imagine viewing more than 2500 slides of faces and places, for only 10 seconds each. Later you see 280 of these slides, paired with others not previously seen. If you are like the participants in this experiment by Ralph Haber (1970), you would recognize 90 percent of those you had seen before.

Or imagine yourself looking at a picture fragment, such as the one in **FIGURE 20.1**. Also imagine that you had seen the complete picture for a couple of seconds 17 years earlier. Given this experience in a real experiment (Mitchell, 2006), people were more likely to identify previously seen objects than were members of a control group who had not seen complete drawings. Moreover, like the cicada insect that reemerges every 17 years, the picture memory reappeared even for those who had no conscious recollection of participating in the long-ago experiment!

How do we accomplish such memory feats? How can we remember things we have not thought about for years, yet forget the name of someone we met a minute ago? How are memories stored in our brain? Why do some painful memories persist, like unwelcome houseguests, while other memories leave too quickly? How can two people's memories of the same event be so different? Why, when I ask you later, will you be likely to misrecall this sentence: *"The angry rioter threw the rock at the window"?* How can we improve our memories? These will be among the questions we consider as we review more than a century of research on memory.

memory the persistence of learning over time through the storage and retrieval of information.

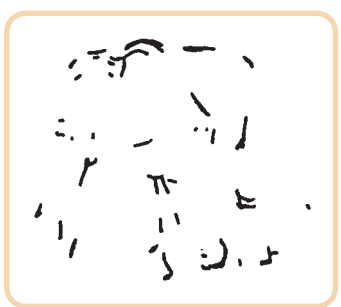


FIGURE 20.1 What is this? People who had, 17 years earlier, seen the complete image (which you can see in Figure 20.3 by turning the page) were more likely to recognize this fragment, even if they had forgotten the earlier experience (Mitchell, 2006).

encoding the processing of information into the memory system—for example, by extracting meaning.

storage the retention of encoded information over time.

retrieval the process of getting information out of memory storage.

sensory memory the immediate, very brief recording of sensory information in the memory system.

short-term memory activated memory that holds a few items briefly, such as the seven digits of a phone number while dialing, before the information is stored or forgotten.

long-term memory the relatively permanent and limitless storehouse of the memory system. Includes knowledge, skills, and experiences.

Studying Memory: Information-Processing Models

20-1: How do psychologists describe the human memory system?

A model of how memory works can help us think about how we form and retrieve memories. One often-used model is a computer's information-processing system, which is in some ways similar to human memory. To remember any event, we must get information into our brain **(encoding),** retain that information **(storage),** and later get it back out **(retrieval).** A computer also encodes, stores, and retrieves information. First, it translates input (keystrokes) into an electronic language, much as the brain encodes sensory information into a neural language. The computer permanently stores vast amounts of information on a drive, from which it can later be retrieved.

Like all analogies, the computer model has its limits. Our memories are less literal and more fragile than a computer's. Moreover, most computers process information speedily but sequentially, even while alternating between tasks. The brain is slower but does many things at once.

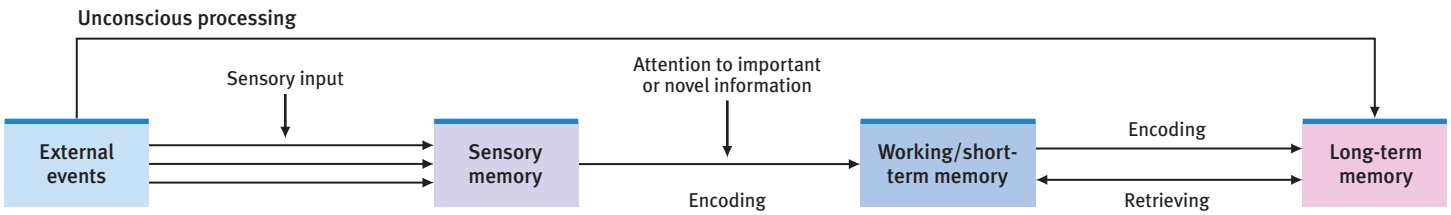
Psychologists have proposed several information-processing models of memory. One modern model, *connectionism,* views memories as emerging from interconnected neural networks. Specific memories arise from particular activation patterns within these networks. In an older but easier-to-picture model, Richard Atkinson and Richard Shiffrin (1968) proposed that we form memories in three stages:

1. We first record to-be-remembered information as a fleeting **sensory memory.**
2. From there, we process information into a **short-term memory** bin, where we encode it through *rehearsal.*
3. Finally, information moves into **long-term memory** for later retrieval.

Although historically important and helpfully simple, this three-step process is limited and fallible. In this text, we use a *modified version of the three-stage processing model of memory* (**FIGURE 20.2**). This updated model accommodates two important new concepts:

- Some information, as you will see later in this module, skips Atkinson and Shiffrin's first two stages and is processed directly and automatically into long-term memory, without our conscious awareness.

FIGURE 20.2 A modified three-stage processing model of memory Atkinson and Shiffrin's classic three-step model helps us to think about how memories are processed, but today's researchers recognize other ways long-term memories form. For example, some information slips into long-term memory via a "back door," without our consciously attending to it. And so much active processing occurs in the short-term memory stage that many now prefer the term *working memory.*



Bob Daemmrich/The Image Works

Sensory memory registers incoming information, allowing your brain to capture for a moment a sea of faces.

Bob Daemmrich/The Image Works

We pay attention to and encode important or novel stimuli—in this case, an angry face in the crowd.

Frank Wartenberg/Picture Press/Corbis

If we stare at the face long enough (rehearsal), or if we're sufficiently disturbed by it (it's deemed "important"), we will encode it for long-term storage, and we may, an hour later, be able to call up an image of the face.

- **Working memory,** a newer understanding of Atkinson and Shiffrin's second stage, concentrates on the active processing of information in this intermediate stage. Because we cannot possibly focus on all the information bombarding our senses at once, we shine the flashlight beam of our attention on certain incoming stimuli—often those that are novel or important. We process these incoming stimuli, along with information we retrieve from long-term memory, in temporary working memory. Working memory associates new and old information and solves problems (Baddeley, 2001, 2002; Engle, 2002).

Let's use our updated model now to look more closely at how we encode, store, and retrieve information.

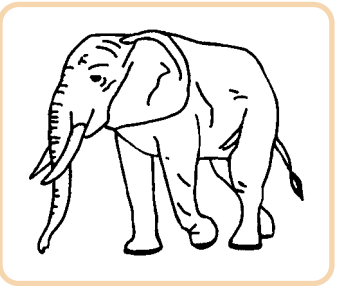


FIGURE 20.3 Now you know People who had seen this complete image were, 17 years later, more likely to recognize the fragment in Figure 20.1.

Encoding: Getting Information In

20-2: What information do we encode automatically? What information do we encode effortfully, and how does the distribution of practice influence retention?

How We Encode: Levels of Processing

Some information, such as the route you walked to your last class, you process with great ease, freeing your memory system to focus on less familiar events. But to retain novel information, such as a friend's new cell-phone number, you need to pay attention and try hard.

Automatic Processing

Thanks to your brain's capacity for simultaneous activity (for parallel processing), an enormous amount of multitasking goes on without your conscious attention. For example, without conscious effort you **automatically process** information about

- *space*. While studying, you often encode the place on a page where certain material appears; later, when struggling to recall that information, you may visualize its location.
- *time*. While going about your day, you unintentionally note the sequence of the day's events. Later, when you realize you've left your coat somewhere, you can re-create that sequence and retrace your steps.
- *frequency*. You effortlessly keep track of how many times things happen, thus enabling you to realize that "this is the third time I've run into her today."
- *well-learned material*. For example, when you see words in your native language, perhaps on the side of a delivery truck, you cannot help but register their meaning. At such times, automatic processing is so effortless that it is difficult to shut off.

Deciphering words was not always so easy. When you first learned to read, you sounded out individual letters to figure out what words they made. With effort, you plodded slowly through a mere 20 to 50 words on a page, until, with experience and practice, reading became automatic. Imagine now learning to read reversed sentences like this:

.citamotua emoceb nac gnissecorp luftroffE

At first, this requires effort, but after enough practice, you would also perform this task much more automatically. We develop many skills in this way. We learn to drive, to text message, to speak a new language first with full attention and great effort, then more automatically.

Effortful Processing

We encode and retain vast amounts of information automatically, but we remember other types of information, such as this module's concepts, only with effort and attention (FIGURE 20.4 on the next page). **Effortful processing** often produces durable and accessible memories.

working memory a newer understanding of short-term memory that focuses on conscious, active processing of incoming auditory and visual-spatial information, and of information retrieved from long-term memory.

automatic processing unconscious encoding of incidental information, such as space, time, and frequency, and of well-learned information, such as word meanings.

effortful processing encoding that requires attention and conscious effort.

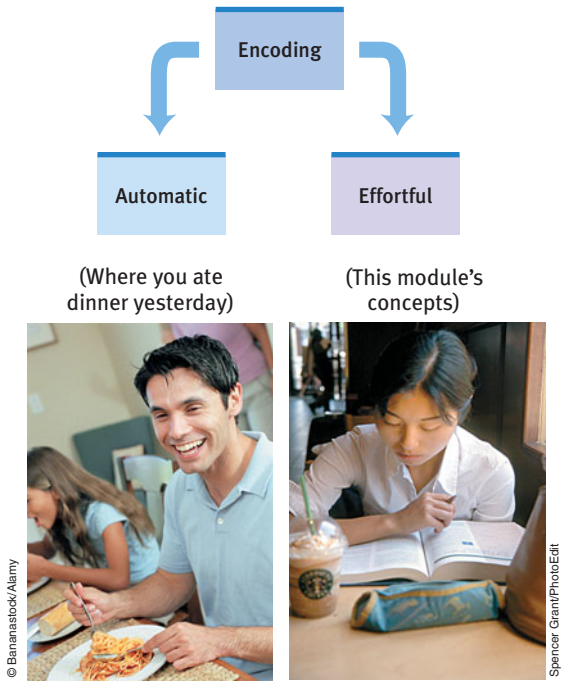


FIGURE 20.4 Automatic versus effortful processing Some information, such as where you ate dinner yesterday, you process automatically. Other information, such as this module's concepts, requires effort to encode and remember.

When learning novel information, such as names, we can boost our memory through **rehearsal,** or conscious repetition. The pioneering researcher of verbal memory, German philosopher Hermann Ebbinghaus (1850–1909), showed this after becoming impatient with philosophical speculations about memory. Ebbinghaus decided he would scientifically study his own learning and forgetting of novel verbal materials.

To create novel verbal material for his learning experiments, Ebbinghaus formed a list of all possible nonsense syllables by sandwiching one vowel between two consonants. He then randomly selected a sample of the syllables, practiced them, and tested himself. To get a feel for his experiments, rapidly read aloud, eight times over, the following list (from Baddeley, 1982). Then try to recall the items.

"He should test his memory by reciting the verses."

—Abdur-Rahman Abdul Khaliq, "Memorizing the Quran"

JIH, BAZ, FUB, YOX, SUJ, XIR, DAX, LEQ, VUM, PID, KEL, WAV, TUV, ZOF, GEK, HIW.

The day after learning such a list, Ebbinghaus could recall few of the syllables. But were they entirely forgotten? As **FIGURE 20.5** portrays, the more frequently he repeated the list aloud on day 1, the fewer repetitions he required to relearn the list on day 2. Here, then, was a simple beginning principle: *The amount remembered depends on the time spent learning.* Even after we learn material, additional rehearsal *(overlearning)* increases retention. *The point to remember:* For novel verbal information, practice—effortful processing—does indeed make perfect.

Later research revealed more about how to lay down enduring memories. To paraphrase Ebbinghaus (1885), those who learn quickly also forget quickly. We retain information better when our rehearsal is distributed over time (as when learning classmates' names), a phenomenon called the **spacing effect.** More than 300 experiments over the last century consistently reveal the benefits of spacing learning times (Cepeda et al., 2006). *Massed practice* (cramming) can produce speedy short-term learning and feelings of confidence. But *distributed study time* produces better long-term recall. After you've studied long enough to master the material, further study—overlearning—is most efficient if delayed (Rohrer & Pashler, 2007). Better to spend that extra reviewing time later—a day later if you need to remember something 10 days hence, or a month later if you need to remember something 6 months hence.

In a 9-year experiment, Harry Bahrick and three of his family members (1993) practiced foreign language word translations for a given number of times,

rehearsal the conscious repetition of information, either to maintain it in consciousness or to encode it for storage.

spacing effect the tendency for distributed study or practice to yield better long-term retention than is achieved through massed study or practice.

serial position effect our tendency to recall best the last and first items in a list.

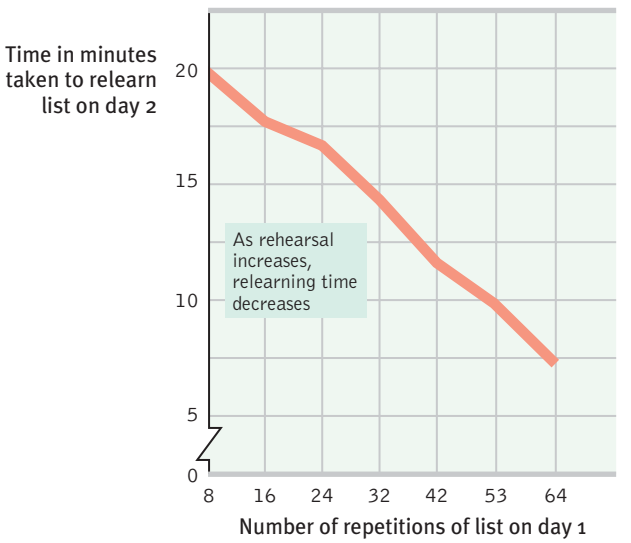


FIGURE 20.5 Ebbinghaus' retention curve Ebbinghaus found that the more times he practiced a list of nonsense syllables on day 1, the fewer repetitions he required to relearn it on day 2. Said simply, the more time we spend learning novel information, the more we retain. (From Baddeley, 1982.)

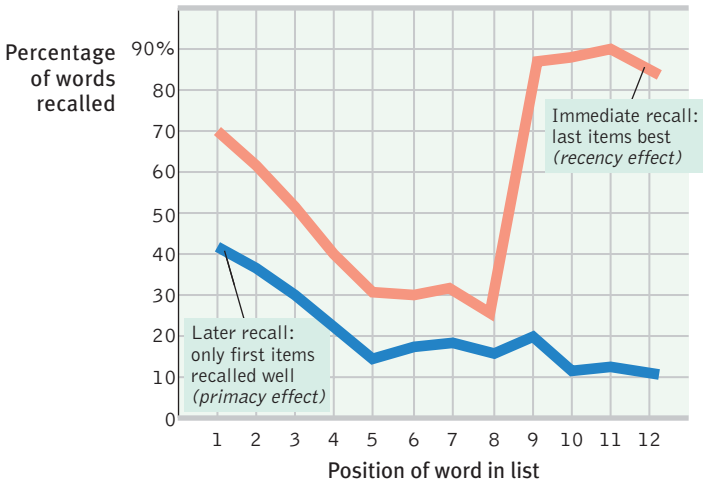
at intervals ranging from 14 to 56 days. Their consistent finding: The longer the space between practice sessions, the better their retention up to 5 years later. The practical implication? Spreading out learning—over a semester or a year, rather than over a shorter term—should help you not only on comprehensive final exams, but also in retaining the information for a lifetime. Repeated quizzing of previously studied material also helps, a phenomenon that Henry Roediger and Jeffrey Karpicke (2006) call the *testing effect*, adding, "Testing is a powerful means of improving learning, not just assessing it." *So here is another point to remember:* Spaced study and self-assessment beat cramming.

"The mind is slow in unlearning what it has been long in learning."

—Roman philosopher Seneca (4 B.C.E.–65 C.E.)

Another phenomenon, the **serial position effect,** further illustrates the benefits of rehearsal. As an everyday parallel, imagine it's your first day in a new job, and your manager is introducing co-workers. As you meet each one, you repeat (rehearse) all their names, starting from the beginning. By the time you meet the last person, you will have spent more time rehearsing the earlier names than the later ones; thus, the next day you will probably more easily recall the earlier names. Also, learning the first few names may interfere with your learning the later ones.

Experimenters have demonstrated the serial position effect by showing people a list of items (words, names, dates, even odors) and then immediately asking them to recall the items in any order (Reed, 2000). Struggling to recall the list, people often remember the last and first items better than those in the middle (see **FIGURE 20.6**).



AP Photo/Musadeq Sadeq, Pool

FIGURE 20.6 The serial position effect Immediately after Australian Prime Minister Kevin Rudd introduced this long line of officials to Afghan President Hamid Karzai, President Karzai probably recalled the names of the last few people best. But later he may have recalled the first few people best. (From Craik & Watkins, 1973.)

Perhaps because the last items are still in working memory, people briefly recall them especially quickly and well *(a recency effect)*. But after a delay—after they shift their attention from the last items—their recall is best for the first items *(a primacy effect)*.

Sometimes, however, rehearsal is not enough to store new information for later recall (Craik & Watkins, 1973; Greene, 1987). To understand why this happens, we need to know more about how we encode information for processing into long-term memory.

What We Encode

20-3: What effortful processing methods aid in forming memories?

Processing our sensory input is like sorting through e-mail. Some items we instantly discard. Others we open, read, and retain. We process information by encoding its meaning, encoding its image, or mentally organizing it.

Encoding Meaning

When processing verbal information for storage, we usually encode its meaning, associating it with what we already know or imagine. Whether we hear *eye-screem* as "ice cream" or "I scream" depends on how the context and our experience guide us to interpret and encode the sounds. (Remember, our working memories interact with our long-term memories.)

Here is another sentence I will ask you about later: The fish attacked the swimmer.

Can you repeat the sentence about the rioter that I gave you at this module's beginning? ("The angry rioter threw . . ."). Perhaps, like those in an experiment by William Brewer (1977), you recalled the rioter sentence by the meaning you encoded when you read it (for example, "The angry rioter threw the rock *through* the window") and not as it was written ("The angry rioter threw the rock *at* the window"). Referring to such recall, Gordon Bower and Daniel Morrow (1990) likened our minds to theater directors who, given a raw script, imagine a finished stage production. Asked later what we heard or read, we recall not the literal text but *what we encoded.* Thus, studying for an exam, you may remember your lecture notes rather than the lecture itself.

But given too raw a script, we have trouble creating a mental model. Put yourself in the place of the students who John Bransford and Marcia Johnson (1972) asked to remember the following recorded passage:

> The procedure is actually quite simple. First you arrange things into different groups. Of course, one pile may be sufficient depending on how much there is to do. . . . After the procedure is completed one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually they will be used once more and the whole cycle will then have to be repeated. However, that is part of life.

When the students heard the paragraph you have just read, without a meaningful context, they remembered little of it. When told the paragraph described washing clothes (something meaningful to them), they remembered much more of it—as you probably could now after rereading it.

Such research suggests the benefits of rephrasing what we read and hear into meaningful terms. People often ask actors how they learn "all those lines." They do it by first coming to understand the flow of meaning, report psychologist-actor team Helga Noice and Tony Noice (2006). "One actor divided a half-page of dialogue into three [intentions]: 'to flatter,' 'to draw him out,' and 'to allay his fears.'" With this meaningful sequence in mind, the actor more easily remembers the lines.

From his experiments on himself, Ebbinghaus estimated that, compared with learning nonsense material, learning meaningful material required one-tenth the effort. As memory researcher Wayne Wickelgren (1977, p. 346) noted, "The time you spend thinking about material you are reading and relating it to previously stored material is about the most useful thing you can do in learning any new subject matter."

The point to remember: The amount remembered depends both on the time spent learning and on your making it meaningful.

imagery mental pictures; a powerful aid to effortful processing, especially when combined with encoding.

mnemonics [nih-MON-iks] memory aids, especially those techniques that use vivid imagery and organizational devices.

chunking organizing items into familiar, manageable units; often occurs automatically.

Visual Encoding

Why is it that we struggle to remember formulas, definitions, and dates, yet we can easily remember where we were yesterday, who was with us, where we sat, and what we wore? One difference is the greater ease of remembering mental pictures. Our earliest memories—probably of something that happened at age 3 or 4—involve visual **imagery.** We more easily remember concrete words, which lend themselves to visual mental images, than we do abstract, low-imagery words. (When I quiz you later, which three of these words—*typewriter, void, cigarette, inherent, fire, process*—will you most likely recall?) If you still recall the rock-throwing rioter sentence, it is probably not only because of the meaning you encoded but also because the sentence lent itself to a visual image. Memory for concrete nouns, such as *cigarette,* is aided by encoding *both* their meaning and their image (Marschark et al., 1987; Paivio, 1986). Two codes are better than one.

Thanks to this durability of vivid images, our memory of an experience is often colored by its best or worst moment—the best moment of pleasure or joy, and the worst moment of pain or frustration (Fredrickson & Kahneman, 1993). Recalling the high points while forgetting the mundane may explain the phenomenon of *rosy retrospection* (Mitchell et al., 1997): People tend to recall events such as a camping holiday more positively than they judged them at the time. The muggy heat and long lines of that visit to Disney World fade as we bask in our vivid recall of the surroundings, food, and rides.

Imagery is at the heart of many **mnemonic** (nih-MON-ik) devices (so named after the Greek word for "memory"). Ancient Greek scholars and orators developed mnemonics to help them retrieve lengthy memorized passages and speeches. Some modern mnemonic devices rely on both acoustic and visual codes. For example, the *peg-word system* requires you to memorize a jingle: *"One is a bun; two is a shoe; three is a tree; four is a door; five is a hive; six is sticks; seven is heaven; eight is a gate; nine is swine; ten is a hen."* Without much effort, you will soon be able to count by peg-words instead of numbers: *bun, shoe, tree* . . . and then to visually associate the peg-words with to-be-remembered items. Now you are ready to challenge anyone to give you a grocery list to remember. Carrots? Stick them into the imaginary bun. Milk? Fill the shoe with it. Paper towels? Drape them over the tree branch. Think *bun, shoe, tree* and you see their associated images: carrots, milk, paper towels. With few errors (Bugelski et al., 1968), you will be able to recall the items in any order and to name any given item. Memory whizzes understand the power of such systems. A study of star performers in the World Memory Championships showed them not to have exceptional intelligence, but rather to be superior at using spatial mnemonic strategies (Maguire et al., 2003).

How many Fs *are in the following sentence? FINISHED FILES ARE THE RESULTS OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF YEARS. See inverted answer below.*

Partly because your initial processing of the letters was primarily acoustic rather than visual, you probably missed some of the six Fs, *especially those that sound like a* V *rather than an* F.

Organizing Information for Encoding

Mnemonic devices can also help organize material for our later retrieval. When Bransford and Johnson's laundry paragraph became meaningful, we could mentally organize its sentences into a sequence. We process information more easily when we can organize it into meaningful units or structures.

Chunking Glance for a few seconds at row 1 of **FIGURE 20.7**, then look away and try to reproduce what you saw. Impossible, yes? But you can easily reproduce the second row, which is no less complex. Similarly, you will probably find row 4 much easier to remember than row 3, although both contain the same letters. And you could remember the sixth cluster more easily than the fifth, although both contain the same words.

As these units demonstrate, we more easily recall information when we can organize it into familiar, manageable chunks. **Chunking** occurs so naturally that we take it for granted. If you are a native English speaker, you can reproduce perfectly the 150 or so line segments that make up the words in the three phrases of item 6 in Figure 20.7. It would astonish someone unfamiliar with the language.

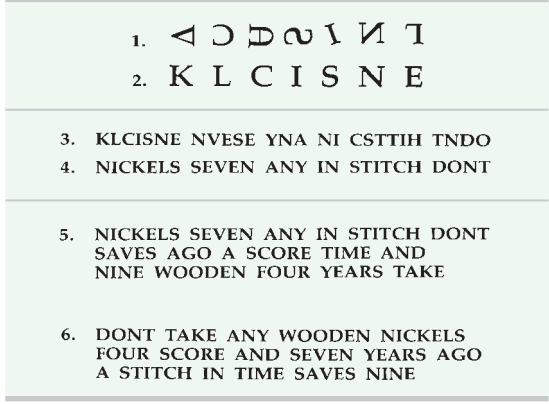


FIGURE 20.7 Effects of meaningful chunking on memory When we organize information into meaningful units, such as letters, words, and phrases, we recall it more easily. (From Hintzman, 1978.)

FIGURE 20.8 An example of chunking—for those who read Chinese After looking at these characters, can you reproduce them exactly? If so, you are literate in Chinese.

I am similarly awed at the ability of someone literate in Chinese to glance at FIGURE 20.8 and then to reproduce all of the strokes; or of a chess master who, after a 5-second look at the board during a game, can recall the exact positions of most of the pieces (Chase & Simon, 1973); or of a varsity basketball player who, given a 4-second glance at a basketball play, can recall the positions of the players (Allard & Burnett, 1985). We all remember information best when we can organize it into personally meaningful arrangements.

Chunking can also be used as a mnemonic technique to recall unfamiliar material. Want to remember the colors of the rainbow in order of wavelength? Think of the mnemonic ROY G. BIV (*r*ed, *o*range, *y*ellow, *g*reen, *b*lue, *i*ndigo, *v*iolet). Need to recall the names of North America's five Great Lakes? Just remember HOMES (*H*uron, *O*ntario, *M*ichigan, *E*rie, *S*uperior). In each case, we chunk information into a more familiar form by creating a word (called an *acronym*) from the first letters of the to-be-remembered items.

Hierarchies When people develop expertise in an area, they process information not only in chunks but also in *hierarchies* composed of a few broad concepts divided and subdivided into narrower concepts and facts. This module, for example, aims not only to teach you the elementary facts of memory but also to help you organize these facts around broad principles, such as *encoding;* subprinciples, such as *automatic* and *effortful processing;* and still more specific concepts, such as *meaning*, *imagery*, and *organization* (FIGURE 20.9).

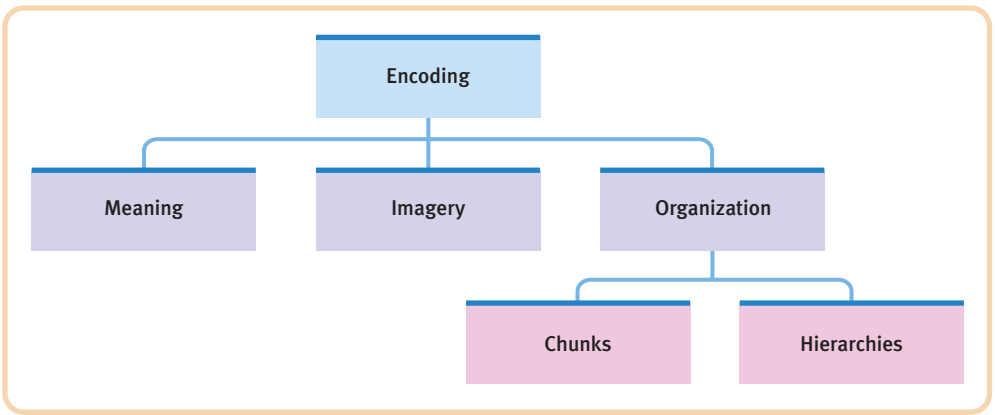


FIGURE 20.9 Organization benefits memory When we organize words or concepts into hierarchical groups, as illustrated here with concepts in this module, we remember them better than when we see them presented randomly.

In the discussion of encoding imagery, I gave you six words and told you I would quiz you about them later. How many of these words can you now recall? Of these, how many are high-imagery words? How many are low-imagery? (You can check your list against the six inverted words below.)

Typewriter, void, cigarette, inherent, fire, process

Organizing knowledge into hierarchies helps us retrieve information efficiently. Gordon Bower and his colleagues (1969) demonstrated this by presenting words either randomly or grouped into categories. When the words were organized into groups, recall was two to three times better. Such results show the benefits of organizing what you study—of giving special attention to module outlines, headings, preview questions, summaries, and self-test questions. If you can master a module's concepts within their overall organization, your recall should be effective at test time. Taking lecture and text notes in outline format—a type of hierarchical organization—may also prove helpful.

Storage: Retaining Information

At the heart of memory is storage. If you later recall something you experienced, you must, somehow, have stored and retrieved it. Anything stored in long-term memory lies dormant, waiting to be reconstructed by a cue. What is our memory storage capacity? Let's start with the first memory store noted in the modified three-stage processing model (Figure 20.2)—our fleeting sensory memory.

Sensory Memory

20-4: What are two components of sensory memory?

How much of this page could you sense and recall with less exposure than a lightning flash? Researcher George Sperling (1960) asked people to do something similar when he showed them, for only one-twentieth of a second, three rows of three letters each (**FIGURE 20.10**). After the nine letters disappeared, people could recall only about half of them.

Was it because they had insufficient time to glimpse them? No, Sperling cleverly demonstrated that people actually *could* see and recall all the letters, but only momentarily. Rather than ask them to recall all nine letters at once, Sperling sounded a high, medium, or low tone immediately *after* flashing the nine letters. This cue directed participants to report only the letters of the top, middle, or bottom row, respectively. Now they rarely missed a letter, showing that all nine letters were momentarily available for recall.

K	Z	R
Q	B	T
S	G	N

FIGURE 20.10 Momentary photographic memory When George Sperling flashed a group of letters similar to this for one-twentieth of a second, people could recall only about half of the letters. But when signaled to recall a particular row immediately after the letters had disappeared, they could do so with near-perfect accuracy.

Sperling's experiment revealed that we have a fleeting photographic memory called **iconic memory.** For a few tenths of a second, our eyes register an exact representation of a scene and we can recall any part of it in amazing detail. But if Sperling delayed the tone signal by more than half a second, the image faded and participants again recalled only about half the letters. Our visual screen clears quickly, as new images are superimposed over old ones.

We also have an impeccable, though fleeting, memory for auditory stimuli, called **echoic memory** (Cowan, 1988; Lu et al., 1992). Picture yourself in conversation, as your attention veers to the TV. If your mildly irked companion tests your attention by asking, "What did I just say?" you can recover their last few words from your mind's echo chamber. Auditory echoes tend to linger for 3 or 4 seconds. Experiments on echoic and iconic memory have helped us understand the initial recording of sensory information in the memory system.

iconic memory a momentary sensory memory of visual stimuli; a photographic or picture-image memory lasting no more than a few tenths of a second.

echoic memory a momentary sensory memory of auditory stimuli; if attention is elsewhere, sounds and words can still be recalled within 3 or 4 seconds.

Working/Short-Term Memory

20-5: What are the duration and capacity of short-term and of long-term memory?

Among the vast amounts of information registered by our sensory memory, we illuminate some with our attentional flashlight. We also retrieve information from long-term storage for "on-screen" display. But unless our working memory meaningfully encodes or rehearses that information, it quickly disappears from our short-term store. During your finger's trip from phone book to phone, a telephone number may evaporate.

To find out how quickly a short-term memory will disappear, Lloyd Peterson and Margaret Peterson (1959) asked people to remember three-consonant groups, such as CHJ. To prevent rehearsal, the researchers asked them, for example, to start at 100 and count aloud backward by threes. After 3 seconds, people recalled the letters only about half the time; after 12 seconds, they seldom recalled them at all (**FIGURE 20.11**). Without active processing, short-term memories have a limited life.

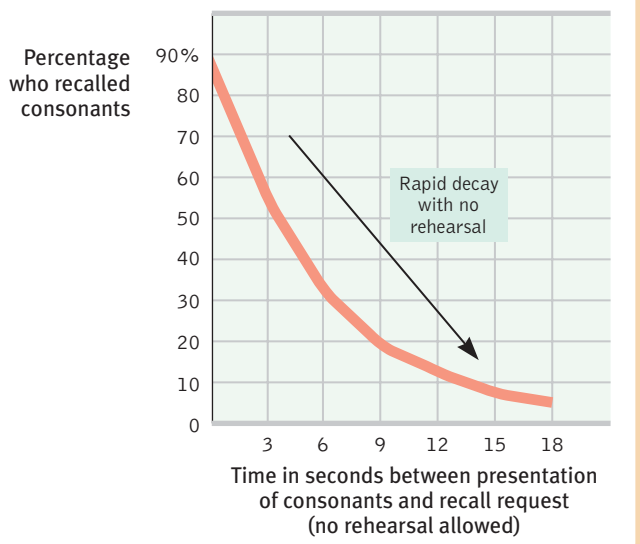


FIGURE 20.11 Short-term memory decay Unless rehearsed, verbal information may be quickly forgotten. (From Peterson & Peterson, 1959; see also Brown, 1958.)

The Magical Number Seven has become psychology's contribution to an intriguing list of magic sevens—the seven wonders of the world, the seven seas, the seven deadly sins, the seven primary colors, the seven musical scale notes, the seven days of the week—seven magical sevens.

Short-term memory is limited not only in duration but also in capacity, typically storing about seven bits of information (give or take two). George Miller (1956) enshrined this recall capacity as the *Magical Number Seven, plus or minus two.* Not surprisingly, when some phone companies began requiring all callers to dial a three-digit area code in addition to a seven-digit number, many people reported trouble retaining the just-looked-up number.

Our short-term recall is slightly better for random digits (as in a phone number) than for random letters, which may have similar sounds. It is slightly better for what we hear than for what we see. Both children and adults have short-term recall for roughly as many words as they can speak in 2 seconds (Cowan, 1994; Hulme & Tordoff, 1989).

Without rehearsal, most of us actually retain in short-term memory only about four information chunks (for example, letters meaningfully grouped as BBC, FBI, KGB, CIA) (Cowan, 2001; Jonides et al., 2008). Suppressing rehearsal by saying *the, the, the* while hearing random digits also reduces memory to about four items. The basic principle: *At any given moment, we can consciously process only a very limited amount of information.*

R. J. Erwin/Photo Researchers

Clark's Nutcracker Among animals, one contender for champion memorist would be a mere birdbrain—the Clark's Nutcracker—which during winter and early spring can locate up to 6000 caches of pine seeds it had previously buried (Shettleworth, 1993).

Long-Term Memory

In Arthur Conan Doyle's *A Study in Scarlet,* Sherlock Holmes offers a popular theory of memory capacity:

> I consider that a man's brain originally is like a little empty attic, and you have to stock it with such furniture as you choose. . . . It is a mistake to think that that little room has elastic walls and can distend to any extent. Depend upon it, there comes a time when for every addition of knowledge you forget something that you knew before.

Contrary to Holmes' belief, our capacity for storing long-term memories is essentially limitless. Our brains are *not* like attics, which once filled can store more items only if we discard old ones.

The point is vividly illustrated by those who have performed phenomenal memory feats. Consider the 1990s tests of psychologist Rajan Mahadevan's memory. Given a block of 10 digits from the first 30,000 or so digits of pi, Rajan, after a few moments of mental searching for the string, would pick up the series from there, firing numbers like a machine gun (Delaney et al., 1999; Thompson et al., 1993). He could also repeat 50 random digits—backward. It is not a genetic gift, he said; anyone could learn to do it. But given the genetic influence on so many human traits, and knowing that Rajan's father memorized Shakespeare's complete works, one wonders. We are reminded that many psychological phenomena, including memory capacity, can be studied by means of different levels of analysis, including the biological.

Pi in the sky: The world record for memorizing pi has been held by Japan's Akira Haraguchi, who in 2006 reportedly recited the first 100,000 digits correctly (Associated Press, 2006).

Storing Information in the Brain

20-6: How does the brain store our memories?

I marveled at my aging mother-in-law, a retired pianist and organist. At age 88 her blind eyes could no longer read music. But let her sit at a keyboard and she would flawlessly play any of hundreds of hymns, including ones she had not thought of for 20 years. Where did her brain store those thousands of sequenced notes?

For a time, some surgeons and memory researchers believed that flashbacks triggered by brain stimulation during surgery indicated that our whole past, not just well-practiced music, is "in there," in complete detail, just waiting to be relived. But when Elizabeth Loftus and Geoffrey Loftus (1980) analyzed the vivid "memories" triggered by brain stimulation, they found that the seeming flashbacks appeared to have been invented, not relived. Psychologist Karl Lashley (1950) further demonstrated that memories do not reside in single, specific spots. He trained rats to find their way out of a maze, then cut out pieces of their brain's cortex and retested their memory. Amazingly,

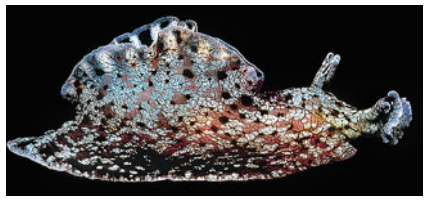
long-term potentiation (LTP) an increase in a synapse's firing potential after brief, rapid stimulation. Believed to be a neural basis for learning and memory.

no matter what small section he removed, the rats retained at least a partial memory of how to navigate the maze. So, despite the brain's vast storage capacity, we do not store information as libraries store their books, in discrete, precise locations.

Synaptic Changes

Looking for clues to the brain's storage system, contemporary memory researchers have searched for a *memory trace*. The quest to understand the physical basis of memory—for how information becomes incarnated in matter—has sparked study of the synaptic meeting places where neurons communicate with one another via their neurotransmitter messengers.

We know that experience does modify the brain's neural networks; given increased activity in a particular pathway, neural interconnections form or strengthen. Eric Kandel and James Schwartz (1982) observed such changes in the sending neurons of a simple animal, the California sea slug, *Aplysia*. Its mere 20,000 or so nerve cells are unusually large and accessible, enabling the researchers to observe synaptic changes during learning. The sea slug can be classically conditioned (with electric shock) to reflexively withdraw its gills when squirted with water, much as a shell-shocked soldier jumps at the sound of a snapping twig. By observing the slugs' neural connections before and after conditioning, Kandel and Schwartz pinpointed changes. When learning occurs, the slug releases more of the neurotransmitter *serotonin* at certain synapses. These synapses then become more efficient at transmitting signals.



Jeff Rotman

Aplysia The California sea slug, which neuroscientist Eric Kandel studied for 45 years, has increased our understanding of the neural basis of learning.

Increased synaptic efficiency makes for more efficient neural circuits. In experiments, rapidly stimulating certain memory-circuit connections has increased their sensitivity for hours or even weeks to come. The sending neuron now needs less prompting to release its neurotransmitter, and the receiving neuron's receptor sites may increase (**FIGURE 20.12**). This prolonged strengthening of potential neural firing, called **long-term potentiation (LTP),** provides a neural basis for learning and remembering associations (Lynch, 2002; Whitlock et al., 2006). Several lines of evidence confirm that LTP is a physical basis for memory:

- Drugs that block LTP interfere with learning (Lynch & Staubli, 1991).
- Mutant mice engineered to lack an enzyme needed for LTP can't learn their way out of a maze (Silva et al., 1992).
- Rats given a drug that enhances LTP will learn a maze with half the usual number of mistakes (Service, 1994).
- Injecting rats with a chemical that blocks the preservation of LTP erases recent learning (Pastalkova et al., 2006).

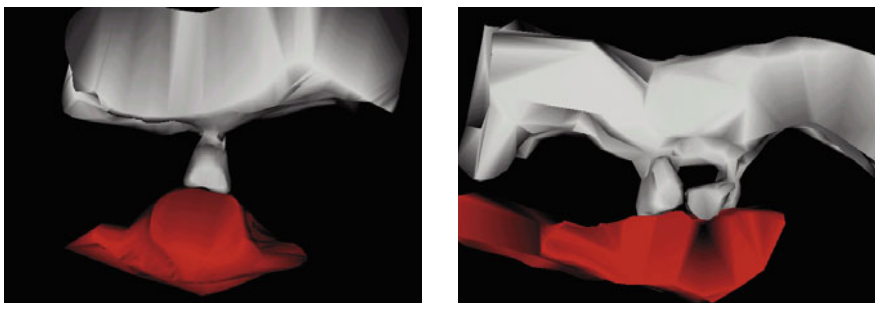
Some memory-biology explorers have helped found pharmaceutical companies that are competing to develop and test memory-boosting drugs. Their target market includes millions of people with Alzheimer's disease, millions more with *mild cognitive impairment* that often becomes Alzheimer's, and countless millions who would love to turn back the clock on age-related memory decline. From expanding memories perhaps will come bulging profits.

"Our memories are flexible and superimposable, a panoramic blackboard with an endless supply of chalk and erasers."

—Elizabeth Loftus and Katherine Ketcham, *The Myth of Repressed Memory,* 1994

"The biology of the mind will be as scientifically important to this [new] century as the biology of the gene [was] to the twentieth century."

—Eric Kandel, acceptance remarks for a 2000 Nobel Prize



Both photos: From N. Toni et al., *Nature*, 402, Nov. 25, 1999. Courtesy of Dominique Muller

FIGURE 20.12 Doubled receptor sites
Electron microscope images show just one receptor site (gray) reaching toward a sending neuron before long-term potentiation (left), and two sites after LTP (right). A doubling of the receptor sites means that the receiving neuron has increased sensitivity for detecting the presence of the neurotransmitter molecules that may be released by the sending neuron. (From Toni et al., 1999.)

After LTP has occurred, passing an electric current through the brain won't disrupt old memories. But the current will wipe out very recent memories. Such is the experience both of laboratory animals and of depressed people given electroconvulsive therapy (ECT). A blow to the head can do the same. Football players and boxers momentarily knocked unconscious typically have no memory of events just before the knock-out (Yarnell & Lynch, 1970). Their working memory had no time to consolidate the information into long-term memory before the lights went out.

Although ECT for depression disrupts memory for recent experiences, it leaves most memories intact.

Stress Hormones and Memory

Arousal can sear certain events into the brain, while disrupting memory for neutral events around the same time (Birnbaum et al., 2004; Brewin et al., 2007). When we are excited or stressed, emotion-triggered stress hormones make more glucose energy available to fuel brain activity, signaling the brain that something important has happened. Moreover, the amygdala, the two emotion-processing clusters in the limbic system, boosts activity and available proteins in the brain's memory-forming areas (Buchanan, 2007; Kensinger, 2007). The result? "Stronger emotional experiences make for stronger, more reliable memories," says James McGaugh (1994, 2003). After traumatic experiences—a wartime ambush, a house fire, a rape—vivid recollections of the horrific event may intrude again and again. It is as if they were burned in. This makes adaptive sense. Memory serves to predict the future and to alert us to potential dangers.

Conversely, weaker emotion means weaker memories. People given a drug that blocks the effects of stress hormones will later have more trouble remembering the details of an upsetting story (Cahill, 1994). That connection is appreciated by those working to develop drugs that, when taken after a traumatic experience, might blunt intrusive memories. In one experiment, victims of car accidents, rapes, and other traumas received, for 10 days afterward, either one such drug, propranolol, or a placebo. When tested three months later, half the placebo group but none of the drug-treated group showed signs of stress disorder (Pitman et al., 2002, 2005).

If you suffered a traumatic experience, would you want to take a drug to blunt that memory?

Emotion-triggered hormonal changes help explain why we long remember exciting or shocking events, such as our first kiss or our whereabouts when learning of a friend's death. In a 2006 Pew survey, 95 percent of American adults said they could recall exactly where they were or what they were doing when they first heard the news of the 9/11 attack. This perceived clarity of memories of surprising, significant events leads some psychologists to call them **flashbulb memories.** It's as if the brain commands, "Capture this!" The people who experienced a 1989 San Francisco earthquake did just that. A year and a half later, they had perfect recall of where they had been and what they were doing (verified by their recorded thoughts within a day or two of the quake). Others' memories for the circumstances under which they merely *heard* about the quake were more prone to errors (Neisser et al., 1991; Palmer et al., 1991).

Which is more important—your experiences or your memories of them?

Spencer Platt/Getty Images

Severe stress sears in memories
Significantly stressful events, such as the disastrous 2007 California wildfires, may be an indelible part of the memories of those who experienced them.

Our flashbulb memories are noteworthy for their vividness and the confidence with which we recall them. But as we relive, rehearse, and discuss them, these memories may come to err, as misinformation seeps into them (Talarico et al., 2003; Talarico & Rubin, 2007).

flashbulb memory a clear memory of an emotionally significant moment or event.

amnesia the loss of memory.

Storing Implicit and Explicit Memories

A memory-to-be enters the cortex through the senses, then wends its way into the brain's depths. Precisely where it goes depends on the type of information, as dramatically illustrated by those who, as in the case of my father mentioned earlier, suffer from a type of **amnesia** in which they are unable to form new memories.

The most famous case, a patient known to every neuroscientist as H. M., experienced in 1953 the necessary surgical removal of a brain area involved in laying down new conscious memories of facts and experiences. The brain tissue loss left his older memories intact—many years later, he was still doing daily crossword puzzles. But converting new experiences to long-term storage was another matter. "I've known H. M. since 1962, and he still doesn't know who I am," noted his longtime researcher Suzanne Corkin (Adelson, 2005).

Neurologist Oliver Sacks (1985, pp. 26–27) described another such patient, Jimmie, who had brain damage. Jimmie had no memories—thus, no sense of elapsed time—beyond his injury in 1945. Asked in 1975 to name the U.S. President, he replied, "FDR's dead. Truman's at the helm."

When Jimmie gave his age as 19, Sacks set a mirror before him: "Look in the mirror and tell me what you see. Is that a 19-year-old looking out from the mirror?"

Jimmie turned ashen, gripped the chair, cursed, then became frantic: "What's going on? What's happened to me? Is this a nightmare? Am I crazy? Is this a joke?" When his attention was diverted to some children playing baseball, his panic ended, the dreadful mirror forgotten.

Sacks showed Jimmie a photo from *National Geographic*. "What is this?" he asked.

"It's the Moon," Jimmie replied.

"No, it's not," Sacks answered. "It's a picture of the Earth taken from the Moon."

"Doc, you're kidding? Someone would've had to get a camera up there!"

"Naturally."

"Hell! You're joking—how the hell would you do that?" Jimmie's wonder was that of a bright young man from 60 years ago reacting with amazement to his travel back to the future.

Careful testing of these unique people reveals something even stranger: Although incapable of recalling new facts or anything they have done recently, Jimmie and others with similar conditions can learn. Shown hard-to-find figures in pictures (in the *Where's Waldo?* series), they can quickly spot them again later. They can find their way to the bathroom, though without being able to tell you where it is. They can learn to read mirror-image writing or do a jigsaw puzzle, and they have even been taught complicated job skills (Schacter, 1992, 1996; Xu & Corkin, 2001). And they can be classically conditioned. However, *they do all these things with no awareness of having learned them.* For example, over many practice sessions, H. M. became skilled at what is for anyone an initially difficult task: tracing the mirrored outline of a star. Yet, with no memory of having done the task in many practice trials, H. M. remarked to researcher Brenda Milner that "this was easier than I thought it would be" (Carey, 2008).

http://www.nytimes.com/2008/12/05/us/05hm.html.

"The most important person in the history of brain science." So said the *New York Times* of H. M., revealed at his death in 2008 to be Henry Molaison. H. M. died at age 82 in a Connecticut nursing home.

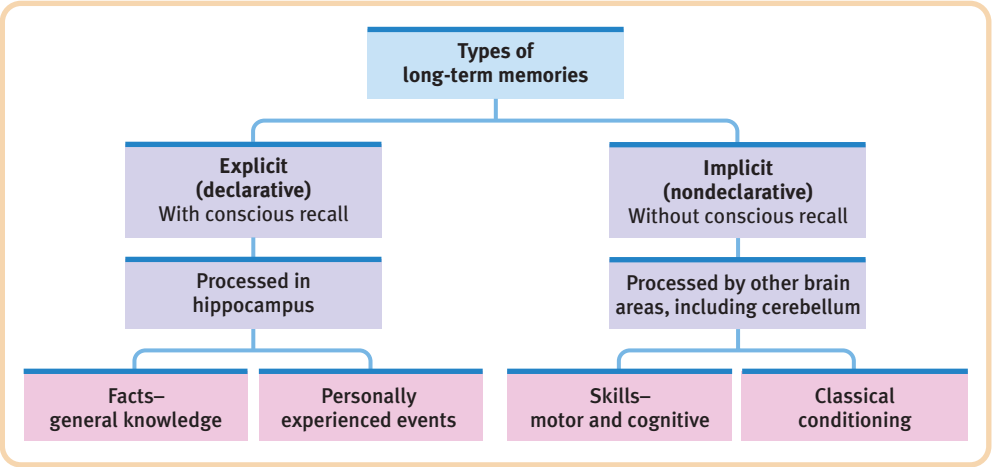


FIGURE 20.13 Memory subsystems We process and store our explicit and implicit memories separately. Thus, people with brain damage may lose explicit memory (becoming amnesic), yet display implicit memory for material they cannot consciously recall.

implicit memory retention independent of conscious recollection. (Also called *nondeclarative memory*.)

explicit memory memory of facts and experiences that one can consciously know and "declare." (Also called *declarative memory*.)

hippocampus a neural center that is located in the limbic system; helps process explicit memories for storage.

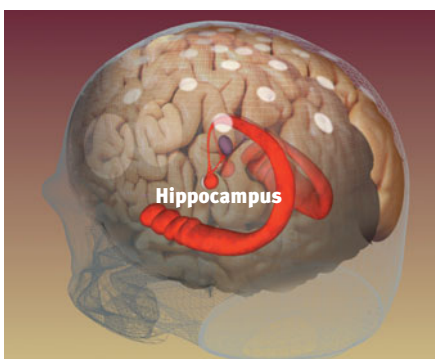
These amnesia victims are in some ways like people with brain damage who cannot consciously recognize faces but whose physiological responses to familiar faces reveal an *implicit* (unconscious) recognition. Their behaviors challenge the idea that memory is a single, unified, conscious system. Instead, we seem to have two memory systems operating in tandem (FIGURE 20.13). Whatever has destroyed *conscious* recall in these individuals with amnesia has not destroyed their *unconscious* capacity for learning. They can learn *how* to do something. Their **implicit memory** *(nondeclarative memory)* will be intact—having read a story once, they will read it faster a second time. But they may not know and declare that they know. There will be no **explicit memory** *(declarative memory)*, for they cannot recall having seen the story before. If repeatedly shown the word *perfume*, they will not recall having seen it. But if asked the first word that comes to mind in response to the letters *per*, they say *perfume*, readily displaying their learning. Using such tasks, even Alzheimer's patients, whose explicit memories for people and events are lost, display an ability to form new implicit memories (Lustig & Buckner, 2004).

These remarkable stories provoke us to wonder: Do our explicit and implicit memory systems involve separate brain regions? Research indicates that they do. Memory may seem to be a single ability, but it is not. Rather, our two-track memory system splits information into different components for separate and simultaneous processing.

"[Brain-scanning] technologies are revolutionizing the study of the brain and mind in the same way that the telescope revolutionized the study of the heavens."

—Endel Tulving (1996)

FIGURE 20.14 The hippocampus Explicit memories for facts and episodes are processed in the hippocampus and fed to other brain regions for storage.



Weidenfield & Nicolson archives

The Hippocampus

Brain scans, such as PET scans of people recalling words (Squire, 1992), and autopsies of people who had amnesia, reveal that new explicit memories of names, images, and events are laid down via the **hippocampus,** a temporal lobe neural center that also forms part of the brain's limbic system (FIGURE 20.14; Anderson et al., 2007).

Damage to the hippocampus therefore disrupts some types of memory. Chickadees and other birds can store food in hundreds of places and return to these unmarked caches months later, but not if their hippocampus has been removed (Kamil & Cheng, 2001; Sherry & Vaccarino, 1989). Like the brain's cortex, the hippocampus is lateralized. (You have two of them, one just above each ear and about an inch and a half straight in.) Damage to one or the other seems to produce different results. With left-hippocampus damage, people have trouble remembering verbal information, but they have no trouble recalling visual designs and locations. With right-hippocampus damage, the problem is reversed (Schacter, 1996).

New research also pinpoints the functions of subregions of the hippocampus. One part is active as people learn to associate names with faces (Zeineh et al., 2003). Another part is active as memory whizzes engage in spatial mnemonics (Maguire et al., 2003b). The rear area, which processes spatial memory, also grows bigger the longer a London cabbie has been navigating the maze of city streets (Maguire et al., 2003a).

The hippocampus is active during slow-wave sleep, as memories are processed and filed for later retrieval. The greater the hippocampus activity during sleep after a training experience, the better the next day's memory (Peigneux et al., 2004). But those memories are not permanently stored in the hippocampus. Instead, it seems to act as a loading dock where the brain registers and temporarily holds the elements of a remembered episode—its smell, feel, sound, and location. Then, like older files shifted to a basement storeroom, memories migrate for storage elsewhere. Sleep supports this memory consolidation. During sleep, our hippocampus and brain cortex display simultaneous activity rhythms, as if they were having a dialogue (Euston et al., 2007; Mehta, 2007). Researchers suspect that the brain is replaying the day's experiences as it transfers them to the cortex for long-term storage.

Once stored, our mental encores of these past experiences activate various parts of the frontal and temporal lobes (Fink et al., 1996; Gabrieli et al., 1996; Markowitsch, 1995). Recalling a telephone number and holding it in working memory, for example, would activate a region of the left frontal cortex; recalling a party scene would more likely activate a region of the right hemisphere.

The Cerebellum Although your hippocampus is a temporary processing site for your *explicit* memories, you could lose it and still lay down memories for skills and conditioned associations. Joseph LeDoux (1996) recounted the story of a brain-damaged patient whose amnesia left her unable to recognize her physician as, each day, he shook her hand and introduced himself. One day, after reaching for his hand, she yanked hers back, for the physician had pricked her with a tack in his palm. The next time he returned to introduce himself she refused to shake his hand but couldn't explain why. Having been classically conditioned, she just wouldn't do it.

The *cerebellum,* the brain region extending out from the rear of the brainstem (**FIGURE 20.15**), plays a key role in forming and storing the implicit memories created by classical conditioning. With a damaged cerebellum, people cannot develop certain conditioned reflexes, such as associating a tone with an impending puff of air—and thus do not blink in anticipation of the puff (Daum & Schugens, 1996; Green & Woodruff-Pak, 2000). By methodically disrupting the function of different pathways in the cortex and cerebellum of rabbits, researchers have shown that rabbits also fail to learn a conditioned eyeblink response when the cerebellum is temporarily deactivated (Krupa et al., 1993; Steinmetz, 1999). Implicit memory formation needs the cerebellum.

Our dual explicit-implicit memory system helps explain *infantile amnesia:* The implicit reactions and skills we learned during infancy reach far into our future, yet as adults we recall nothing (explicitly) of our first three years. Children's explicit memories have a seeming half-life. In one study, events experienced and discussed with one's mother at age 3 were 60 percent remembered at age 7 but only 34 percent remembered at age 9 (Bauer et al., 2007). As adults, our conscious memory of our first three years is blank because we index so much of our explicit memory by words that nonspeaking children have not learned, but also because the hippocampus is one of the last brain structures to mature.

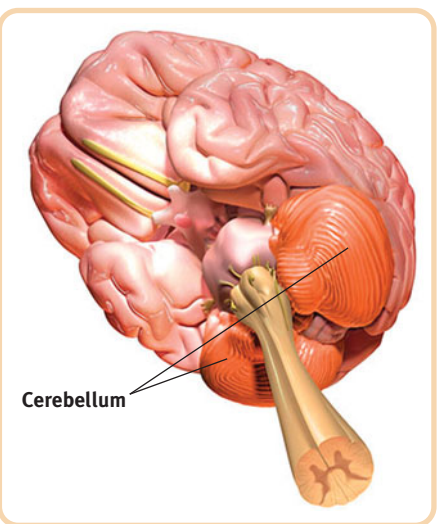
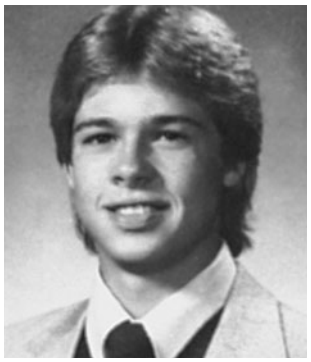


FIGURE 20.15 The cerebellum The cerebellum plays an important part in our forming and storing of implicit memories.



Both Photos Spanky's Yearbook Archive

Remembering things past Even if Oprah Winfrey and Brad Pitt had not become famous, their high school classmates would most likely still recognize their yearbook photos.

Multiple-choice questions test our
a. recall.
b. recognition.
c. relearning.

Fill-in-the-blank questions test our _____.
(See inverted answers below.)

Multiple-choice questions test recognition. Fill-in-the-blank questions test recall.

Retrieval: Getting Information Out

20-7: How do we get information out of memory?

To remember an event requires more than getting it in (encoding) and retaining it (storage). To most people, memory is **recall,** the ability to retrieve information not in conscious awareness. To a psychologist, memory is any sign that something learned has been retained. So **recognizing** or more quickly **relearning** information also indicates memory.

Long after you cannot recall most of the people in your high school graduating class, you may still be able to recognize their yearbook pictures from a photographic lineup and pick their names from a list of names. Harry Bahrick and his colleagues (1975) reported that people who had graduated 25 years earlier could not *recall* many of their old classmates, but they could *recognize* 90 percent of their pictures and names. If you are like most students, you, too, could likely recognize more names of the Seven Dwarfs than you could recall (Miserandino, 1991).

Our recognition memory is impressively quick and vast. "Is your friend wearing a new or old outfit?" "Old." "Is this five-second movie clip from a film you've ever seen?" "Yes." "Have you ever seen this person before—this minor variation on the same old human features (two eyes, one nose, and so on)?" "No." Before the mouth can form our answer to any of millions of such questions, the mind knows, and knows that it knows.

Our speed at relearning also reveals memory. If you once learned something and then forgot it, you probably will relearn it more quickly your second time around. When you study for a final exam or resurrect a language used in early childhood, the relearning is easier. Tests of recognition and of time spent relearning confirm the point: We remember more than we can recall.

"Memory is not like a container that gradually fills up; it is more like a tree growing hooks onto which memories are hung."

—Peter Russell, *The Brain Book,* 1979

Retrieval Cues

Imagine a spider suspended in the middle of her web, held up by the many strands extending outward from her in all directions to different points (perhaps a window sill, a tree branch, a leaf on a shrub). If you were to trace a pathway to the spider, you would first need to create a path from one of these anchor points and then follow the strand down into the web.

The process of retrieving a memory follows a similar principle, because memories are held in storage by a web of associations, each piece of information interconnected with others. When you encode into memory a target piece of information, such as the name of the person sitting next to you in class, you associate with it other bits of information about your surroundings, mood, seating position, and so on. These bits can serve as *retrieval cues,* anchor points you can use to access the target information when you want to retrieve it later. The more retrieval cues you have, the better your chances of finding a route to the suspended memory.

Do you recall the gist of the second sentence I asked you to remember, in the discussion of what we encode? If not, does the word *shark* serve as a retrieval cue? Experiments show that *shark* (likely what you visualized) more readily retrieves the image you stored than does the sentence's actual word, *fish* (Anderson et al., 1976). (The sentence was "The fish attacked the swimmer.")

Mnemonic devices—ROY G. BIV; HOMES; bun, shoe, tree—provide us with handy retrieval cues. But the best retrieval cues come from associations we form at the time we encode a memory. Tastes, smells, and sights often evoke our recall of associated episodes. To call up visual cues when trying to recall something, we may mentally place ourselves in the original context. After losing his

"Let me refresh your memory. It was the night before Christmas and all through the house not a creature was stirring until you landed a sled, drawn by reindeer, on the plaintiff's home, causing extensive damage to the roof and chimney."

sight, John Hull (1990, p. 174) described his difficulty recalling such details: "I knew I had been somewhere, and had done particular things with certain people, but where? I could not put the conversations . . . into a context. There was no background, no features against which to identify the place. Normally, the memories of people you have spoken to during the day are stored in frames which include the background."

The features Hull was mourning are the strands we activate to retrieve a specific memory from its web of associations. Philosopher-psychologist William James referred to this process, which we call **priming,** as the "wakening of associations." Often our associations are activated, or primed, without our awareness. As **FIGURE 20.16** indicates, seeing or hearing the word *rabbit* primes associations with *hare*, even though we may not recall having earlier seen or heard *rabbit.*

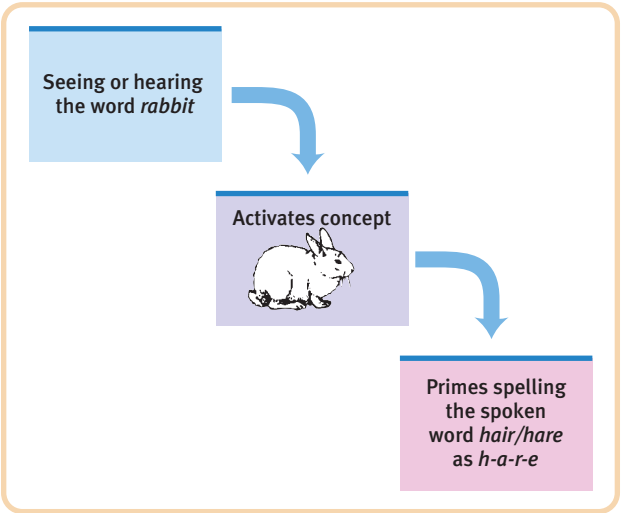


FIGURE 20.16 Priming—awakening associations After seeing or hearing *rabbit,* we are later more likely to spell the spoken word as *h-a-r-e.* The spreading of associations unconsciously activates related associations. This phenomenon is called priming. (Adapted from Bower, 1986.)

Priming is often "memoryless memory"—invisible memory without explicit remembering. If, walking down a hallway, you see a poster of a missing child, you will then unconsciously be primed to interpret an ambiguous adult-child interaction as a possible kidnapping (James, 1986). Although you don't consciously remember the poster, it predisposes your interpretation.

recall a measure of memory in which the person must retrieve information learned earlier, as on a fill-in-the-blank test.

recognition a measure of memory in which the person need only identify items previously learned, as on a multiple-choice test.

relearning a measure of memory that assesses the amount of time saved when learning material for a second time.

priming the activation, often unconsciously, of particular associations in memory.

Context Effects

20-8: How do external contexts and internal emotions influence memory retrieval?

Putting yourself back in the context where you experienced something can prime your memory retrieval. Duncan Godden and Alan Baddeley (1975) discovered this when they had scuba divers listen to a list of words in two different settings, either 10 feet underwater or sitting on the beach. As **FIGURE 20.17** illustrates, the divers recalled more words when they were tested in the same place.

Ask a friend two rapid-fire questions: (a) How do you pronounce the word spelled by the letters s-h-o-p*? (b) What do you do when you come to a green light? If your friend answers "stop" to the second question, you have demonstrated priming.*

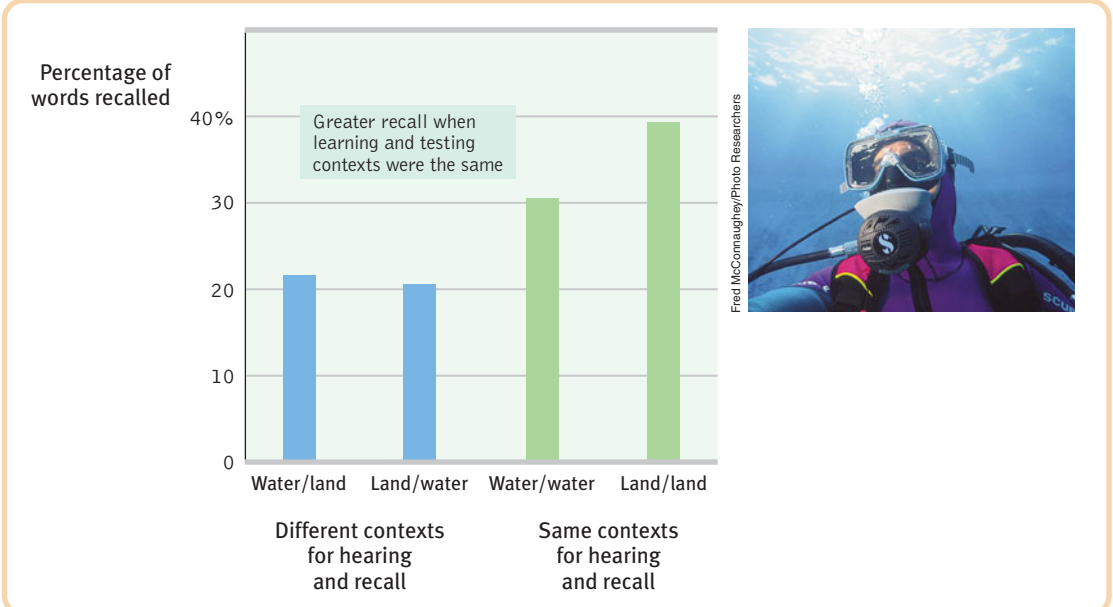


FIGURE 20.17 The effects of context on memory Words heard underwater are best recalled underwater; words heard on land are best recalled on land. (Adapted from Godden & Baddeley, 1975.)

déjà vu that eerie sense that "I've experienced this before." Cues from the current situation may subconsciously trigger retrieval of an earlier experience.

mood-congruent memory the tendency to recall experiences that are consistent with one's current good or bad mood.

You may have experienced similar context effects. Consider this scenario: While taking notes from this book, you realize you need to sharpen your pencil. You get up and walk downstairs, but then you cannot remember why. After returning to your desk it hits you: "I wanted to sharpen this pencil!" What happens to create this frustrating experience? In one context (desk, reading psychology), you realize your pencil needs sharpening. When you go downstairs into a different context, you have few cues to lead you back to that thought. When you are once again at your desk, you are back in the context in which you encoded the thought ("This pencil is dull").

In several experiments, Carolyn Rovee-Collier (1993) found that a familiar context can activate memories even in 3-month-olds. After infants learned that kicking a crib mobile would make it move (via a connecting ribbon from the ankle), the infants kicked more when tested again in the same crib with the same bumper than when in a different context.

Sometimes, being in a context similar to one we've been in before may trigger the experience of **déjà vu** (French for "already seen"). Two-thirds of us have experienced this fleeting, eerie sense that "I've been in this exact situation before," but it happens most commonly to well-educated, imaginative young adults, especially when tired or stressed (Brown, 2003, 2004b; McAneny, 1996). Some wonder, "How could I recognize a situation I'm experiencing for the first time?" Others may think of reincarnation ("I must have experienced this in a previous life") or precognition ("I viewed this scene in my mind before experiencing it").

"Do you ever get that strange feeling of vujà dé? Not déjà vu; vujà dé. It's the distinct sense that, somehow, something just happened that has never happened before. Nothing seems familiar. And then suddenly the feeling is gone. Vujà dé."

—George Carlin (1937–2008), *Funny Times,* 2001

Posing the question differently ("Why do I feel as though I recognize this situation?"), we can see how our memory system might produce déjà vu (Alcock, 1981). The current situation may be loaded with cues that unconsciously retrieve an earlier, similar experience. (We take in and retain vast amounts of information while hardly noticing and often forgetting where it came from.) Thus, if in a similar context you see a stranger who looks and walks like one of your friends, the similarity may give rise to an eerie feeling of recognition. Having awakened a shadow of that earlier experience, you may think, "I've seen that person in this situation before."

Or perhaps, suggests James Lampinen (2002), a situation seems familiar when moderately similar to several events. Imagine you briefly encounter my dad, my brothers, my sister, my children, and a few weeks later meet me. You might think, "I've been with this guy before." Although no one in my family looks or acts just like me (lucky them), their looks and gestures are somewhat like mine and I might form a "global match" to what you had experienced.

Moods and Memories

Associated words, events, and contexts are not the only retrieval cues. Events in the past may have aroused a specific *emotion* that later primes us to recall its associated events. Cognitive psychologist Gordon Bower (1983) explained it this way: "An emotion is like a library room into which we place memory records. We best retrieve those records by returning to that emotional room." What we learn in one state—be it drunk or sober—may be more easily recalled when we are again in that state, a subtle phenomenon called *state-dependent memory.* What people learn when drunk they don't recall well in *any* state (alcohol disrupts storage). But they recall it slightly better when again drunk. Someone who hides money when drunk may forget the location until drunk again.

Our mood states provide an example of memory's state dependence. Emotions that accompany good or bad events become retrieval cues (Fiedler et al., 2001). Thus, our memories are somewhat **mood-congruent.** If you've had a bad evening—your date never showed, your Toledo Mud Hens hat disappeared, your TV went out 10 minutes before the end of a mystery—your gloomy mood may facilitate recalling other bad times. Being depressed sours memories by priming negative associations, which we then use to explain our current mood. If put in a buoyant mood—whether under hypnosis or just by the day's events (a World Cup soccer victory for the German participants in one study)—people recall the world

"When a feeling was there, they felt as if it would never go; when it was gone, they felt as if it had never been; when it returned, they felt as if it had never gone."

—George MacDonald, *What's Mine's Mine,* 1886

through rose-colored glasses (DeSteno et al., 2000; Forgas et al., 1984; Schwarz et al., 1987). They judge themselves competent and effective, other people benevolent, happy events more likely.

Knowing this mood-memory connection, we should not be surprised that adolescents' ratings of parental warmth in one week give little clue to how they will rate their parents six weeks later (Bornstein et al., 1991). When teens are down, their parents seem inhuman; as their mood brightens, their parents morph from devils into angels. You and I may nod our heads knowingly. Yet, in a good or bad mood, we persist in attributing to reality our own changing judgments and memories.

"I can't remember what we're arguing about, either. Let's keep yelling, and maybe it will come back to us."

Our mood's effect on retrieval helps explain why our moods persist. When happy, we recall happy events and therefore see the world as a happy place, which helps prolong our good mood. When depressed, we recall sad events, which darkens our interpretations of current events. For those of us with a predisposition to depression, this process can help maintain a vicious, dark cycle.

Moods influence not only our memories but also how we interpret *other people's behavior. In a bad mood we read someone's look as a glare and feel even worse; in a good mood we encode the same look as interest and feel even better. Passions exaggerate.*

REVIEWING

Information Processing

Module Review

20-1: How do psychologists describe the human memory system? *Memory* is the persistence of learning over time. The Atkinson-Shiffrin classic three-stage memory model (*encoding*, *storage*, and *retrieval*) suggests that we (1) register fleeting *sensory memories*, some of which are (2) processed into on-screen *short-term memories*, a tiny fraction of which are (3) encoded for *long-term memory* and later retrieval. Two new concepts update the classic model: (a) We register some information automatically, directly into long-term memory. And (b) the term *working memory* (rather than *short-term memory*) emphasizes the active processing that occurs in the second stage.

20-2: What information do we encode automatically? What information do we encode effortfully, and how does the distribution of practice influence retention? In *automatic processing*, we unconsciously absorb information about space, time, frequency, and well-learned material. *Effortful processing* (of meaning, imagery, organization) requires conscious attention and deliberate effort. We retain information more easily if we practice it repeatedly (the *spacing effect*) than if we practice it in one long cram session. The *serial position effect* is the tendency to recall best the first and last items in a list.

20-3: What effortful processing methods aid in forming memories? We process information by encoding its meaning and by encoding *imagery*, as when using some *mnemonic* devices. We also mentally organize information through *chunking* and hierarchies, for easier retrieval.

20-4: What are two components of sensory memory? As information enters the memory system through our senses, we briefly register and store visual images via *iconic memory*, in which images last no more than a few tenths of a second. We register and store sounds via *echoic memory*, where sound echoes may linger as long as 3 or 4 seconds.

20-5: What are the duration and capacity of short-term and of long-term memory? Without *rehearsal*, short-term memory is limited in duration (a few seconds) and in capacity (about seven items of information, either new or retrieved from our memory store). Our capacity for storing information permanently in long-term memory is essentially unlimited.

20-6: How does the brain store our memories? *Long-term potentiation (LTP)* appears to be the neural basis for learning and memory. Stress triggers hormonal changes that arouse brain areas and can produce indelible memories. We are particularly likely to remember emotionally significant events that form *flashbulb memories*. We have a dual-track memory system. *Explicit* (declarative) *memories* of general knowledge, facts, and experiences are processed by the *hippocampus*. *Implicit* (nondeclarative) *memories* of skills and conditioned responses are processed by other parts of the brain, including the cerebellum.

20-7: How do we get information out of memory? *Recall* is the ability to retrieve information not in conscious awareness; a fill-in-the-blank question tests recall. *Recognition* is the ability to

identify items previously learned; a multiple-choice question tests recognition. *Relearning* is the ability to master previously stored information more quickly than you originally learned it. Retrieval cues catch our attention and tweak our web of associations, helping to move target information into conscious awareness. *Priming* is the process of activating associations (often unconsciously).

20-8: How do external contexts and internal emotions influence memory retrieval? The context in which we originally experienced an event or encoded a thought can flood our memory with retrieval cues. Cues triggered by a different but similar context can trick us into believing we have had the experience before, a feeling known as *déjà vu.* Specific emotions can prime us to retrieve memories consistent with that state, a phenomenon known as *mood-congruent memory*.

Rehearse It!

1. The psychological terms for taking in information, retaining it, and later getting it back out are

a. retrieval, encoding, and storage.
b. encoding, storage, and retrieval.
c. storage, encoding, and retrieval.
d. retrieval, storage, and encoding.

2. Short-term memory is an intermediate memory stage where information is held before it is stored or forgotten. The newer concept of working memory

a. clarifies the idea of short-term memory by focusing on the active processing that occurs in this stage.
b. splits short-term memory into two substages—sensory memory and working memory.
c. splits short-term memory into two areas—working (retrievable) memory and inaccessible memory.
d. clarifies the idea of short-term memory by focusing on space, time, and frequency.

3. Rehearsal, the conscious repetition of information a person wants to remember, is part of

a. automatic processing.
b. effortful processing.
c. forgetting.
d. retrieval.

4. When tested immediately after viewing a list of words, people tend to recall the first and last items more readily than those in the middle. When retested after a delay, they are most likely to recall

a. the first items on the list.
b. the first and last items on the list.
c. a few items at random.
d. the last items on the list.

5. Memory aids that use visual imagery, peg-words, or other organizational devices are called

a. encoders.
b. nonsense material.
c. acoustic clues.
d. mnemonics.

6. Organizing information into broad categories, which are then divided into subcategories, is known as

a. the serial position effect.
b. the peg-word system.
c. hierarchical organization.
d. creating acronyms.

7. Sensory information is initially recorded in our sensory memory. This memory may be visual (_____ memory) or auditory (_____ memory).

a. implicit; explicit
b. iconic; echoic
c. declarative; nondeclarative
d. long-term; short-term

8. Our short-term memory for new information is limited; its capacity is about

a. 20 items.
b. 18 items.
c. 7 items.
d. 3 items.

9. Long-term potentiation (LTP) seems to provide a neural basis for learning and memory. LTP refers to

a. emotion-triggered hormonal changes.
b. the role of the hippocampus in processing explicit memories.
c. an increase in a synapse's firing potential after brief, rapid stimulation.
d. aging people's potential for learning.

10. Amnesia following hippocampus damage typically leaves people unable to learn new facts or recall recent events. However, they may be able to learn new skills, such as riding a bicycle, which is an _____ memory.

a. explicit
b. implicit
c. iconic
d. echoic

11. The hippocampus seems to function as a

a. temporary processing site for explicit memories.
b. temporary processing site for implicit memories.
c. permanent storage area for emotion-based memories.
d. permanent storage area for iconic and echoic memories.

12. A psychologist who asks you to write down as many objects as you can remember having seen a few minutes earlier is testing your

a. recall.
b. recognition.
c. recall and recognition.
d. relearning.

13. Specific odors, visual images, emotions, or other associations that help us access a memory are examples of

a. relearning.
b. déjà vu.
c. declarative memories.
d. retrieval cues.

14. When retrieval cues trigger the feeling that "I've been here before," you are experiencing

a. déjà vu.
b. mood-congruent memory.
c. relearning.
d. an explicit memory.

15. Our tendency to recall experiences consistent with our current emotions is called

a. mnemonics.
b. chunking.
c. repression.
d. mood-congruent memory.

Answers: 1. b, 2. a, 3. b, 4. a, 5. d, 6. c, 7. b, 8. c, 9. c, 10. b, 11. a, 12. a, 13. d, 14. a, 15. d.

Terms and Concepts to Remember

memory, p. 271
encoding, p. 272
storage, p. 272
retrieval, p. 272
sensory memory, p. 272
short-term memory, p. 272
long-term memory, p. 272
working memory, p. 273
automatic processing, p. 273
effortful processing, p. 273
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mood-congruent memory, p. 288

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. What would be the most effective strategy to learn and retain a list of names of key historical figures for a week? For a year?
2. Maria has always loved to wear winter clothing. The sensation of being bundled up makes her feel safe and secure. How might her preference be related to her January birth in Chicago?
3. When you feel sad, why might it help to look at pictures that reawaken some of your best memories?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

21

"Amnesia seeps into the crevices of our brains, and amnesia heals."

—Joyce Carol Oates, "Words Fail, Memory Blurs, Life Wins," 2001

Forgetting, Memory Construction, and Improving Memory

Forgetting

21-1: Why do we forget?

Amid all the applause for memory—all the efforts to understand it, all the books on how to improve it—have any voices been heard in praise of forgetting? William James (1890, p. 680) was such a voice: "If we remembered everything, we should on most occasions be as ill off as if we remembered nothing." To discard the clutter of useless or out-of-date information—where we parked the car yesterday, a friend's old phone number, restaurant orders already cooked and served—is surely a blessing. Russian memory whiz Shereshevskii accumulated a junk heap of memories that haunted him. They dominated his consciousness. He had difficulty thinking abstractly—generalizing, organizing, evaluating. After reading a story, he could recite it but would struggle to summarize its gist.

Robert Hanashiro, *USA Today*

The woman who can't forget "A. J." in real life is Jill Price, who, with writer Bart Davis, told her story in a 2008 published memoir. Price remembers every day of her life since age 14 with detailed clarity, including both the joys and the unforgotten hurts.

A more recent case of a life overtaken by memory is "A. J.," whose experience has been studied and verified by a University of California at Irvine research team (Parker et al., 2006). A. J., who has identified herself as Jill Price, describes her memory as "like a running movie that never stops. It's like a split screen. I'll be talking to someone and seeing something else. . . . Whenever I see a date flash on the television (or anywhere for that matter) I automatically go back to that day and remember where I was, what I was doing, what day it fell on, and on and on and on and on. It is nonstop, uncontrollable, and totally exhausting." A good memory is helpful, but so is the ability to forget. If a memory-enhancing pill becomes available, it had better not be *too* effective.

More often, however, our memory dismays and frustrates us. Memories are quirky. My own memory can easily call up such episodes as that wonderful first kiss with the woman I love or trivial facts like the air mileage from London to Detroit. Then it abandons me when I discover I have failed to encode, store, or retrieve my new colleague's name or where I left my sunglasses.

Cellist Yo-Yo Ma forgot his 266-year-old, $2.5 million cello in a New York taxi. (He later recovered it.).

"Each of us finds that in [our] own life every moment of time is completely filled. [We are] bombarded every second by sensations, emotions, thoughts . . . nine-tenths of which [we] must simply ignore. The past [is] a roaring cataract of billions upon billions of such moments: Any one of them too complex to grasp in its entirety, and the aggregate beyond all imagination. . . . At every tick of the clock, in every inhabited part of the world, an unimaginable richness and variety of 'history' falls off the world into total oblivion."

—English novelist-critic C. S. Lewis (1967)

Encoding Failure

Much of what we sense we never notice, and what we fail to encode, we will never remember (**FIGURE 21.1**). Age can affect encoding efficiency. The brain areas that jump into action when young adults encode new information are less responsive in older adults. This slower encoding helps explain age-related memory decline (Grady et al., 1995).

But no matter how young we are, we selectively attend to few of the myriad sights and sounds continually bombarding us. Consider something you have looked at countless times: What letters accompany the number 5 on your telephone? For people who don't text message, the question is surprisingly difficult. This detail is not personally meaningful, and few of us have made the effort to encode it. Some information—where we had dinner yesterday—we encode automatically; other types of information—like the concepts in this chapter—require effortful processing. Without effort, many memories never form.

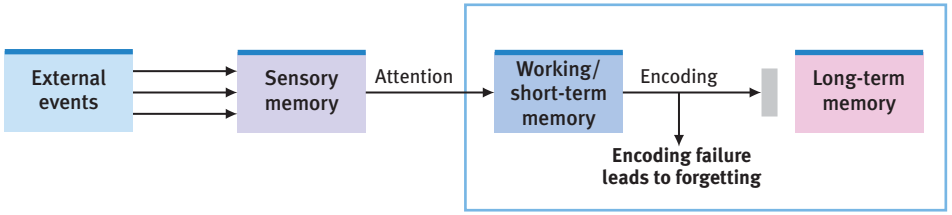
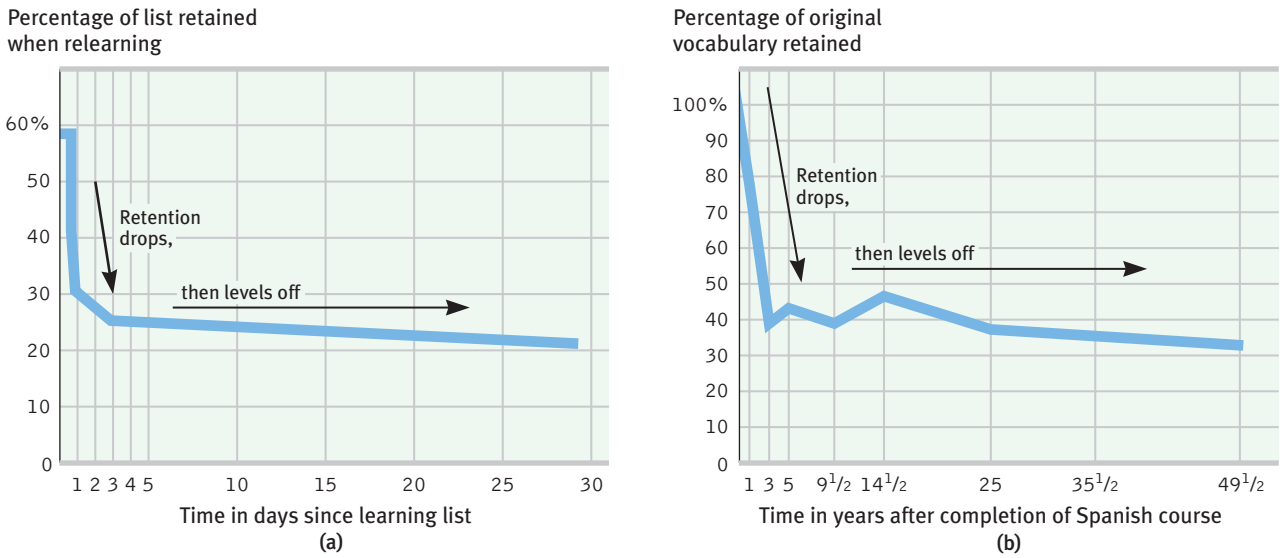


FIGURE 21.1 Forgetting as encoding failure We cannot remember what we have not encoded.

Storage Decay

Even after encoding something well, we sometimes later forget it. To study the durability of stored memories, German philosopher Hermann Ebbinghaus (1885) learned lists of nonsense syllables and measured how much he retained when relearning each list, from 20 minutes to 30 days later. The result, confirmed by later experiments, was his famous forgetting curve (**FIGURE 21.2a**): The course of forgetting is initially rapid, then levels off with time (Wixted & Ebbesen, 1991). One such experiment was Harry Bahrick's (1984) study of the forgetting curve for Spanish vocabulary learned in school. Compared with those just completing a high school or college Spanish course, people 3 years out of school had forgotten much of what they had learned (Figure 21.2b). However, what people remembered then, they still remembered 25 and more years later. Their forgetting had leveled off.

FIGURE 21.2 Two forgetting curves (a) After learning lists of nonsense syllables, Ebbinghaus studied how much he retained up to 30 days later. He found that memory for novel information fades quickly, then levels out. (Adapted from Ebbinghaus, 1885.) (b) Compared with those just completing a Spanish course, people 3 years out of the course remembered much less. Compared with the 3-year group, however, those who studied Spanish even longer ago did not forget much more. (Adapted from Bahrick, 1984.)



One explanation for these forgetting curves is a gradual fading of the physical memory trace. Cognitive neuroscientists are getting closer to solving the mystery of the physical storage of memory and are increasing our understanding of how memory storage could decay. But memories fade for other reasons, including the accumulation of learning that disrupts our retrieval.

Retrieval Failure

Forgotten events are like books you can't find in your campus library—some because they were never acquired (not encoded), others because they were discarded (stored memories decay).

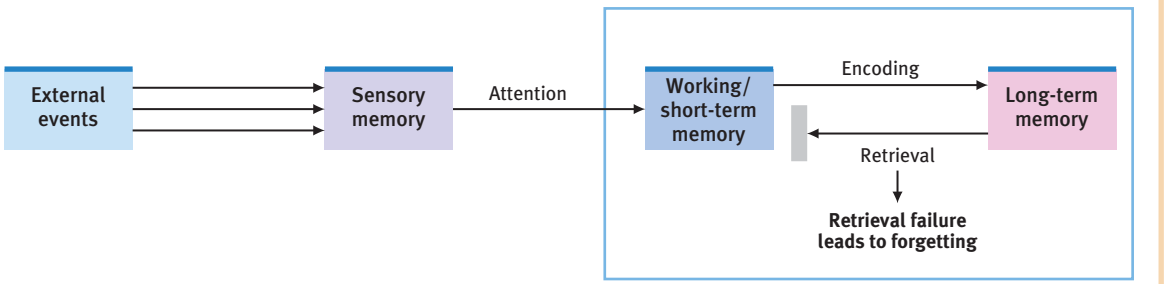


FIGURE 21.3 Retrieval failure We store in long-term memory what's important to us or what we've rehearsed. But sometimes even stored information cannot be accessed, which leads to forgetting.

But there is a third possibility: The book may be there but inaccessible because we don't have enough information to look it up and retrieve it. How frustrating when we know information is "in there," but we cannot get it out (**FIGURE 21.3**), as when a name lies poised on the tip of our tongue, waiting to be retrieved. Given retrieval cues ("It begins with an *M*"), we may easily access the elusive memory. Retrieval problems contribute to the occasional memory failures of older adults, who more frequently are frustrated by tip-of-the-tongue forgetting (Abrams, 2008). Often, forgetting is not memories discarded but memories unretrieved.

Deaf persons fluent in sign language experience a parallel "tip of the fingers" phenomenon (Thompson et al., 2005).

Interference

Learning some items may interfere with retrieving others, especially when the items are similar. If someone gives you a phone number, you may be able to recall it later. But if two more people give you their numbers, each successive number will be more difficult to recall. Likewise, if you buy a new combination lock, your memory of the old one may interfere. Such **proactive** *(forward-acting)* **interference** occurs when something you learned earlier disrupts your recall of something you experience later. As you collect more and more information, your mental attic never fills, but it certainly gets cluttered.

Retroactive *(backward-acting)* **interference** occurs when new information makes it harder to recall something you learned earlier. It is rather like a second stone tossed in a pond, disrupting the waves rippling out from a first. (See Close-Up: Retrieving Passwords.)

proactive interference the disruptive effect of prior learning on the recall of new information.

retroactive interference the disruptive effect of new learning on the recall of old information.

Information presented in the hour before sleep is protected from retroactive interference because the opportunity for interfering events is minimized. Researchers John Jenkins and Karl Dallenbach (1924) discovered this in a now-classic experiment. Day after day, two people each learned some nonsense syllables, then tried to recall them after up to eight hours of being awake or asleep at night. As **FIGURE 21.4** shows, forgetting occurred more rapidly after being awake and involved with other

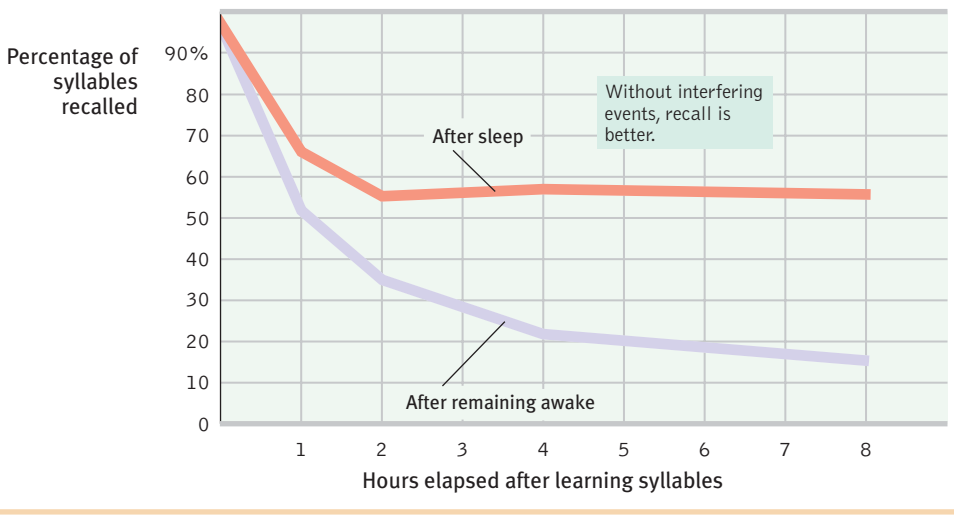


FIGURE 21.4 Retroactive interference More forgetting occurred when a person stayed awake and experienced other new material. (From Jenkins & Dallenbach, 1924.)

Close-Up:

Retrieving Passwords

There's something that you need lots of, and that your grandparents at your age didn't: passwords. To log into your e-mail, retrieve your voice mail, draw cash from a machine, access your phone card, use the copy machine, or persuade the keypad to open the building door, you need to remember your password. A typical student faces eight demands for passwords (Brown et al., 2004).

With so many passwords needed, what's a person to do? As **FIGURE 21.5** illustrates, we are plagued by proactive interference from irrelevant old information and retroactive interference from other newly learned information.

Memory researcher Henry Roediger takes a simple approach to storing all the important phone, PIN, and code numbers in his life: "I have a sheet in my shirt pocket with all the numbers I need," says Roediger (2001), adding that he can't mentally store them all, so why bother? Other strategies may help those who do not want to lose their PINs in the wash. First, *duplicate*. The average student uses four different passwords to meet those eight needs. Second, *harness retrieval cues*. Surveys in Britain and the United States reveal that about half of our passwords harness a familiar name or date. Others often involve familiar phone or identification numbers.

Third, in online banking or other situations where security is essential, *use a mix of letters and numbers* (Brown et al., 2004). Rehearse that password, then rehearse it a day later, and continue rehearsing at increasing intervals. In such ways, long-term memories will form and be retrievable at the cash and copy machines.

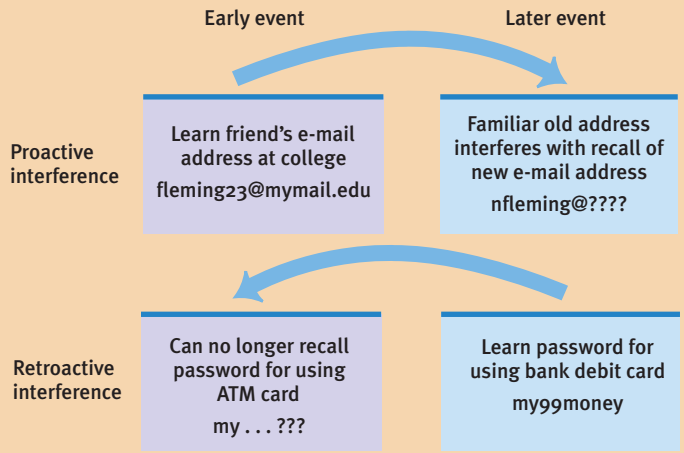


FIGURE 21.5 Proactive and retroactive interference

activities. The investigators surmised that "forgetting is not so much a matter of the decay of old impressions and associations as it is a matter of interference, inhibition, or obliteration of the old by the new" (1924, p. 612). Later experiments have confirmed the benefits of sleep and found that the hour before a night's sleep is indeed a good time to commit information to memory (Benson & Feinberg, 1977; Fowler et al., 1973; Nesca & Koulack, 1994). But not the seconds just before sleep; information presented then is seldom remembered (Wyatt & Bootzin, 1994). Nor is recorded information played during sleep, although the ears do register it (Wood et al., 1992).

Interference is an important cause of forgetting, and it may explain why ads viewed during attention-grabbing violent or sexual TV programs are so forgettable (Bushman & Bonacci, 2002). But we should not overstate the point. Sometimes old information can facilitate our learning of new information. Knowing Spanish may help us to learn Italian—a phenomenon called *positive transfer*. It is when old and new information compete with each other that interference occurs.

Motivated Forgetting

To remember our past is often to revise it. Years ago, the huge cookie jar in our kitchen was jammed with freshly baked chocolate chip cookies. Still more were cooling across racks on the counter. Twenty-four hours later, not a crumb was left. Who had taken them? During that time, my wife, three children, and I were the only people in the house. So while memories were still fresh, I conducted a little memory test. Andy acknowledged wolfing down as many as 20. Peter admitted eating 15. Laura guessed she had stuffed her then-6-year-old body with 15 cookies. My wife, Carol, recalled eating 6, and I remembered consuming 15 and taking 18 more to the office. We sheepishly accepted responsibility for 89 cookies. Still, we had not come close; there had been 160.

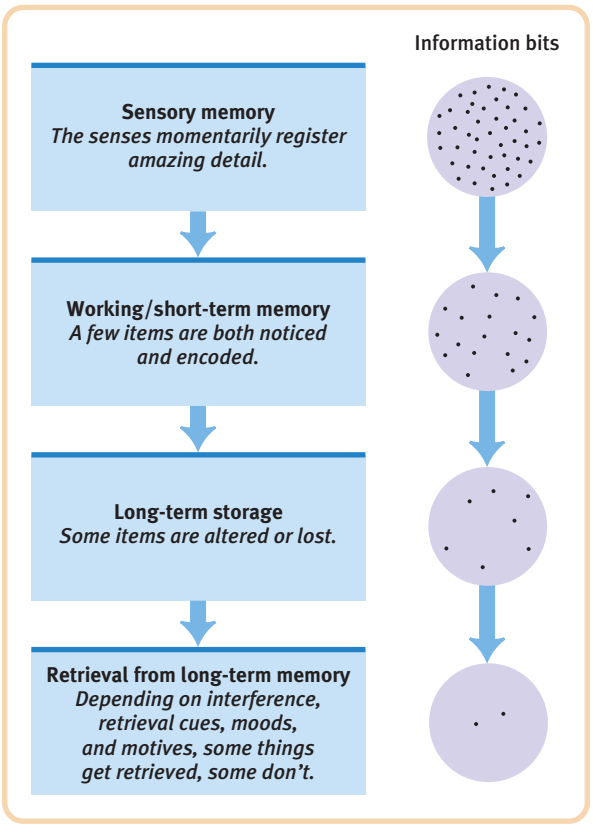


FIGURE 21.6 When do we forget?
Forgetting can occur at any memory stage. As we process information, we filter, alter, or lose much of it.

This would not have surprised Michael Ross and his colleagues (1981), who time and again showed that people unknowingly revise their own histories. One group of people, told the benefits of frequent tooth-brushing, then recalled (more than others did) having frequently brushed their teeth in the preceding two weeks.

Why do our memories fail us? Why did my family and I not remember the number of cookies each of us had eaten? As **FIGURE 21.6** reminds us, we automatically encode sensory information in amazing detail. So was it an encoding problem? Or a storage problem—might our memories of cookies, like Ebbinghaus' memory of nonsense syllables, have vanished almost as fast as the cookies themselves? Or was the information still intact but irretrievable because it would be embarrassing to remember?[1]

Sigmund Freud might have argued that our memory systems self-censored this information. He proposed that we **repress** painful memories to protect our self-concept and to minimize anxiety. But the submerged memory will linger, he believed, to be retrieved by some later cue or during therapy. Here is a sample case. A woman had an intense, unexplained fear of running water. One day her aunt whispered, "I have never told." Like relighting a blown-out candle, these words cued the woman's memory of an incident when, as a disobedient young child, she had wandered away from a family picnic and become trapped under a waterfall—until being rescued by her aunt, who promised not to tell her parents (Kihlstrom, 1990).

Repression was central to Freud's psychology and became part of psychology's lore. Most everyone—including 9 in 10 university students—believes that "memories for painful experiences are sometimes pushed into unconsciousness" (Brown et al., 1996). Therapists often assume it. *Yet increasing numbers of memory researchers think repression rarely, if ever, occurs.* People's efforts to intentionally forget neutral material often succeed, but not when the to-be-forgotten material is emotional (Payne & Corrigan, 2007). Thus, we may have intrusive memories of the very traumatic experiences we would most like to forget.

repression in psychoanalytic theory, the basic defense mechanism that banishes from consciousness anxiety-arousing thoughts, feelings, and memories.

misinformation effect incorporating misleading information into one's memory of an event.

Memory Construction

21-2: How do misinformation, imagination, and source amnesia influence our memory construction?

Picture yourself having this experience:

> You go to a fancy restaurant for dinner. You are seated at a table with a white tablecloth. You study the menu. You tell the server you want prime rib, medium rare, a baked potato with sour cream, and a salad with blue cheese dressing. You also order some red wine from the wine list. A few minutes later the server returns with your salad. Later the rest of the meal arrives. You enjoy it all, except the prime rib is a bit overdone.

Were I immediately to quiz you on this paragraph (adapted from Hyde, 1983), you could surely retrieve considerable detail. For example, without looking back, answer the following questions:

1. What kind of salad dressing did you order?
2. Was the tablecloth red checked?
3. What did you order to drink?
4. Did the server give you a menu?

You were probably able to recall exactly what you ordered, and maybe even the tablecloth color. But did the server give you a menu? Not in the paragraph given. Nevertheless, many answer *yes*. Like scientists who infer a dinosaur's appearance

"Memory isn't like reading a book; it's more like writing a book from fragmentary notes."
—Psychologist John F. Kihlstrom (1994)

[1] One of my cookie-scarfing sons, on reading this in his father's textbook years later, confessed he had fibbed "a little."

from its remains, we infer our past from stored information plus what we later imagined, expected, saw, and heard. We often construct our memories as we encode them and, as Daniel Gilbert noted (2007, p. 79), we don't just retrieve our memories, we reweave them: "Information acquired after an event alters memory of the event."

Misinformation and Imagination Effects

In more than 200 experiments, involving more than 20,000 people, Elizabeth Loftus has shown how eyewitnesses reconstruct their memories when later questioned. In one classic experiment, Loftus and John Palmer showed a film of a traffic accident and then quizzed people about what they had seen (Loftus & Palmer, 1974). Those asked, "How fast were the cars going when they *smashed* into each other?" gave higher speed estimates than those asked, "How fast were the cars going when they *hit* each other?" A week later, the researchers asked both groups if they recalled seeing any broken glass. Those who had heard *smashed* were more than twice as likely to report seeing glass fragments (**FIGURE 21.7**). In fact, the film showed no broken glass.

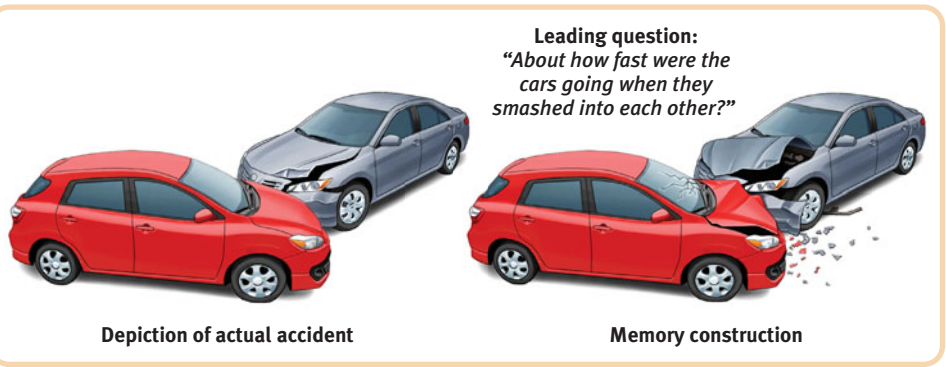


FIGURE 21.7 Memory construction When people who had seen the film of a car accident were later asked a leading question, they recalled a more serious accident than they had witnessed. (From Loftus, 1979.)

In many follow-up experiments around the world, people have demonstrated this **misinformation effect.** After exposure to subtle misinformation, they have misrecalled a yield sign as a stop sign, hammers as screwdrivers, Coke cans as peanut cans, *Vogue* magazine as *Mademoiselle,* "Dr. Henderson" as "Dr. Davidson," breakfast cereal as eggs, and a clean-shaven man as a man with a mustache (Loftus et al., 1992). One experiment showed people digitally altered photos depicting themselves (a pasted image from a childhood family album) taking a hot air balloon ride. After seeing this three times over two weeks, half the participants "remembered" the nonexistent experience, often in rich detail (Wade et al., 2002). The human mind comes with built-in Photoshopping software.

So unwitting is the misinformation effect that we may later find it nearly impossible to discriminate between our memories of real and suggested events (Schooler et al., 1986). Perhaps you can recall recounting an experience and filling in memory gaps with plausible guesses and assumptions. We all do it, and after more retellings, we may recall the guessed details—now absorbed into our memories—as if we had actually observed them (Roediger et al., 1993). Others' vivid retelling of an event may also implant false memories.

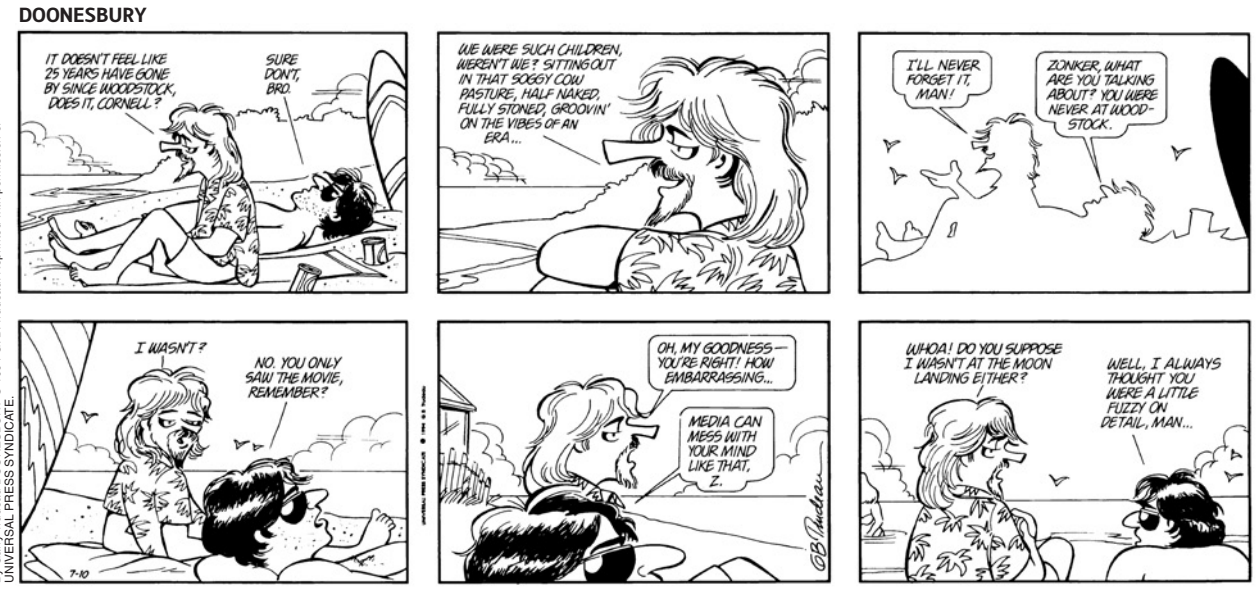
"Memory is insubstantial. Things keep replacing it. Your batch of snapshots will both fix and ruin your memory. . . . You can't remember anything from your trip except the wretched collection of snapshots."

—Annie Dillard, "To Fashion a Text," 1988

Even repeatedly *imagining* nonexistent actions and events can create false memories. Students who repeatedly imagined simple acts (breaking a toothpick, picking up a stapler) were later more likely than others to think they had actually done such things during the experiment's first phase (Goff & Roediger, 1998; Seamon et al., 2006). Similarly, one in four American and British university students asked to imagine certain childhood events, such as breaking a window with their hand or having a skin sample removed from a finger, later recalled the imagined event as something that had really happened (Garry et al., 1996; Mazzoni & Memon, 2003).

This *imagination inflation* occurs partly because visualizing something and actually perceiving it activate similar brain areas (Gonsalves et al., 2004). Imagined events later seem more familiar, and familiar things seem more real. Thus, the more vividly we can imagine things, the more likely we are to inflate them into memories (Loftus, 2001; Porter et al., 2000). People who believe aliens transported them to spaceships for medical exams tend to have powerful imaginations and, in memory tests, to be more susceptible to false memories (Clancy, 2005). Those who believe they have recovered memories of childhood sexual abuse likewise tend to have vivid imaginations and to score high on false memory tests (Clancy et al., 2000; McNally, 2003).

To see how far the mind's search for a fact will go in creating a fiction, Richard Wiseman and his University of Hertfordshire colleagues (1999) staged eight seances,



each attended by 25 curious people. During each session, the medium—actually a professional actor and magician—urged everyone to concentrate on the moving table. Although it never moved, he suggested it had: "That's good. Lift the table up. That's good. Keep concentrating. Keep the table in the air." When questioned two weeks later, 1 in 3 participants recalled actually having seen the table levitate.

Memory construction may explain how faulty eyewitness identification could have helped convict 79 percent of 200 people later exonerated by DNA testing (Garrett, 2008). It explains why "hypnotically refreshed" memories of crimes so easily incorporate errors, some of which originate with the hypnotist's leading questions ("Did you hear loud noises?"). It explains why dating partners who fall in love *over*estimate their first impressions of one another ("It was love at first sight"), while those who break up *under*estimate their earlier liking ("We never really clicked") (McFarland & Ross, 1987). And it explains why people asked how they felt 10 years ago about marijuana or gender issues recall attitudes closer to their current views than to the views they had actually reported a decade earlier (Markus, 1986). How people feel today seems to be how they have always felt. What people know today seems to be what they have always known (Mazzoni & Vannucci, 2007). This is our tendency to *hindsight bias*.

As George Vaillant (1977, p. 197) noted after following adult lives through time, "It is all too common for caterpillars to become butterflies and then to maintain that in their youth they had been little butterflies. Maturation makes liars of us all."

U.S. Senator John McCain on the Iraq war:
2007 (on MSNBC): **"When I voted to support this war I knew it was probably going to be long and hard and tough."**
2002 (on Larry King): **"I believe that the operation will be relatively short [and] that the success will be relatively easy."**

"It isn't so astonishing, the number of things I can remember, as the number of things I can remember that aren't so."
—Mark Twain (1835–1910)

Source Amnesia

Among the frailest parts of a memory is its source. Thus, we may recognize someone but have no idea where we have seen the person. We may dream an event and later be unsure whether it really happened. We may hear something and later recall seeing it (Henkel et al., 2000). In all these cases of **source amnesia** (also called *source misattribution*), we retain the memory of the event but not of the context in which we acquired it.

Authors and songwriters sometimes suffer source amnesia. They think an idea came from their own creative imagination, when in fact they are unintentionally plagiarizing something they earlier read or heard.

Australian psychologist Donald Thompson found his own work on memory distortion haunting him when authorities brought him in for questioning about a rape. Although he was a near-perfect match to the victim's memory of the rapist, he had an airtight alibi. Just before the rape occurred, Thompson was being interviewed on live television. He could not possibly have made it to the crime scene. Then it came to light that the victim had been watching the interview—ironically about face recognition—and had experienced source amnesia, confusing her memories of Thompson with those of the rapist (Schacter, 1996).

source amnesia attributing to the wrong source an event we have experienced, heard about, read about, or imagined. (Also called *source misattribution.*) Source amnesia, along with the misinformation effect, is at the heart of many false memories.

Debra Poole and Stephen Lindsay (1995, 2001, 2002) demonstrated source amnesia among preschoolers. They had the children interact with "Mr. Science," who engaged them in activities such as blowing up a balloon with baking soda and vinegar. Three months later, on three successive days, their parents read them a story

describing some things the children had experienced with Mr. Science and some they had not. When a new interviewer asked what Mr. Science had done with them—"Did Mr. Science have a machine with ropes to pull?"—4 in 10 children spontaneously recalled him doing things that had happened only in the story.

Children's Eyewitness Recall

If memories can be sincere, yet sincerely wrong, might children's recollections of sexual abuse be prone to error? Stephen Ceci (1993) thinks "it would be truly awful to ever lose sight of the enormity of child abuse." Yet, as we have seen, interviewers who ask leading questions can plant false memories. Ceci and Maggie Bruck's (1993, 1995) studies of children's memories have sensitized them to children's suggestibility. For example, they asked 3-year-olds to show on anatomically correct dolls where a pediatrician had touched them. Fifty-five percent of the children who had not received genital examinations pointed to either genital or anal areas. And when the researchers used suggestive interviewing techniques, they found that most preschoolers and many older children could be induced to report false events (Bruck & Ceci, 1999, 2004).

In one study, Ceci and Bruck had a child choose a card from a deck of possible happenings and an adult then read from the card. For example, "Think real hard, and tell me if this ever happened to you. Can you remember going to the hospital with a mousetrap on your finger?" After 10 weekly interviews, with the same adult repeatedly asking children to think about several real and fictitious events, a new adult asked the same question. The stunning result: 58 percent of preschoolers produced false (often vivid) stories regarding one or more events they had never experienced, as this little boy did (Ceci et al., 1994):

> My brother Colin was trying to get Blowtorch [an action figure] from me, and I wouldn't let him take it from me, so he pushed me into the wood pile where the mousetrap was. And then my finger got caught in it. And then we went to the hospital, and my mommy, daddy, and Colin drove me there, to the hospital in our van, because it was far away. And the doctor put a bandage on this finger.

In experiments with adults, suggestive questions ("In fresh water, do snakes swim upside down for about half the time?") are often misremembered as statements (Pandelaere & Dewitte, 2006).

Given such detailed stories, professional psychologists who specialize in interviewing children could not reliably separate real memories from false ones. Nor could the children themselves. The above child, reminded that his parents had told him several times that the mousetrap incident never happened—that he had imagined it—protested, "But it really did happen. I remember it!"

Does this mean that children can never be accurate eyewitnesses? No. If questioned about their experiences in neutral words they understand, children often accurately recall what happened and who did it (Goodman, 2006; Howe, 1997; Pipe, 1996). When interviewers use less suggestive, more effective techniques, even 4- to 5-year-old children produce more accurate recall (Holliday & Albon, 2004; Pipe et al., 2004). Children are especially accurate when they have not talked with involved adults prior to the interview and when their disclosure is made in a first interview with a neutral person who asks nonleading questions.

"[The] research leads me to worry about the possibility of false allegations. It is not a tribute to one's scientific integrity to walk down the middle of the road if the data are more to one side."

—Stephen Ceci (1993)

Repressed or Constructed Memories of Abuse?

21-3: What is the controversy related to claims of repressed and recovered memories?

There are two tragedies related to adult recollections of child abuse. One is trauma survivors being disbelieved when telling their secret. The other is innocent people being falsely accused. What, then, shall we say about clinicians who have guided people in "recovering" memories of childhood abuse? Are they triggering false memories that damage innocent adults? Or are they uncovering the truth?

Some therapists have reasoned with patients that "people who've been abused often have your symptoms, so you probably were abused. Let's see if, aided by hypnosis or drugs, or helped to dig back and visualize your trauma, you can recover it." As we might expect from the research on source amnesia and the misinformation effect, patients exposed to such techniques may form an image of a threatening person. With further visualization, the image grows more vivid, leaving the patient stunned, angry,

and ready to confront or sue the equally stunned and devastated parent, relative, or clergy member, who then vigorously denies the accusation. After 32 therapy sessions, one woman recalled her father abusing her when she was 15 months old.

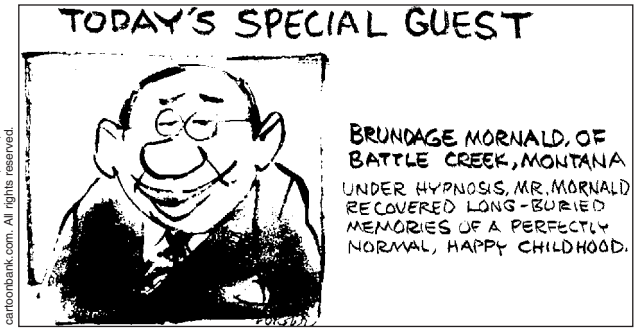
Without questioning the professionalism of most therapists, critics have charged that clinicians who use "memory work" techniques such as "guided imagery," hypnosis, and dream analysis to recover memories "are nothing more than merchants of mental chaos, and, in fact, constitute a blight on the entire field of psychotherapy" (Loftus et al., 1995). "Thousands of families were cruelly ripped apart," with "previously loving adult daughters" suddenly accusing fathers, noted Martin Gardiner (2006) in his commentary on North America's "greatest mental health scandal." Irate clinicians countered that those who dispute recovered memories of abuse add to abused people's trauma and play into the hands of child molesters.

In an effort to find a sensible common ground that might resolve this ideological battle—psychology's "memory war"—study panels have been convened and public statements made by the American Medical, American Psychological, and American Psychiatric Associations; the Australian Psychological Society; the British Psychological Society; and the Canadian Psychiatric Association. Those committed to protecting abused children and those committed to protecting wrongly accused adults agree on the following:

- ***Sexual abuse happens.*** And it happens more often than we once supposed. There is no characteristic "survivor syndrome" (Kendall-Tackett et al., 1993). However, sexual abuse is a traumatic betrayal that can leave its victims predisposed to problems ranging from sexual dysfunction to depression (Freyd et al., 2007).
- ***Injustice happens.*** Some innocent people have been falsely convicted. And some guilty people have evaded responsibility by casting doubt on their truth-telling accusers.
- ***Forgetting happens.*** Many of those actually abused were either very young when abused or may not have understood the meaning of their experience—circumstances under which forgetting is common. Forgetting isolated past events, both negative and positive, is an ordinary part of everyday life.
- ***Recovered memories are commonplace.*** Cued by a remark or an experience, we recover memories of long-forgotten events, both pleasant and unpleasant. What is debated is whether the unconscious mind sometimes *forcibly represses* painful experiences and, if so, whether these can be retrieved by certain therapist-aided techniques. (Memories that surface naturally are more likely to be corroborated than are therapist-assisted recollections [Geraerts et al., 2007].)
- ***Memories of things happening before age 3 are unreliable.*** Because people do not reliably recall happenings of any sort from their first three years, most psychologists—including most clinical and counseling psychologists—doubt "recovered" memories of abuse during infancy (Gore-Felton et al., 2000; Knapp & Vande Creek, 2000). The older the child was when suffering sexual abuse, and the more severe the abuse, the more likely it is to be remembered (Goodman et al., 2003).
- ***Memories "recovered" under hypnosis or the influence of drugs are especially unreliable.*** "Age-regressed" hypnotized subjects incorporate suggestions into their memories, even memories of "past lives."
- ***Memories, whether real or false, can be emotionally upsetting.*** Both the accuser and the accused may suffer when what was born of mere suggestion becomes, like an actual trauma, a stinging memory that drives bodily stress (McNally, 2003, 2007). People knocked unconscious in unremembered accidents have later developed stress disorders after being haunted by memories they constructed from photos, news reports, and friends' accounts (Bryant, 2001).

"When memories are 'recovered' after long periods of amnesia, particularly when extraordinary means were used to secure the recovery of memory, there is a high probability that the memories are false."

—Royal College of Psychiatrists Working Group on Reported Recovered Memories of Child Sexual Abuse (Brandon et al., 1998)



So, does repression ever occur? Or is this concept—the cornerstone of Freud's theory and of so much popular psychology—misleading? Although the issue is hotly debated, this much appears certain: The most common response to a traumatic experience (witnessing a parent's murder, experiencing the horrors of a Nazi death camp, being terrorized by a hijacker or a rapist, escaping the

collapsing World Trade Center towers, surviving an Asian tsunami) is not banishment of the experience into the unconscious. Rather, such experiences are typically etched on the mind as vivid, persistent, haunting memories (Porter & Peace, 2007). Playwright Eugene O'Neill understood. As one of the characters in his *Strange Interlude* (1928) exclaimed, "The devil! . . . What beastly incidents our memories insist on cherishing!"

"Horror sears memory, leaving . . . the consuming memories of atrocity."

—Robert Kraft, *Memory Perceived: Recalling the Holocaust,* 2002

Improving Memory

21-4: How can an understanding of memory contribute to more effective study techniques?

Now and then we are dismayed at our forgetfulness—at our embarrassing inability to recall someone's name, at forgetting to bring up a point in conversation, at not bringing along something important, at finding ourselves standing in a room unable to recall why we are there (Herrmann, 1982). Is there anything we can do to minimize such memory misdeeds? Much as biology benefits medicine and botany benefits agriculture, so can the psychology of memory benefit education. Here, for easy reference, is a summary of concrete suggestions for improving memory. The SQ3R—Survey, Question, Read, Rehearse, Review—study technique used in this book incorporates several of these strategies.

"I have discovered that it is of some use when you lie in bed at night and gaze into the darkness to repeat in your mind the things you have been studying. Not only does it help the understanding, but also the memory."

—Leonardo da Vinci (1452–1519)

Study repeatedly. To master material, use distributed (spaced) practice. To learn a concept, provide yourself with many separate study sessions: Take advantage of life's little intervals—riding on the bus, walking across campus, waiting for class to start. To memorize specific facts or figures, suggests Thomas Landauer (2001), "rehearse the name or number you are trying to memorize, wait a few seconds, rehearse again, wait a little longer, rehearse again, then wait longer still and rehearse yet again. The waits should be as long as possible without losing the information." New memories are weak; exercise them and they will strengthen. Speed-reading (skimming) complex material—with minimal rehearsal—yields little retention. Rehearsal and critical reflection help more. It pays to study actively.

"Knit each new thing on to some acquisition already there."

—William James, *Principles of Psychology,* 1890

Make the material meaningful. To build a network of retrieval cues, take text and class notes in your own words. (Mindlessly repeating someone else's words is relatively ineffective.) To apply concepts to your own life, form images, understand and organize information, relate the material to what you already know or have experienced, and put it in your own words. Increase retrieval cues by forming associations. Without such cues, you may find yourself stuck when a question uses phrasing different from the rote forms you memorized.

Activate retrieval cues. Mentally re-create the situation and the mood in which your original learning occurred. Return to the same location. Jog your memory by allowing one thought to cue the next.

Use mnemonic devices. Associate items with peg words. Make up a story that incorporates vivid images of the items. Chunk information into acronyms. Create rhythmic rhymes ("*i* before *e,* except after *c*").

Minimize interference. Study before sleeping. Do not schedule back-to-back study times for topics that are likely to interfere with each other, such as French and Italian.

Sleep more. During sleep, the brain organizes and consolidates information for long-term memory. Sleep-deprivation disrupts this process.

Test your own knowledge, both to rehearse it and to help determine what you do not yet know. Don't be lulled into overconfidence by your ability to recognize information. Test your recall using the Preview Questions. Outline sections on a blank page. Define the terms and concepts listed at each module's end before turning back to their definitions. Take practice tests, including the Rehearse It questions and Test for Success exercises at the end of each module. The study guides that accompany this and many other texts are a good source for self-tests.

Thinking and memory Most of what we know is not the result of efforts to memorize. We learn because we're curious and because we spend time thinking about our experiences. Actively thinking as we read, by rehearsing and relating ideas, yields the best retention.

Forgetting, Memory Construction, and Improving Memory

Module Review

21-1: Why do we forget? We may fail to encode information for entry into our memory system. Memories may fade after storage—rapidly at first, and then leveling off, a trend known as the forgetting curve. We may experience retrieval failure, when old and new material compete, when we don't have adequate retrieval cues, or possibly, in rare instances, because of motivated forgetting, or *repression.* In *proactive interference,* something learned in the past interferes with our ability to recall something recently learned. In *retroactive interference,* something recently learned interferes with something learned in the past.

21-2: How do misinformation, imagination, and source amnesia influence our memory construction? If we are exposed to *misinformation* after an event, or if we repeatedly imagine and rehearse an event that never occurred, we may construct a false memory of what actually happened. We experience *source amnesia* when we attribute a memory to the wrong source.

21-3: What is the controversy related to claims of repressed and recovered memories? Memory researchers and some well-meaning therapists have debated whether people repress memories of early childhood abuse and can recover them by means of leading questions and/or hypnosis during therapy. Psychologists now tend to agree that: (1) Sexual abuse happens, and can leave lasting scars. (2) Some innocent people have been falsely convicted of abuse that never happened, and some true abusers have used the controversy over recovered memories to avoid punishment. (3) Forgetting isolated past events, good or bad, is an ordinary part of life. (4) Recovering good and bad memories, triggered by some memory cue, is commonplace. (5) Infantile amnesia—the inability to recall memories from the first three years of life—makes recovery of very early childhood memories unlikely. (6) Memories obtained under the influence of hypnosis or drugs or therapy are unreliable. (7) Both real and false memories cause stress and suffering.

21-4: How can an understanding of memory contribute to more effective study techniques? Memory research–based strategies include studying repeatedly, making material personally meaningful, activating retrieval cues, using mnemonic devices, minimizing interference, getting adequate sleep, and self-testing.

Rehearse It!

1. When forgetting is due to encoding failure, meaningless information has not been transferred from
   a. the environment into sensory memory.
   b. sensory memory into long-term memory.
   c. long-term memory into short-term memory.
   d. short-term memory into long-term memory.
2. Ebbinghaus' "forgetting curve" shows that after an initial decline, memory for novel information tends to
   a. increase slightly.
   b. decrease noticeably.
   c. decrease greatly.
   d. level out.
3. The hour before sleep is a good time to memorize information because going to sleep after learning new material minimizes
   a. the misinformation effect.
   b. amnesia.
   c. retroactive interference.
   d. proactive interference.
4. Freud proposed that painful or unacceptable memories are self-censored, or blocked from consciousness, through a mechanism called
   a. repression.
   b. proactive interference.
   c. the misinformation effect.
   d. physical decay of the memory trace.
5. One reason false memories form is our tendency to fill in memory gaps with our assumptions about events. This tendency is an example of
   a. proactive interference.
   b. the misinformation effect.
   c. retroactive interference.
   d. the forgetting curve.
6. We may recognize a face in the crowd but be unable to recall where we know the person from. This is an example of
   a. the misinformation effect.
   b. proactive interference.
   c. source amnesia.
   d. repression.

Answers: 1. d, 2. d, 3. c, 4. a, 5. b, 6. c.

Terms and Concepts to Remember

proactive interference, p. 294
retroactive interference, p. 294
repression, p. 296
misinformation effect, p. 297
source amnesia, p. 298

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. What you know today seems to be what you have always known. Explain what this means.
2. Eliza's family loves to tell the story of how she "stole the show" as a 2-year-old, dancing at her aunt's wedding reception. Infantile amnesia should have prevented her from forming a memory, yet Eliza can recall the event clearly. How is this possible?
3. What—given the commonality of source amnesia—might life be like if we remembered all our waking experiences and all our dreams?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Thinking, Language, and Intelligence

Thinking, Language, and Intelligence

Throughout history, we humans have both bemoaned our foolishness and celebrated our wisdom. The poet T. S. Eliot was struck by "the hollow men . . . Headpiece filled with straw." But Shakespeare's Hamlet extolled the human species as "noble in reason! . . . infinite in faculties! . . . in apprehension how like a god!" Throughout this text, we likewise marvel at both our abilities and our errors.

We study the human brain—3 pounds of wet tissue the size of a small cabbage, yet containing circuitry more complex than the planet's telephone networks. We marvel at the competence of newborns. We relish our sensory system, which disassembles visual stimuli into millions of nerve impulses, distributes them for parallel processing, and then reassembles them into colorful perceptions. We ponder our memory's seemingly limitless capacity and the ease with which our two-track mind processes information, consciously and unconsciously. Little wonder that our species has had the collective genius to invent the camera, the car, and the computer; to unlock the atom and crack the genetic code; to travel out to space and into the oceans' depths.

Yet we also see that our species is kin to the other animals. We are influenced by the same principles that produce learning in rats and pigeons. As one pundit said, echoing Pavlov, "How like a dog!" We note that we assimilate reality into our preconceptions and succumb to perceptual illusions. We see how easily we deceive ourselves about hypnotic feats, pseudopsychic claims, and false memories.

In Modules 22 through 24, we encounter further instances of these two images of the human condition—the rational and the irrational. We will consider how we form concepts, solve problems, make decisions, and form judgments (Module 23). We will look at our flair for language and ask whether our species alone has this capability (Module 23). And in Module 24, we will focus on an ongoing debate in which psychologists and others pick sides on two major questions: (1) Does each of us have an inborn, general mental capacity? and (2) Can we quantify this capacity as a meaningful number?

"The average newspaper boy in Pittsburgh knows more about the universe than did Galileo, Aristotle, Leonardo, or any of those other guys who were so smart they only needed one name."

—Daniel Gilbert, *Stumbling on Happiness*, 2006

MODULE
22

Thinking

Cognition refers to all the mental activities associated with thinking, knowing, remembering, and communicating. *Cognitive psychologists* study these activities, including the logical and sometimes illogical ways in which we create concepts, solve problems, make decisions, and form judgments.

We begin with the building blocks of thinking: concepts. As you read this discussion and others in this module, join me in reflecting on how deserving we are of our name, *Homo sapiens*—wise human.

Concepts

22-1: What are the functions of concepts?

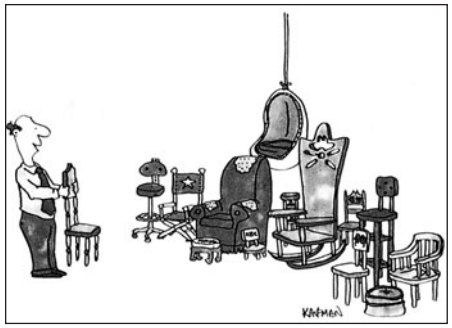
To think about the countless events, objects, and people in our world, we simplify things. We form **concepts**—mental groupings of similar objects, events, ideas, and people. The concept *chair* includes many items—a baby's high chair, a reclining chair, a dentist's chair—all of which are for sitting. Chairs vary, but it is their common features that define the concept of *chair.*

Imagine life without concepts. We would need a different name for every object and idea. We could not ask a child to "throw the ball" because there would be no concept of *ball* (or *throw*). Instead of saying, "They were angry," we would have to describe expressions, intensities, and words. Such concepts as *ball* and *anger* give us much information with little cognitive effort.

To further simplify things, we organize concepts into category *hierarchies*. Cab drivers organize their cities into geographical sectors, which subdivide into neighborhoods, and again into blocks. Once our categories exist, we use them efficiently. Shown a bird, car, or food, people need no more time to identify an item's category than to perceive that something is there. "As soon as you know it is there, you know what it is," report Kalanit Grill-Spector and Nancy Kanwisher (2005).

We form some concepts by *definition.* Told that a triangle has three intersecting sides, we thereafter classify all three-sided geometric forms as triangles. More often, however, we form our concepts by developing **prototypes**—a mental image or best example that incorporates all the features we associate with a category (Rosch, 1978). The more closely something matches our prototype of a concept, the more readily we recognize it as an example of the concept. A robin and a penguin both satisfy our definition of *bird:* a two-footed animal that has wings and feathers and hatches from an egg. Yet people agree more quickly that "a robin is a bird" than that "a penguin is a bird." For most of us, the flying robin is the birdier bird; it more closely resembles our bird prototype.

Move away from our prototypes, and category boundaries may blur. Is a tomato a fruit? Is a 17-year-old female a girl or a woman? Is a whale a fish or a mammal? Because this marine animal fails to match our prototype, we are slower to recognize it as a mammal. Similarly, we are slow to perceive an illness when our symptoms don't fit one of our disease prototypes (Bishop, 1991). People whose heart attack symptoms (shortness of breath, exhaustion, a dull weight in the chest) don't match their prototype of a heart attack (sharp chest pain) may not seek help. So, like other mental shortcuts we will encounter, concepts speed and guide our thinking. But they don't always make us wise.



"Attention, everyone! I'd like to introduce the newest member of our family."

cognition the mental activities associated with thinking, knowing, remembering, and communicating.

concept a mental grouping of similar objects, events, ideas, or people.

prototype a mental image or best example of a category. Matching new items to a prototype provides a quick and easy method for sorting items into categories (as when comparing feathered creatures to a prototypical bird, such as a robin).

Daniel J. Cox/Liaison/Getty Images

J. Messerschmidt/The Picture Cube

A bird and a . . . ? It takes a bit longer to conceptualize a penguin as a bird because it doesn't match our prototype of a small, feathered, flying creature.

B2M Productions/Digital Vision/Getty Images

Heuristic searching To search for guava juice, you could search every supermarket aisle (an algorithm), or check the bottled beverage, natural foods, and produce sections (heuristics). The heuristics approach is often speedier, but an algorithmic search guarantees you will find it eventually.

Solving Problems

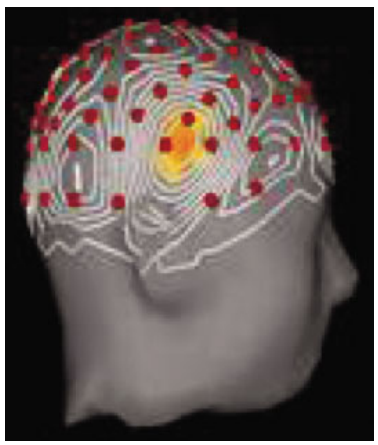
22-2: What strategies assist our problem solving, and what obstacles hinder it?

One tribute to our rationality is our problem-solving skill in coping with novel situations. What's the best route around this traffic jam? How shall we handle a friend's criticism? How can we get in the house without our keys?

Some problems we solve through *trial and error*. Thomas Edison tried thousands of lightbulb filaments before stumbling upon one that worked. For other problems, we use **algorithms,** step-by-step procedures that guarantee a solution. But step-by-step algorithms can be laborious and exasperating. For example, to find another word using all the letters in *SPLOYOCHYG*, we could try each letter in each position, but we would need to generate and examine the 907,200 resulting permutations. In such cases, we often resort to simpler strategies called **heuristics.** Thus, we might reduce the number of options in our *SPLOYOCHYG* example by excluding rare letter combinations, such as two Y's together. By using heuristics and then applying trial and error, we may hit upon the answer.[1]

Sometimes, the problem-solving strategy seems to be no strategy at all. We puzzle over a problem, and suddenly, the pieces fall together as we perceive the solution in a sudden flash of **insight.** Ten-year-old Johnny Appleton displayed insight in solving a problem that had stumped construction workers: how to rescue a young robin that had fallen into a narrow 30-inch-deep hole in a cement-block wall. Johnny's solution: Slowly pour in sand, giving the bird enough time to keep its feet on top of the constantly rising sand (Ruchlis, 1990).

Teams of researchers have identified brain activity associated with sudden flashes of insight (Jung-Beeman et al., 2004; Sandkühler & Bhattacharya, 2008). They gave people a problem: Think of a word that will form a compound word or phrase with each of three words in a set (such as *pine, crab,* and *sauce*), and press a button to sound a bell when you know the answer. (If you need a hint: The word is a fruit.[2])



From Mark Jung-Beeman, Northwestern University and John Kounios, Drexel University

FIGURE 22.1 The Aha! moment A burst of right temporal lobe activity accompanies insight solutions to word problems (Jung-Beeman et al., 2004).

To see what brain activity enables insight, the researchers mapped the problem solver's brain activity, using fMRIs (functional MRIs) or EEGs. In the first experiment, about half the solutions were by a sudden Aha! insight, which typically was preceded by frontal lobe activity involved in focusing attention and was accompanied by a burst of activity in the right temporal lobe, just above the ear (**FIGURE 22.1**).

As you perhaps experienced in solving the *pine-crab-sauce* problem, insight often pops into mind with striking suddenness, with no prior sense that one is "getting warmer" or feeling close to the answer (Knoblich & Oellinger, 2006; Metcalfe, 1986). When the "Eureka moment" hits us, we feel a sense of satisfaction, a feeling of happiness. The joy of a joke may similarly lie in our sudden comprehension of an unexpected ending or a double meaning.

algorithm a methodical, logical rule or procedure that guarantees solving a particular problem. Contrasts with the usually speedier—but also more error-prone—use of *heuristics*.

heuristic a simple thinking strategy that often allows us to make judgments and solve problems efficiently; usually speedier but also more error-prone than *algorithms*.

insight a sudden and often novel realization of the solution to a problem; it contrasts with strategy-based solutions.

Obstacles to Problem Solving

Inventive as we can be in solving problems, the correct answer may elude us. Two cognitive tendencies—*confirmation bias* and *fixation*—often lead us astray.

Confirmation Bias

We seek evidence verifying our ideas more eagerly than we seek evidence that might refute them (Klayman & Ha, 1987; Skov & Sherman, 1986). This tendency, known as **confirmation bias,** is a major obstacle to problem solving. Peter Wason (1960)

[1]The answer: PSYCHOLOGY.

[2]The word is *apple:* pineapple, crabapple, applesauce.

demonstrated the confirmation bias by giving British university students the three-number sequence 2-4-6 and asking them to guess the rule he had used to devise the series. (The rule was simple: any three ascending numbers.) Before submitting answers, students generated their own sets of three numbers, and Wason told them whether their sets conformed to his rule. Once they felt *certain* they had the rule, they were to announce it. The result? Seldom right but never in doubt. Most of Wason's students formed a wrong idea ("Maybe it's counting by twos") and then searched only for evidence confirming the wrong rule (by testing 6-8-10, 100-102-104, and so forth).

"Ordinary people," said Wason (1981), "evade facts, become inconsistent, or systematically defend themselves against the threat of new information relevant to the issue." The results are sometimes momentous. The United States launched its war against Iraq on the assumption that Saddam Hussein possessed weapons of mass destruction (WMD) that posed an immediate threat. When that assumption turned out to be false, confirmation bias was one of the flaws in the judgment process identified by the bipartisan U.S. Senate Select Committee on Intelligence (2004). Administration analysts "had a tendency to accept information which supported [their presumptions] . . . more readily than information which contradicted" them. Sources denying such weapons were deemed "either lying or not knowledgeable about Iraq's problems, while those sources who reported ongoing WMD activities were seen as having provided valuable information."

"The human understanding, when any proposition has been once laid down . . . forces everything else to add fresh support and confirmation."
—Francis Bacon, *Novum Organum*, 1620

Fixation

Once we incorrectly represent a problem, it's hard to restructure how we approach it. If the solution to the matchstick problem in **FIGURE 22.2** eludes you, you may be experiencing **fixation**—the inability to see a problem from a fresh perspective.

One example of fixation is *mental set*. As a perceptual set predisposes what we perceive, a **mental set** predisposes how we think. Mental set refers to our tendency to approach a problem with the mind-set of what has worked for us previously. Indeed, solutions that worked in the past often do work on new problems. Consider:

Given the sequence *O-T-T-F-?-?-?*, what are the final three letters?

Most people have difficulty recognizing that the three final letters are *F*(ive), *S*(ix), and *S*(even). But solving this problem may make the next one easier:

Given the sequence *J-F-M-A-?-?-?*, what are the final three letters? (If you don't get this one, ask yourself what month it is.)

Sometimes, however, a mental set based on what worked in the past precludes our finding a new solution to a new problem. Our mental set from our past experiences with matchsticks predisposes our arranging them in two dimensions.

FIGURE 22.2 The matchstick problem
How would you arrange six matches to form four equilateral triangles? (See the solution in Figure 22.3.)

Making Decisions and Forming Judgments

22-3: How do heuristics, overconfidence, and belief perseverance influence our decisions and judgments?

When making each day's hundreds of judgments and decisions *(Is it worth the bother to take an umbrella? Can I trust this person? Should I shoot the basketball or pass to the player who's hot?)* we seldom take the time and effort to reason systematically. We just follow our intuition. After interviewing policymakers in government, business, and education, social psychologist Irving Janis (1986) concluded that they "often do not use a reflective problem-solving approach. How do they usually arrive at their decisions? If you ask, they are likely to tell you . . . they do it mostly by *the seat of their pants*."

confirmation bias a tendency to search for information that supports our preconceptions and to ignore or distort contradictory evidence.

fixation the inability to see a problem from a new perspective, by employing a different mental set.

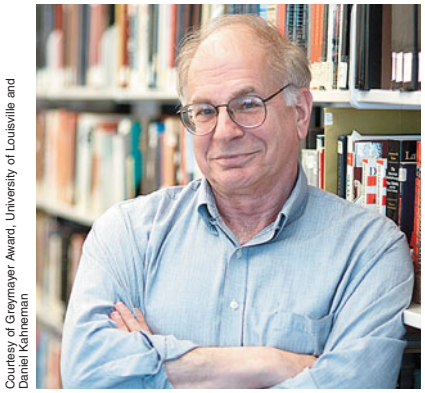
mental set a tendency to approach a problem in one particular way, often a way that has been successful in the past.

Using and Misusing Heuristics

When we need to act quickly, those mental shortcuts we call heuristics often do help us overcome analysis paralysis. Thanks to our mind's automatic information processing, intuitive judgments are instantaneous. But the price we sometimes pay for this efficiency—quick but bad judgments—can be costly. Research by cognitive

Courtesy of Greymayer Award, University of Louisville and the Tversky family

"In creating these problems, we didn't set out to fool people. All our problems fooled us, too."
Amos Tversky (1985)



Courtesy of Greymayer Award, University of Louisville and Daniel Kahneman

"Intuitive thinking [is] fine most of the time. . . . But sometimes that habit of mind gets us in trouble."
Daniel Kahneman (2005)

psychologists Amos Tversky and Daniel Kahneman (1974) on the *representativeness* and *availability heuristics* showed how these generally helpful shortcuts can lead even the smartest people into dumb decisions. (Their joint work on decision making received a 2002 Nobel Prize, although sadly, only Kahneman was alive to receive the honor.)

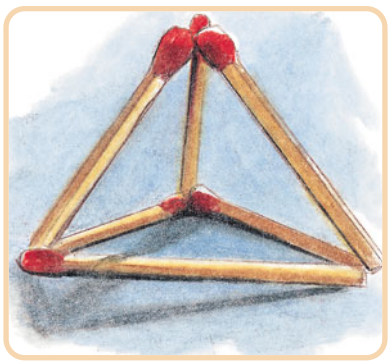


FIGURE 22.3 Solution to the matchstick problem To solve this problem, you must view it from a new perspective, breaking the fixation of limiting solutions to two dimensions.

The Representativeness Heuristic

To judge the likelihood of things in terms of how well they represent particular prototypes is to use the **representativeness heuristic.** To illustrate, consider:

> A stranger tells you about a person who is short, slim, and likes to read poetry, and then asks you to guess whether this person is more likely to be a professor of classics at an Ivy League university or a truck driver. Which would be the better guess (adapted from Nisbett & Ross, 1980)?

Did you answer "professor"? Many people do, because the description seems more *representative* of Ivy League scholars than of truck drivers. The representativeness heuristic enabled you to make a snap judgment. But it also led you to ignore other relevant information. When I help people think through this question, the conversation goes something like this:

Question: *First, let's figure out how many professors fit the description. How many Ivy League universities do you suppose there are?*
Answer: *Oh, about 10, I suppose.*
Question: *How many classics professors would you guess there are at each?*
Answer: *Maybe 4.*
Question: *Okay, that's 40 Ivy League classics professors. What fraction of these are short and slim?*
Answer: *Let's say half.*
Question: *And, of these 20, how many like to read poetry?*
Answer: *I'd say half—10 professors.*
Question: *Okay, now let's figure how many truck drivers fit the description. How many truck drivers do you suppose there are?*
Answer: *Maybe 400,000.*
Question: *What fraction are short and slim?*
Answer: *Not many—perhaps 1 in 8.*
Question: *Of these 50,000, what percentage like to read poetry?*
Answer: *Truck drivers who like poetry? Maybe 1 in 100—oh, oh, I get it—that leaves 500 short, slim, poetry-reading truck drivers.*
Comment: *Yup. So, even if we accept your stereotype that the description is more representative of classics professors than of truck drivers, the odds are 50 to 1 that this person is a truck driver.*

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"The problem is I can't tell the difference between a deeply wise, intuitive nudge from the Universe and one of my own bone-headed ideas!"

The representativeness heuristic influences many of our daily decisions. To judge the likelihood of something, we intuitively compare it with our mental representation of that category—of, say, what truck drivers are like. If the two match, that fact usually overrides other considerations of statistics or logic.

The Availability Heuristic

The **availability heuristic** operates when we base our judgments on the mental availability of information. Anything that enables information to "pop into mind" quickly and with little effort—its recency, vividness, or distinctiveness—can increase its perceived availability, making it seem commonplace. Casinos entice us to gamble by signaling even small wins with bells and lights—making them vividly memorable—while keeping big losses soundlessly invisible. And if someone from a particular ethnic group commits a terrorist act, our readily available memory of the dramatic event may shape our impression of the whole group. When statistical reality is pitted against a single vivid case, the memorable case often wins. The mass killing of civilians may seem on the increase of late, thanks to memorably available terrorism and genocide. Actually, such horrors have declined sharply since the late 1980s (Pinker, 2007; U.S. Department of State, 2004).

Even during 9/11's horrific year, terrorist acts claimed comparatively few lives, note risk researchers (see **FIGURE 22.4**). Yet in 2007, a poll showed "terrorism" was Americans' top priority for Congress and the President, and that responding to global climate change—which some scientists regard as a future "Armageddon in slow motion"—was one of the lowest priorities (Pew, 2007). Emotion-laden images of terror exacerbate our fears of terrorism by harnessing the availability heuristic, notes political scientist Cass Sunstein (2007). We fear flying because we play in our heads a tape of 9/11 or some other air disaster. We fear letting our children walk to school because we play in our heads tapes of abducted and brutalized children. We fear swimming in ocean waters because we replay *Jaws* in our heads. And so, thanks to these readily available images, we come to fear extremely rare events. We overfeel and underthink. (For more on the power of vivid cases, see Thinking Critically About: The Fear Factor—Do We Fear the Right Things? on the next page.)

"Don't believe everything you think."
—Bumper sticker

"The human understanding is most excited by that which strikes and enters the mind at once and suddenly, and by which the imagination is immediately filled and inflated. It then begins almost imperceptibly to conceive and suppose that everything is similar to the few objects which have taken possession of the mind."
—Francis Bacon, *Novum Organum*, 1620

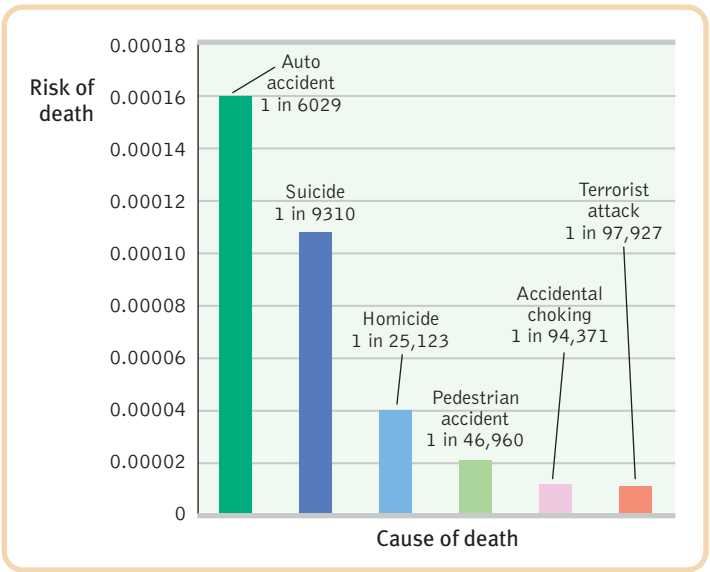


FIGURE 22.4 Risk of death from various causes in the United States, 2001 (Data assembled from various government sources by Randall Marshall et al., 2007.)

Overconfidence

Our use of intuitive heuristics when forming judgments, our eagerness to confirm the beliefs we already hold, and our knack for explaining away failures combine to create **overconfidence,** a tendency to overestimate the accuracy of our knowledge and judgments. Across various tasks, people overestimate what their performance was, is, or will be (Metcalfe, 1998).

People are also more confident than correct when answering such questions as, "Is absinthe a liqueur or a precious stone?" (It's a licorice-flavored liqueur.) On questions where only 60 percent of people answer correctly, respondents typically feel 75 percent confident. Even those who feel 100 percent certain err about 15 percent of the time (Fischhoff et al., 1977).

representativeness heuristic judging the likelihood of things in terms of how well they seem to represent, or match, particular prototypes; may lead us to ignore other relevant information.

availability heuristic estimating the likelihood of events based on their availability in memory; if instances come readily to mind (perhaps because of their vividness), we presume such events are common.

overconfidence the tendency to be more confident than correct—to overestimate the accuracy of our beliefs and judgments.

Thinking Critically About:

The Fear Factor—Do We Fear the Right Things?

"Most people reason dramatically, not quantitatively," said Oliver Wendell Holmes. After 9/11, many people feared flying more than driving. (In a 2006 Gallup survey, only 40 percent reported being "not afraid at all" to fly.) Yet, for most people, the most dangerous aspect of airline flying is the drive to the airport. In the months between 2003 and 2005, mile for mile, Americans were 230 times more likely to die in an automobile crash than on a commercial flight (National Safety Council, 2008).

In a late-2001 essay, I calculated that if—because of 9/11—we flew 20 percent less and instead drove half those unflown miles, about 800 more people would die in traffic accidents in the year after 9/11 (Myers, 2001). In checking this estimate against actual accident data (why didn't I think of that?), German psychologist Gerd Gigerenzer (2004) found that the last three months of 2001 did indeed produce significantly more U.S. traffic fatalities than the three-month average in the previous five years (**FIGURE 22.5**). Long after 9/11, the dead terrorists were still killing Americans. As air travel gradually recovered during 2002 through 2005, U.S. commercial flights carried nearly 2.5 billion passengers, with no deaths on a major airline big jet (McMurray, 2006; Miller, 2005). Meanwhile, 172,000 Americans died in traffic accidents.

Why do we fear the wrong things? Why do we judge terrorism to be a greater risk than accidents—which kill nearly as many per *week* in just the United States as did terrorism (2527 deaths worldwide) in all

AP/Wide World Photos

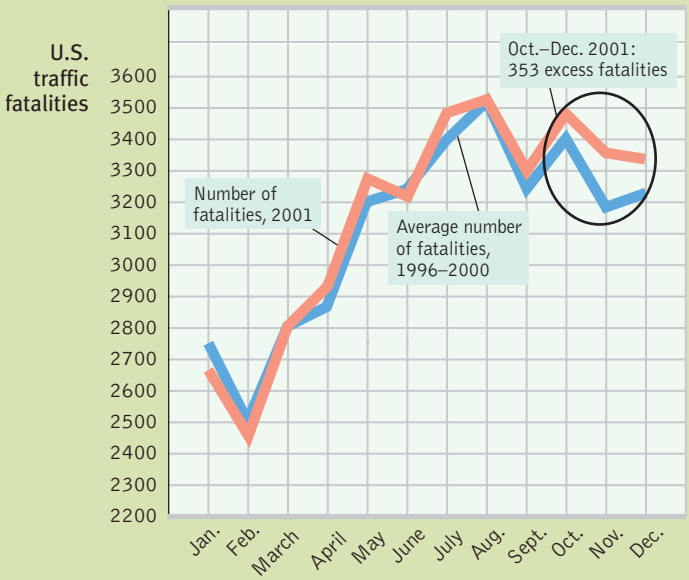


FIGURE 22.5 Still killing Americans Images of 9/11 etched a sharper image in our minds than did the millions of fatality-free flights on U.S. airlines during 2002 and after. Such dramatic events, being readily available to memory, shape our perceptions of risk. In the three months after 2001, those faulty perceptions led more people to travel, and some to die, by car. (Adapted from Gigerenzer, 2004.)

Predict your own behavior When will you finish reading this module?

Bianca Moscatelli/Worth Publishers

Overconfidence plagues decisions outside the laboratory, too. It was an overconfident Lyndon Johnson who waged war with North Vietnam, and an overconfident George W. Bush who marched into Iraq to eliminate supposed weapons of mass destruction. Overconfidence also drives stockbrokers and investment managers to market their ability to outperform stock market averages, despite overwhelming evidence to the contrary (Malkiel, 2004). A purchase of stock X, recommended by a broker who judges this to be the time to buy, is usually balanced by a sale made by someone who judges this to be the time to sell. Despite their confidence, buyer and seller cannot both be right.

Students are routinely overconfident about how quickly they can do assignments and write papers, typically expecting to finish ahead of schedule (Buehler et al., 1994). In fact, the projects generally take about twice the number of days predicted. Despite our painful underestimates, we remain overly confident of our next prediction. Moreover, anticipating how much we will accomplish, and believing we will have more free time in the future, we happily accept invitations, only to discover we're just as busy when the day rolls around (Zauberman & Lynch, 2005).

Failing to appreciate our potential for error can have serious consequences, but overconfidence does have adaptive value. People who err on the side of overconfidence

of the 1990s (Johnson, 2001)? Even with the horror of 9/11, more Americans in 2001 died of food poisoning (which scares few) than of terrorism (which scares many). Psychological science has identified four influences on our intuitions about risk. Together they explain why we sometimes fret over remote possibilities while ignoring much higher probabilities.

First, *we fear what our ancestral history has prepared us to fear.* Human emotions were road tested in the Stone Age. Our old brain prepares us to fear yesterday's risks: snakes, lizards, and spiders (which combined now kill relatively few in developed countries). And it prepares us to fear confinement and heights, and therefore flying.

Second, *we fear what we cannot control.* Driving we control, flying we do not.

Third, *we fear what is immediate.* Threats related to flying are mostly telescoped into the moments of takeoff and landing, while the dangers of driving are diffused across many moments to come, each trivially dangerous. Similarly, many smokers (whose habit shortens their life, on average, by about five years) fret openly before flying (which, averaged across people, shortens life by one day). Smoking's toxicity kills in the distant future.

Fourth, *we fear what is most readily available in memory.* Powerful, available memories—like the image of United Flight 175 slicing into the World Trade Center—serve as our measuring rods as we intuitively judge risks. Thousands of safe car trips have extinguished our anxieties about driving.

Ian Berry/Magnum Photos

Dramatic deaths in bunches breed concern and fear The memorable South Asian tsunami that killed some 300,000 people stirred an outpouring of concern and new tsunami-warning technology. Meanwhile, a "silent tsunami" of poverty-related malaria was killing about that many of the world's children every couple months, noted Jeffrey Sachs, the head of a United Nations project aiming to cut extreme poverty in half by 2015 (Dugger, 2005).

Vivid events also distort our comprehension of risks and probable outcomes. We comprehend disasters that have killed people dramatically, in bunches. But we fear too little those threats that will claim lives undramatically, one by one, and in the distant future. As Bill Gates has noted, each year a half-million children worldwide—the equivalent of four 747s full of children every day—die quietly, one by one, from rotavirus, and we hear nothing of it (Glass, 2004). Dramatic outcomes make us gasp; probabilities we hardly grasp.

The point to remember: It is perfectly normal to fear purposeful violence from those who hate us. When terrorists strike again, we will all recoil in horror. But smart thinkers will remember this: *Check your fears against the facts and resist those who serve their own purposes by cultivating a culture of fear.* By so doing, we can take away the terrorists' most omnipresent weapon: exaggerated fear.

"Fearful people are more dependent, more easily manipulated and controlled, more susceptible to deceptively simple, strong, tough measures and hard-line postures."

—Media researcher George Gerbner to U.S. Congressional Subcommittee on Communications, 1981

live more happily, find it easier to make tough decisions, and seem more credible than those who lack self-confidence (Baumeister, 1989; Taylor, 1989). Moreover, given prompt and clear feedback—as weather forecasters receive after each day's predictions—we can learn to be more realistic about the accuracy of our judgments (Fischhoff, 1982). The wisdom to know when we know a thing and when we do not is born of experience.

"When you know a thing, to hold that you know it; and when you do not know a thing, to allow that you do not know it; this is knowledge."

—Confucius (551–479 B.C.E.), *Analects*

The Belief Perseverance Phenomenon

Our readiness to fear the wrong things and to be overconfident in our judgments is startling. Equally startling is our tendency to cling to our beliefs in the face of contrary evidence. **Belief perseverance** often fuels social conflict, as it did in one study of people with opposing views of capital punishment (Lord et al., 1979). Those on both sides studied two supposedly new research findings, one supporting and the other refuting the claim that the death penalty deters crime. Each side was more impressed by the study supporting its own beliefs, and each readily disputed the other study. Thus, showing the pro– and anti–capital-punishment groups the *same* mixed evidence actually *increased* their disagreement.

belief perseverance clinging to one's initial conceptions after the basis on which they were formed has been discredited.

"I'm happy to say that my final judgment of a case is almost always consistent with my prejudgment of the case."

If you want to rein in the belief perseverance phenomenon, a simple remedy exists: *Consider the opposite*. When Charles Lord and his colleagues (1984) repeated the capital-punishment study, they asked some participants to be "as *objective* and *unbiased* as possible." The plea did nothing to reduce biased evaluations of evidence. They asked another group to consider "whether you would have made the same high or low evaluations had exactly the same study produced results on the *other* side of the issue." Having imagined and pondered *opposite* findings, these people became much less biased in their evaluations of the evidence.

The more we come to appreciate why our beliefs might be true, the more tightly we cling to them. Once people have explained to themselves why they believe a child is "gifted" or "learning disabled," or why candidate X or Y will be a better commander-in-chief, or why company Z is a stock worth owning, they tend to ignore evidence undermining that belief. Prejudice persists. Once beliefs form and get justified, it takes more compelling evidence to change them than it did to create them.

The Perils and Powers of Intuition

22-4: How do smart thinkers use intuition?

We have seen how our irrational thinking can plague our efforts to solve problems, make wise decisions, form valid judgments, and reason logically. Intuition also feeds our gut fears and prejudices. Moreover, these perils of **intuition** appear even when people are offered extra pay for thinking smart, even when they are asked to justify their answers, and even when they are expert physicians or clinicians (Shafir & LeBoeuf, 2002). From this you might conclude that our heads are indeed filled with straw.

But we must not abandon hope for human rationality. Today's cognitive scientists are also revealing intuition's powers, as you can see throughout this book. For the most part, our cognition's instant, intuitive reactions enable us to react quickly and *usually* adaptively. They do so thanks, first, to our fast and frugal heuristics that enable us, for example, to intuitively assume that fuzzy-looking objects are far away, which they usually are (except on foggy mornings). Our learned associations also spawn the intuitions of our two-track mind. If a stranger looks like someone who previously harmed or threatened us, we may—without consciously recalling the earlier experience—react warily. (The learned association surfaces as a gut feeling.)

University of Amsterdam psychologist Ap Dijksterhuis and his colleagues (2006a,b) discovered the surprising powers of unconscious intuition in experiments that showed people complex information about potential apartments (or roommates or art posters). They invited some participants to state their immediate preference after reading a dozen pieces of information about each of four apartments. A second group, given several minutes to analyze the information, tended to make slightly smarter decisions. But wisest of all, in study after study, was a third group, whose attention was distracted for a time. This enabled their minds to process the complex information unconsciously and to arrive at a more satisfying result. Faced with complex decisions involving many factors, the best advice may indeed be to take our time—to "sleep on it"—and to await the intuitive result of our unconscious processing.

Chick sexing When acquired expertise becomes an automatic habit, as it is for experienced chick sexers, it feels like intuition. At a glance, they just know.

Intuition is huge. More than we realize, thinking occurs offscreen, with the results occasionally displayed on-screen. Intuition feeds our expertise, our creativity, our love, and our spirituality. And intuition, smart intuition, is born of experience. Chess masters can look at a board and intuitively know the right move. Playing "blitz chess," where every move is made after barely more than a glance, they display a hardly diminished skill (Burns, 2004). Experienced chicken sexers can tell you a chick's sex at a glance, yet cannot tell you how they do it. In each case, the immediate insight describes acquired, speedy expertise that feels like instant intuition. Experienced

nurses, firefighters, art critics, car mechanics, hockey players, and you, for anything in which you develop a deep and special knowledge, learn to size up many a situation in an eyeblink. Intuition is recognition, observed Nobel laureate psychologist-economist Herbert Simon (2001). It is analysis "frozen into habit."

So, intuition—fast, automatic, unreasoned feeling and thought—harvests our experience and guides our lives. Intuition is powerful, often wise, but sometimes perilous, and especially so when we overfeel and underthink, as we do when judging risks. Today's psychological science enhances our appreciation for intuition. But it also reminds us to check our intuitions against reality. Our two-track mind makes sweet harmony as smart, critical thinking listens to the creative whispers of our vast unseen mind, and builds upon it by evaluating evidence, testing conclusions, and planning for the future.

The Effects of Framing

22-5: What is framing?

A further test of rationality is whether the same issue, presented in two different but logically equivalent ways, will elicit the same answer. For example, one surgeon tells someone that 10 percent of people die while undergoing a particular surgery. Another tells someone that 90 percent survive. The information is the same. The effect is not. To both patients and physicians, the risk seems greater to those who hear that 10 percent will *die* (Marteau, 1989; McNeil et al., 1988; Rothman & Salovey, 1997).

The effects of **framing,** the way we present an issue, are sometimes striking. Nine in 10 college students rate a condom as effective if it has a supposed "95 percent success rate" in stopping the HIV virus that causes AIDS; only 4 in 10 think it successful given a "5 percent failure rate" (Linville et al., 1992). And people express more surprise when a 1-in-20 event happens than when an equivalent 10-in-200 event happens (Denes-Raj et al., 1995). To scare people, frame risks as numbers, not percentages. People told that a chemical exposure is projected to kill 10 of every 10 million people (imagine 10 dead people!) feel more frightened than if told the fatality risk is an infinitesimal .000001 (Kraus et al., 1992).

Consider how the framing effect influences political and business decisions. Politicians know to frame their position on public assistance as "aid to the needy" if they are for it and "welfare" if not. Merchants mark up their "regular prices" to appear to offer huge savings on "sale prices." A $100 coat marked down from $150 by Store X can seem like a better deal than the same coat priced regularly at $100 by Store Y (Urbany et al., 1988). And ground beef described as "75 percent lean" seems much more appealing than beef that is "25 percent fat" (Levin & Gaeth, 1988; Sanford et al., 2002). Likewise, a price difference between a credit card purchase of gasoline versus a cash purchase feels better if framed as a "cash discount" rather than a "credit card fee."

Framing research also finds a powerful application in the definition of options, which can be posed in ways that nudge people toward better decisions (Thaler & Sunstein, 2008).

- *Why choosing to be an organ donor depends on where you live.* In many European countries as well as the United States, people can decide whether they want to be organ donors when renewing their driver's license. In countries where the default option is *yes,* but people can opt out, nearly 100 percent agree to be donors. In the United States, Britain, and Germany, where the default option is *no* but people can "opt in," only about 25 percent agree to be donors (Johnson & Goldstein, 2003).
- *How to help employees decide to save for their retirement.* A 2006 U.S. pension law recognized the huge effect of framing options. Previously, employees who wanted to defer part of their compensation to a 401(k) retirement plan typically had to elect to lower their take-home pay, which most people are averse to doing. Now companies are being encouraged to enroll their employees automatically

intuition an effortless, immediate, automatic feeling or thought, as contrasted with explicit, conscious reasoning.

framing the way an issue is posed; how an issue is framed can significantly affect decisions and judgments.

What time is it now? When I asked you (in the section on overconfidence) to estimate how quickly you would finish this module, did you underestimate or overestimate?

but to allow them to opt out (thereby raising their take-home pay). In both plans, the choice was the employee's. But under the "opt-out" rather than "opt-in" option, enrollments soared from 49 to 86 percent (Madrian & Shea, 2001).

The point to remember: Those who understand the power of framing can use it to influence our decisions.

* * *

Let's pause to consider the question posed on the first page of this module—how deserving are we of our name *Homo sapiens?* If we were being graded on decision making and judgment, our error-prone species might rate a C+. On problem solving, where humans are inventive yet vulnerable to fixation, we would probably receive better marks, perhaps a B. On cognitive efficiency, our fallible but quick heuristics earn us an A.

REVIEWING

Thinking

Module Review

22-1: What are the functions of concepts? *Cognition* refers to all the mental activities associated with thinking, knowing, remembering, and communicating. We use *concepts,* mental groupings of similar objects, events, ideas, or people, to simplify and order the world around us. In creating hierarchies, we organize concepts into smaller and more detailed units. We form some concepts, such as triangles, by definition (objects with three intersecting sides), but we form most around *prototypes,* mental images or best examples of a category.

22-2: What strategies assist our problem solving, and what obstacles hinder it? An *algorithm* is a methodical, logical rule or procedure (such as a step-by-step description for evacuating a building during a fire) that guarantees a solution to a problem. A *heuristic* is a simpler thinking strategy (such as running for an exit if you smell smoke) that may provide faster—but sometimes incorrect—solutions. *Insight* is not a strategy-based solution, but rather a sudden flash of inspiration that solves a problem.

Problem-solving obstacles are the *confirmation bias* (which predisposes us to verify rather than challenge our hypotheses) and *fixation* (which may prevent us from taking a fresh perspective).

22-3: How do heuristics, overconfidence, and belief perseverance influence our decisions and judgments? The *representativeness heuristic* leads us to judge the likelihood of things in terms of how well they match our prototypes. The *availability heuristic* may lead us to fear the wrong things by judging the likelihood of an event based on how readily it comes to mind. We are often *overconfident,* but right or wrong, we cling to our beliefs even when they have been discredited—a tendency known as *belief perseverance.*

22-4: How do smart thinkers use intuition? Although it sometimes leads us astray, human *intuition*—effortless, immediate, automatic feeling or thought—can give us instant help when we need it. Experts in a field grow adept at making quick, shrewd judgments. Smart thinkers will welcome their intuitions but check them against available evidence.

22-5: What is framing? *Framing* is the way a question or statement is worded. Subtle wording differences can tilt us in the direction of a questioner's preferred response.

Rehearse It!

1. A concept is
   a. a mental grouping of similar things.
   b. an example of insight.
   c. a fixation on certain characteristics.
   d. a representativeness heuristic.

2. The most systematic procedure for solving a problem is a(n)
   a. heuristic.
   b. algorithm.
   c. insight.
   d. intuition.

3. A major obstacle to problem solving is fixation, which is a(n)
   a. tendency to base our judgments on vivid memories.
   b. art of framing the same question in two different ways.
   c. inability to view a problem from a new perspective.
   d. rule of thumb for judging the likelihood of an event in terms of our mental image of it.

4. You notice that your new next-door neighbor is very neatly dressed, wears glasses, and is reading a Greek play. Given a choice between her being a librarian and a store clerk, you incorrectly guess that she is a librarian. You were probably led astray by
   a. the availability heuristic.
   b. confirmation bias.
   c. overconfidence.
   d. the representativeness heuristic.

5. After the 9/11 attacks by foreign-born terrorists, some observers initially assumed that the 2003 East Coast blackout was probably also the work of foreign-born terrorists. This assumption illustrates
   a. belief perseverance.
   b. the availability heuristic.
   c. fixation.
   d. confirmation bias.

6. When consumers respond more positively to ground beef described as "75 percent lean" than to the same product labeled "25 percent fat," they have been influenced by
   a. belief perseverance.
   b. fixation.
   c. confirmation bias.
   d. framing.

Answers: 1. a, 2. b, 3. c, 4. d, 5. b, 6. d.

Terms and Concepts to Remember

cognition, p. 305
concept, p. 305
prototype, p. 305
algorithm, p. 306
heuristic, p. 306
insight, p. 306
confirmation bias, p. 307
fixation, p. 307
mental set, p. 307
representativeness heuristic, p. 309
availability heuristic, p. 309
overconfidence, p. 309
belief perseverance, p. 311
intuition, p. 313
framing, p. 313

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. Oscar describes his political beliefs as "strongly liberal," but he has decided to explore opposing viewpoints. How might this influence his thinking?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

23

Language Development

Thinking and Language

Animal Thinking and Language

Language and Thought

The most tangible of our thinking powers is **language**—our spoken, written, or signed words and the ways we combine them as we think and communicate. Humans have long and proudly proclaimed that language sets us above all other animals. "When we study human language," asserted linguist Noam Chomsky (1972), "we are approaching what some might call the 'human essence,' the qualities of mind that are, so far as we know, unique [to humans]." Cognitive scientist Steven Pinker (1990) has called language "the jewel in the crown of cognition."

Imagine an alien species that could pass thoughts from one head to another merely by pulsating air molecules in the space between them. Perhaps these weird creatures could inhabit a future Spielberg movie? Actually, we are those creatures! When we speak, our brain and voice box conjure up air pressure waves that we send banging against another's eardrum—enabling us to transfer thoughts from our brain into theirs. As Pinker (1998) has noted, we sometimes sit for hours "listening to other people make noise as they exhale, because those hisses and squeaks contain *information*." And thanks to all those funny sounds created in our heads from the air pressure waves we send out, we get people's attention, we get them to do things, and we maintain relationships (Guerin, 2003). Depending on how you vibrate the air after opening your mouth, you may get slapped or kissed.

Thanks to language, we transfer meaning from one mind to another. Whether spoken, written, or signed, language enables us not only to communicate but to transmit civilization's accumulated knowledge across generations. Monkeys mostly know what they see. Thanks to language, we know much that we've never seen.

Language Development

Although you probably know between 60,000 and 80,000 words, you use only 150 words for about half of what you say.

Make a quick guess: How many words did you learn during the years between your first birthday and your high school graduation? The answer is about 60,000 (Bloom, 2000; McMurray, 2007). That averages (after age 2) to nearly 3500 words each year, or nearly 10 each day! How you did it—how the 3500 words a year you learned could so far outnumber the roughly 200 words a year that your schoolteachers consciously taught you—is one of the great human wonders.

Before you were able to add 2 + 2, you were creating your own original and grammatically appropriate sentences. Most of us would have trouble stating our language's rules for ordering words to form sentences. Yet as preschoolers, you comprehended and spoke with a facility that puts to shame your fellow college students now struggling to learn a foreign language.

We humans have an astonishing facility for language. With remarkable efficiency, we selectively sample tens of thousands of words in memory, effortlessly assemble them with near-perfect syntax, and spew them out at a rate of three words a second (Vigliocco & Hartsuiker, 2002). Seldom do we form sentences in our minds before speaking them. Rather they organize themselves on the fly as we speak. And while doing all this, we also adapt our utterances to our social and cultural context, following rules for speaking *(How far apart should we stand?)* and listening *(Is it OK to interrupt?)*. Given how many ways there are to mess up, it's amazing that we can master this social dance. So, when and how does it happen?

When Do We Learn Language?

23-1: What are the milestones in language development?

Receptive Language

Children's language development moves from simplicity to complexity. Infants start without language (*in fantis* means "not speaking"). Yet by 4 months of age, babies can discriminate speech sounds (Stager & Werker, 1997). They can also read lips:

language our spoken, written, or signed words and the ways we combine them to communicate meaning.

They prefer to look at a face that matches a sound, so we know they can recognize that *ah* comes from wide open lips and *ee* from a mouth with corners pulled back (Kuhl & Meltzoff, 1982). This period marks the beginning of the development of babies' *receptive language*, their ability to comprehend speech. At seven months and beyond, babies grow in their power to do what you and I find difficult when listening to an unfamiliar language: segmenting spoken sounds into individual words.

Productive Language

Babies' *productive language,* their ability to produce words, matures after their receptive language. Prior to this, around 4 months of age, babies enter the **babbling stage,** in which they spontaneously utter a variety of sounds, such as *ah-goo.* Babbling is not an imitation of adult speech, for it includes sounds from various languages, even those not spoken in the household. From this early babbling, a listener could not identify an infant as being, say, French, Korean, or Ethiopian. Deaf infants who observe their Deaf parents signing begin to babble more with their hands (Petitto & Marentette, 1991). Before nurture molds our speech, nature enables a wide range of possible sounds. Many of these natural babbling sounds are consonant-vowel pairs formed by simply bunching the tongue in the front of the mouth *(da-da, na-na, ta-ta)* or by opening and closing the lips *(ma-ma),* both of which babies do naturally for feeding (MacNeilage & Davis, 2000).

By the time infants are about 10 months old, their babbling has changed so that a trained ear can identify the language of the household (de Boysson-Bardies et al., 1989). Sounds and intonations outside that language begin to disappear. Without exposure to other languages, babies become functionally deaf to speech sounds outside their native language (Pallier et al., 2001). This explains why adults who speak only English cannot discriminate certain Japanese sounds within speech, and why Japanese adults with no training in English cannot distinguish between the English *r* and *l.* Thus, *la-la-ra-ra* may, to a Japanese-speaking adult, sound like the same syllable repeated. A Japanese-speaking person told that the train station is "just after the next light" may wonder, "The next what? After the street veering right, or farther down, after the traffic light?"

Around their first birthday (the exact age varies from child to child), most children enter the **one-word stage.** They have already learned that sounds carry meanings, and if repeatedly trained to associate, say, *fish* with a picture of a fish, 1-year-olds will look at a fish when a researcher says "Fish, fish! Look at the fish!" (Schafer, 2005). Not surprisingly, they now begin to use sounds—usually only one barely recognizable syllable, such as *ma* or *da*—to communicate meaning. But family members quickly learn to understand, and gradually the infant's language conforms more to the family's language. At this one-word stage, an inflected word may equal a sentence. "Doggy!" may mean "Look at the dog out there!"

At about 18 months, children's word learning explodes from about a word per week to a word per day. By their second birthday, most have entered the **two-word stage.** They start uttering two-word sentences (TABLE 23.1) in **telegraphic speech:** Like the old-fashioned telegrams (TERMS ACCEPTED. SEND MONEY), this early form of speech contains mostly nouns and verbs *(Want juice)*. Also like telegrams, it follows rules of syntax; the words are in a sensible order. English-speaking children typically place adjectives before nouns—*big doggy* rather than *doggy big*.

TABLE 23.1 Language Development

Month (approximate)	Stage
4	Babbling, variety of sounds.
10	Babbling, household language.
12	One-word stage.
24	Two-word, telegraphic speech.
24+	Rapid development, complex sentences.

babbling stage beginning at about 4 months, the stage of speech development in which the infant spontaneously utters various sounds at first unrelated to the household language.

one-word stage the stage in speech development, from about age 1 to 2, during which a child speaks mostly in single words.

two-word stage beginning about age 2, the stage in speech development during which a child speaks mostly two-word statements.

telegraphic speech early speech stage in which a child speaks like a telegram—"go car"—using mostly nouns and verbs.

"Got idea. Talk better. Combine words. Make sentences."

Once children move out of the two-word stage, they quickly begin uttering longer phrases (Fromkin & Rodman, 1983). If they get a late start on learning a particular language, for example after receiving a cochlear implant or being an international adoptee, their language development still proceeds through the same sequence, although usually at a faster pace (Ertmer et al., 2007; Snedeker et al., 2007). By early elementary school, children understand complex sentences and begin to enjoy the humor conveyed by double meanings: "You never starve in the desert because of all the sand-which-is there."

Explaining Language Development

23-2: How do we learn language?

Attempts to explain how we acquire language have sparked a spirited intellectual controversy. The nature-nurture debate surfaces again and, here as elsewhere, appreciation for innate predispositions and nature-nuture interactions has grown.

Skinner: Operant Learning

Behaviorist B. F. Skinner (1957) believed we can explain language development with familiar learning principles, such as *association* (of the sights of things with the sounds of words); *imitation* (of the words and syntax modeled by others); and *reinforcement* (with smiles and hugs when the child says something right). Thus, Skinner (1985) argued, babies learn to talk in many of the same ways that animals learn to peck keys and press bars: "Verbal behavior evidently came into existence when, through a critical step in the evolution of the human species, the vocal musculature became susceptible to operant conditioning."

Chomsky: Inborn Universal Grammar

Linguist Noam Chomsky (1959, 1987) rejected Skinner's ideas, arguing that children acquire untaught words and grammar at a rate too extraordinary to be explained solely by learning principles. They generate all sorts of sentences they have never heard, sometimes with novel errors. (No parent teaches the sentence, "I hate you, Daddy.") Moreover, many of the errors young children make result from overgeneralizing logical grammatical rules, such as adding *-ed* to form the past tense (de Cuevas, 1990): "My teacher holded the baby rabbits and we petted them."

Given adequate nurture, said Chomsky, language will naturally occur: It just "happens to the child." And the reason it happens is that we come prewired with a sort of switch box—a *language acquisition device*. It is as if the switches need to be turned either "on" or "off" for us to understand and produce language. As we hear language, the switches get set for the language we are to learn.

Chomsky also proposed that there is a *universal grammar* underlying human language. All human languages therefore have the same grammatical building blocks, such as nouns and verbs, subjects and objects, negations and questions. Thus, we readily learn the specific grammar of whatever language we experience, whether spoken or signed (Bavelier et al., 2003). And no matter what that language is, we start speaking mostly in nouns *(kitty, da-da)* rather than verbs and adjectives (Bornstein et al., 2004). It happens so naturally—as naturally as birds learning to fly—that training hardly helps.

Many psychologists believe we benefit from both Skinner's and Chomsky's views. Children's genes design complex brain wiring that prepares them to learn language as they interact with their caregivers. Skinner's emphasis on learning helps explain how infants acquire their language as they interact with others. Chomsky's emphasis on our built-in readiness to learn grammar rules helps explain why preschoolers acquire language so readily and use grammar so well. Once again, we see biology and experience working together.

Susan Meiselas/Magnum Photos

Creating a language Brought together as if on a desert island (actually a school), Nicaragua's young deaf children over time drew upon sign gestures from home to create their own Nicaraguan Sign Language, complete with words and intricate grammar. Our biological predisposition for language does not create language in a vacuum. But activated by a social context, nature and nurture work creatively together (Osborne, 1999; Sandler et al., 2005; Senghas & Coppola, 2001).

Critical Periods

Childhood seems to represent a *critical* (or "sensitive") *period* for mastering certain aspects of language (Hernandez & Li, 2007). Deaf children who gain hearing with cochlear implants by age 2 develop better oral speech than do those who receive implants after age 4 (Greers, 2004). And whether children are deaf or hearing, later-than-usual exposure to language (at age 2 or 3) unleashes their brain's idle language capacity, producing a rush of language. But around age 7, a window in the mind closes, and children who have not been exposed to either a spoken or a signed language gradually lose their ability to master *any* language. Natively deaf children who learn sign language after age 9 never learn it as well as those who become deaf at age 9 after learning English. They also never learn English as well as other natively deaf children who learned sign in infancy (Mayberry et al., 2002). The striking conclusion: When a young brain does not learn *any* language, its language-learning capacity never fully develops.

After the window for learning language closes, learning a second language seems more difficult. People who learn a second language as adults usually speak it with the accent of their first. Grammar learning is similarly more difficult. Jacqueline Johnson and Elissa Newport (1991) asked Korean and Chinese immigrants to identify whether each of 276 English sentences *("Yesterday the hunter shoots a deer")* was grammatically correct or incorrect. Some test-takers had arrived in the United States in early childhood, others as adults, but all had been in the country for approximately 10 years. Nevertheless, as **FIGURE 23.1** reveals, those who learned their second language early learned it best. The older the age at which one emigrates to a new country, the harder it is to learn its language (Hakuta et al., 2003).

The impact of early experiences is also evident in language learning in the 90+ percent of deaf children born to hearing-nonsigning parents. These children typically do not experience language during their early years. Compared with children exposed to sign language from birth, those who learn to sign as teens or adults are like immigrants who learn English after childhood. They can master the basic words and learn to order them, but they never become as fluent as native signers in producing and comprehending subtle grammatical differences (Newport, 1990). Moreover, the late-learners show less brain activity in right hemisphere regions that are active as native signers read sign language (Newman et al., 2002). As a flower's growth will be stunted without nourishment, so, too, will children typically become linguistically stunted if isolated from language during the critical period for its acquisition.

"Childhood is the time for language, no doubt about it. Young children, the younger the better, are good at it; it is child's play. It is a onetime gift to the species."

—Lewis Thomas, *The Fragile Species*, 1992

***No* means *no*—no matter how you say it!** Deaf children of Deaf-signing parents and hearing children of hearing parents have much in common. They develop language skills at about the same rate, and they are equally effective at opposing parental wishes and demanding their way.

George Ancona

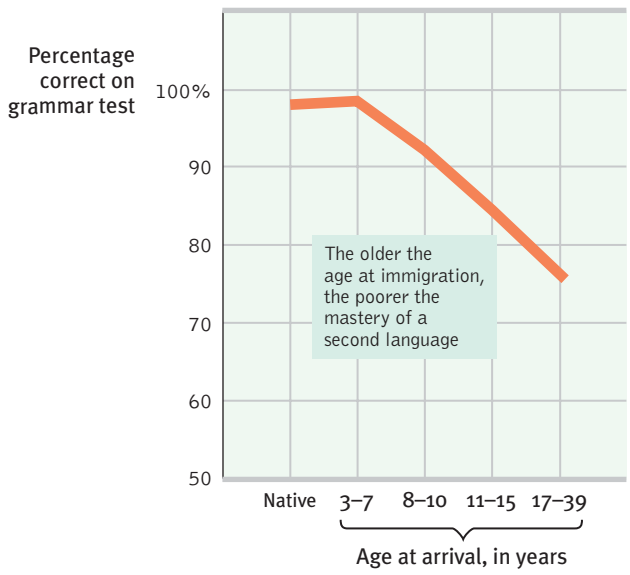


FIGURE 23.1 New language learning gets harder with age
Young children have a readiness to learn language. Ten years after coming to the United States, Asian immigrants took a grammar test. Although there is no sharply defined critical period for second language learning, those who arrived before age 8 understood American English grammar as well as native speakers did. Those who arrived later did not. (From Johnson & Newport, 1991.)

linguistic determinism Whorf's hypothesis that language determines the way we think.

Thinking and Language

23-3: What is the relationship between language and thinking?

Thinking and language intricately intertwine. Asking which comes first is one of psychology's chicken-and-egg questions. Do our ideas come first and we wait for words to name them? Or are our thoughts conceived in words and therefore unthinkable without them?

Language Influences Thinking

"All words are pegs to hang ideas on."
—Henry Ward Beecher, *Proverbs from Plymouth Pulpit*, 1887

Linguist Benjamin Lee Whorf contended that language determines the way we think. According to Whorf's (1956) **linguistic determinism** hypothesis, different languages impose different conceptions of reality: "Language itself shapes a man's basic ideas." The Hopi, Whorf noted, have no past tense for their verbs. Therefore, he contended, a Hopi could not so readily *think* about the past.

To say that language *determines* the way we think is much too strong. But to those who speak two dissimilar languages, such as English and Japanese, it seems obvious that a person may think differently in different languages (Brown, 1986). Unlike English, which has a rich vocabulary for self-focused emotions such as anger, Japanese has more words for interpersonal emotions such as sympathy (Markus & Kitayama, 1991). Many bilinguals report that they have different senses of self, depending on which language they are using (Matsumoto, 1994). They may even reveal different personality profiles when taking the same test in their two languages (Dinges & Hull, 1992).

"Learn a new language and get a new soul."
—Czech proverb

Michael Ross, Elaine Xun, and Anne Wilson (2002) demonstrated this by inviting China-born, bilingual University of Waterloo students to describe themselves in English or Chinese. English-language versions of self-descriptions fit typical Canadian profiles: Students expressed mostly positive self-statements and moods. Responding in Chinese, students gave typically Chinese self-descriptions: They reported more agreement with Chinese values and roughly equal positive and negative self-statements and moods. Their language use seemed to shape how they thought of themselves.

A similar personality change occurs as people shift between the cultural frames associated with English and Spanish. English speakers score higher than Spanish speakers on measures of extraversion, agreeableness, and conscientiousness. But is this a language effect? Nairán Ramírez-Esparza and her co-workers (2006) wondered. So they had samples of bicultural and bilingual Americans and Mexicans take the tests in each language. Sure enough, when using English they expressed their somewhat more extraverted, agreeable, and conscientious selves (and the differences were not due to how the questionnaires were translated).

Before reading on, use a pen or pencil to sketch this idea: "The girl pushes the boy." Then see the inverted note below.

How did you illustrate "the girl pushes the boy"? Anne Maass and Aurore Russo (2003) report that people whose language reads from left to right mostly position the pushing girl on the left. Those who read and write Arabic, a right-to-left language, mostly place her on the right. This spatial bias appears only in those old enough to have learned their culture's writing system (Dobel et al., 2007).

So our words may not *determine* what we think, but they do *influence* our thinking (Hardin & Banaji, 1993; Özgen, 2004). We use our language in forming categories. In Brazil, the isolated Piraha tribespeople have words for the numbers *1* and *2*, but numbers above that are simply "many." Thus, if shown 7 nuts in a row, they find it very difficult to lay out the same number from their own pile (Gordon, 2004).

Words also influence our thinking about colors. Whether we live in New Mexico, New South Wales, or New Guinea, we *see* colors much the same, but we use our native language to *classify* and *remember* colors (Davidoff, 2004; Roberson et al., 2004, 2005). If that language is English, you might view three colors and call two of them "yellow" and one of them "blue." Later you would likely see and recall the yellows as being more similar. But if you were a member of Papua New Guinea's Berinmo tribe, which has words for two different shades of yellow, you would better recall the distinctions between the two yellows.

Perceived distances between cities also grow when two cities are in different countries rather than in the same country (Burris & Branscombe, 2005).

Perceived differences grow when we assign different names to colors. On the color spectrum, blue blends into green—until we draw a dividing line between the portions we call "green" and "blue." Although equally different on the color spectrum, two different "blues" (or two different "greens") that share the same name

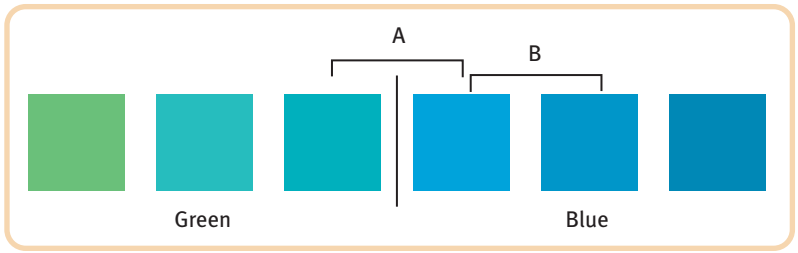


FIGURE 23.2 Language and perception Emre Özgen (2004) reports that when people view blocks of equally different colors, they perceive those with different names as more different. Thus the "green" and "blue" in contrast A may appear to differ more than the two similarly different blues in contrast B.

(**FIGURE 23.2b**), are harder to distinguish than two items with the different names "green" and "blue" (Özgen, 2004).

Given words' subtle influence on thinking, we do well to choose our words carefully. Does it make any difference whether I write, "A child learns language as *he* interacts with *his* caregivers" or "Children learn language as *they* interact with *their* caregivers"? Many studies have found that it does. When hearing the generic *he* (as in "the artist and his work") people are more likely to picture a male (Henley, 1989; Ng, 1990). If *he* and *his* were truly gender-free, we shouldn't skip a beat when hearing that "man, like other mammals, nurses his young."

To expand language is to expand the ability to think. Young children's thinking develops hand in hand with their language (Gopnik & Meltzoff, 1986). Indeed, it is very difficult to think about or conceptualize certain abstract ideas (commitment, freedom, or rhyming) without language! And what is true for preschoolers is true for everyone: *It pays to increase your word power.* That's why most textbooks, including this one, introduce new words—to teach new ideas and new ways of thinking.

Increased word power helps explain what McGill University researcher Wallace Lambert (1992; Lambert et al., 1993) calls the *bilingual advantage*. Bilingual children, who learn to inhibit one language while using the other, are also better able to inhibit their attention to irrelevant information. If asked whether a sentence *("Why is the cat barking so loudly?")* is grammatically correct, they can more efficiently focus on the grammar alone (Bialystok, 2001; Carlson & Meltzoff, 2008).

Lambert helped devise a Canadian program that immerses English-speaking children in French. (From 1981 to 2001, the number of non-Quebec Canadian children immersed in French rose from 65,000 to 297,000 [Statistics Canada, 2007].) For most of their first three years in school, the English-speaking children are taught entirely in French, and thereafter gradually shift by the end of their schooling to classes mostly in English. Not surprisingly, the children attain a natural French fluency unrivaled by other methods of language teaching. Moreover, compared with similarly capable children in control groups, they do so without detriment to their English fluency, and with increased aptitude scores, creativity, and appreciation for French-Canadian culture (Genesee & Gándara, 1999; Lazaruk, 2007).

Whether we are deaf or hearing, minority or majority, language links us to one another. Language also connects us to the past and the future. "To destroy a people, destroy their language," observed poet Joy Harjo.

Jim Cummins/Getty Images

A safe sign We have outfielder William Hoy to thank for baseball sign language. The first deaf player to join the major leagues (1892), he invented hand signals for "Strike!" "Safe!" (shown here) and "Yerr Out!" (Pollard, 1992). Such gestures worked so well that referees in all sports now use invented signs, and fans are fluent in sports sign language.

Many native English speakers, including most Americans, are monolingual. Most humans are bilingual or multilingual. Does monolingualism limit people's ability to comprehend the thinking of other cultures?

Thinking in Images

Without a doubt, words convey ideas. But aren't there times when ideas precede words? To turn on the cold water in your bathroom, in which direction do you turn the handle? To answer this question, you probably thought not in words but with *nondeclarative* (procedural) memory—a mental picture of how you do it.

Indeed, we often think in images. Artists think in images. So do composers, poets, mathematicians, athletes, and scientists. Albert Einstein reported that he achieved some of his greatest insights through visual images and later put them into words. Pianist Liu Chi Kung showed the value of thinking in images. One year after placing second in the 1958 Tschaikovsky piano competition, Liu was imprisoned during China's cultural revolution. Soon after his release, after seven years without

Courtesy Christine Brune

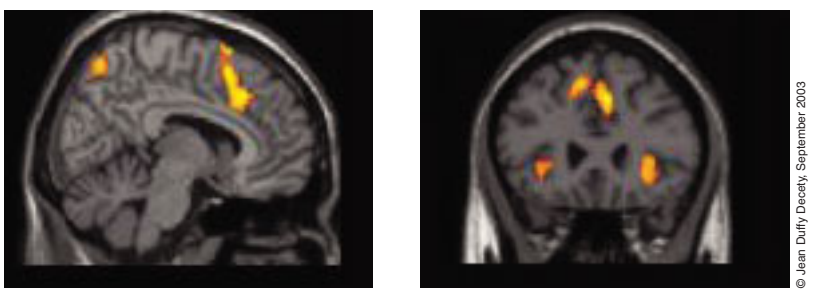
A thoughtful art Playing the piano engages thinking without language. In the absence of a piano, mental practice can sustain one's skill.

touching a piano, he was back on tour, the critics judging his musicianship better than ever. How did he continue to develop without practice? "I did practice," said Liu, "every day. I rehearsed every piece I had ever played, note by note, in my mind" (Garfield, 1986).

For someone who has learned a skill, such as ballet dancing, even *watching* the activity will activate the brain's internal simulation of it, reported one British research team after collecting fMRIs as people watched videos (Calvo-Merino et al., 2004). So, too, will imagining an activity. **FIGURE 23.3** shows an fMRI of a person imagining the experience of pain, activating neural networks that are active during actual pain (Grèzes & Decety, 2001). Small wonder, then, that mental practice is now a standard part of Olympic athletes' training (Suinn, 1997).

One experiment on mental practice and basketball foul shooting tracked the University of Tennessee women's team over 35 games (Savoy & Beitel, 1996). During that time, the team's free-throw shooting increased from approximately 52 percent in games following standard physical practice to some 65 percent after mental practice. Players had repeatedly imagined making foul shots under various conditions, including being "trash-talked" by their opposition. In a dramatic conclusion, Tennessee won the national championship game in overtime, thanks in part to their foul shooting.

Mental rehearsal can also help you achieve an academic goal, as Shelley Taylor and her UCLA colleagues (1998) demonstrated with two groups of introductory psychology students facing a midterm exam one week later. (Scores of other students formed a control group, not engaging in any mental simulation.) The first group was told to spend five minutes each day visualizing themselves scanning the posted grade list, seeing their A, beaming with joy, and feeling proud. This daily *outcome simulation* had little effect, adding only 2 points to their exam-scores average. Another group spent five minutes each day visualizing themselves effectively studying—reading the assignments, going over notes, eliminating distractions, declining an offer to go out. This daily *process simulation* paid off—this second group began studying sooner, spent more time at it, and beat the others' average by 8 points. *The point to remember:* It's better to spend your fantasy time planning how to get somewhere than to dwell on the imagined destination.



© Jean Duffy Decety, September 2003

FIGURE 23.3 The power of imagination Imagining a physical activity triggers action in the same brain areas that are triggered when actually performing that activity. These fMRIs show a person imagining the experience of pain, which activates some of the same areas in the brain as the actual experience of pain.

Experiments on thinking without language bring us back to a now-familiar principle: Much of our information processing occurs outside of consciousness and beyond language. Inside our ever-active brain, many streams of activity flow in parallel, function automatically, are remembered implicitly, and only occasionally surface as conscious words.

* * *

What, then, should we say about the relationship between thinking and language? As we have seen, language does influence our thinking. But if thinking did not also affect language, there would never be any new words. And new words and new combinations of old words express new ideas. The basketball term *slam dunk* was coined after the act itself had become fairly common. So, let us say that *thinking affects our language, which then affects our thought* (**FIGURE 23.4**).

Psychological research on thinking and language mirrors the mixed views of our species by those in fields such as literature and religion. The human mind is simultaneously capable of striking intellectual failures and of striking intellectual power. Misjudgments are common and can have disastrous consequences. So we do well to appreciate our capacity for error. Yet our efficient heuristics often serve us well. Moreover, our ingenuity at problem solving and our extraordinary power of language mark humankind as almost "infinite in faculties."

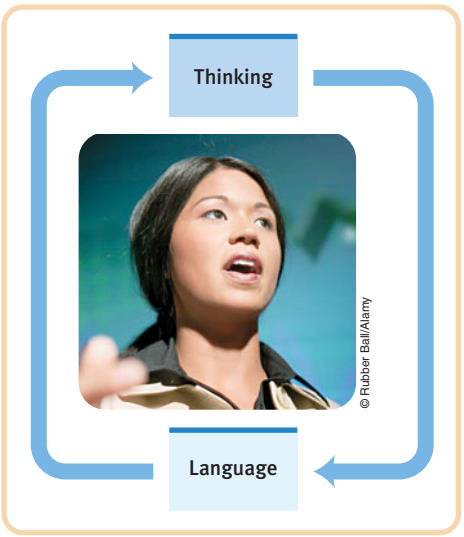


FIGURE 23.4 The interplay of thought and language The traffic runs both ways between thinking and language. Thinking affects our language, which affects our thought.

Animal Thinking and Language

23-4: What do we know about animal thinking? Do other animals share our capacity for language?

If in our use of language we humans are, as the psalmist long ago rhapsodized, "little lower than God," where do other animals fit in the scheme of things? Are they "little lower than human"? Let's see what the research on animal thinking and language can tell us.

What Do Animals Think?

Animals are smarter than we may realize. Baboons know each voice in their 80-member troop (Jolly, 2007). Sheep can recognize and remember individual faces (Morell, 2008). Marmosets can learn from and imitate others. Great apes and even monkeys can *form concepts*. When monkeys learn to classify cats and dogs, certain frontal lobe neurons in their brains fire in response to new "catlike" images, others to new "doglike" images (Freedman et al., 2001). Even pigeons can sort objects (pictures of cars, cats, chairs, flowers). Shown a picture of a never-before-seen chair, pigeons will reliably peck a key that represents the category "chairs" (Wasserman, 1995).

We also are not the only creatures to *display insight*, as psychologist Wolfgang Köhler (1925) demonstrated in an experiment with Sultan, a chimpanzee. Köhler placed a piece of fruit and a long stick well beyond Sultan's reach, and a short stick inside his cage. Spying the short stick, Sultan grabbed it and tried to reach the fruit. After several unsuccessful attempts, Sultan dropped the stick and seemed to survey the situation. Then suddenly, as if thinking "Aha!" he jumped up, seized the short stick again, and used it to pull in the longer stick—which he then used to reach the fruit. This evidence of animal cognition, said Köhler, showed that there is more to learning than conditioning. What is more, in later research, apes have even exhibited foresight, by storing a tool that they can use to retrieve food the next day (Mulcahy & Call, 2006).

Some animals also display a surprising *numerical ability*. Until his death in 2007, the African Grey parrot, Alex, displayed jaw-dropping numerical skills (Pepperberg, 2006). He not only could name and categorize objects, he displayed a comprehension of numbers up to 6. Thus, he could speak the number of objects, add two small clusters of objects and announce the sum, and indicate which of two numbers was greater. And he could answer when shown various groups of objects and asked, for example, "What color four?" (meaning "What's the color of the objects of which there are four?").

Tetsuro Matsuzawa/Primate Research Institute, Kyoto University

FIGURE 23.5
Chimpanzee bests humans It is adaptive for chimpanzees to be able to monitor lots of information in their natural environment. This might explain how chimpanzee Ai can remember and tap numbers in ascending order, even when they are flashed for less than a second before being covered by white boxes.

Kyoto University researcher Tetsuro Matsuzawa (2007) has spent more than two decades studying chimpanzees' ability to remember and relate numbers. In one experiment, the chimpanzee Ai taps, in ascending order, numbers randomly displayed on a computer screen. If four or five of the numbers between 1 and 9 are flashed for no more than a second, and then replaced by white boxes, Ai, after much training, does what a human cannot: Remembering the flashed numbers, she again taps the boxes in numerical order (**FIGURE 23.5**).

Like humans, chimpanzees are shaped by reinforcement when they solve problems. Forest-dwelling chimpanzees have become *natural tool users* (Boesch-Achermann & Boesch, 1993). They break off a reed or a stick, strip the twigs and leaves, carry it to a termite mound, fish for termites by twisting it just so, and then carefully remove it without scraping off many termites. They even select different tools for different purposes—a heavy stick to puncture holes, a light, flexible stick for fishing (Sanz et al., 2004). One anthropologist, trying to mimic the chimpanzee's deft termite fishing, failed miserably.

Researchers have found at least 39 local customs related to chimpanzee tool use, grooming, and courtship (Whiten & Boesch, 2001). One group may slurp ants directly from the stick, while another group plucks them off individually. One group may break nuts with a stone hammer, another with a wooden hammer. Or picture this actual laboratory experiment with observational learning: Chimpanzee B observes Chimpanzee A as it obtains food, either by sliding or lifting a door. Then B follows the same lifting or sliding procedure. So does Chimpanzee C after observing B, and so forth. Chimp see, chimp do, unto the sixth generation (Bonnie et al., 2007; Horner et al., 2006).

The chimpanzee group differences, along with differing dialects and hunting styles, seem not to be genetic. Rather, they are the chimpanzee equivalent of cultural diversity. Like humans, chimpanzees invent behaviors and *transmit cultural patterns* to their peers and offspring (**FIGURE 23.6a**). And so do some Australian dolphins (Figure 23.6b), which have learned to break off sponges and wear them on their snouts while probing the sea floor for fish (Krützen et al., 2005).

Thus animals, and chimpanzees in particular, display remarkable talents. But do they, like humans, exhibit language?

FIGURE 23.6 Cultural transmission (a) On the western bank of one Ivory Coast river, a youngster watches as its mother uses a stone hammer to open a nut. On the river's other side, a few miles away, chimpanzees do not follow this custom. (b) This bottlenose dolphin in Shark Bay, Western Australia, is a member of a small group that uses marine sponges as protective gear when probing the sea floor for fish.

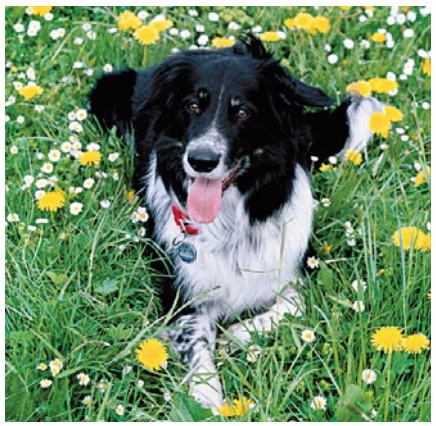
Michael Nichols/National Geographic Image Collection

(a)

Copyright Amanda K. Coakes

(b)

Do Animals Exhibit Language?



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Comprehending canine
Rico, a border collie with a 200-word vocabulary, can infer that an unfamiliar sound refers to a novel object.

Without doubt, animals communicate. Vervet monkeys have different alarm cries for different predators: a barking call for a leopard, a cough for an eagle, and a chuttering for a snake. Hearing the leopard alarm, other vervets climb the nearest tree. Hearing the eagle alarm, they rush into the bushes. Hearing the snake chutter, they stand up and scan the ground (Byrne, 1991). Whales also communicate, with clicks and songs. Honeybees do a dance that informs other bees of the direction and distance of the food source.

And what shall we say of dogs' ability to understand us? Border collie Rico knows and can fetch 200 items by name. Moreover, reports a team of psychologists at Leipzig's Max Planck Institute, if he is asked to retrieve a novel toy with a name he has never heard, Rico will pick out the novel item from among a group of familiar items (Kaminski et al., 2004). Hearing that novel word for the second time four weeks later, he as often as not retrieves the object. Such feats show animals' comprehension and communication. But is this language?

The Case of the Apes

The greatest challenge to our claim to be the only language-using species has come from one of our closest genetic relatives, the chimpanzees. Psychologists Allen Gardner and Beatrix Gardner (1969) aroused enormous scientific and public interest when they taught sign language to the chimpanzee Washoe (c. 1965–2007). After four years, Washoe could use 132 signs; by age 32, the number of signs had reached 181 (Sanz et al., 1998). One *New York Times* reporter, having learned sign language from his deaf parents, visited Washoe and exclaimed, "Suddenly I realized I was conversing with a member of another species in my native tongue."

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"He says he wants a lawyer."

Further evidence of gestured "ape language" surfaced during the 1970s. Usually apes sign just single words such as "that" or "gimme" (Bowman, 2003). But sometimes they string signs together to form intelligible sentences. Washoe signed, "You me go out, please." Apes even appear to combine words creatively. Washoe designated a swan as a "water bird." Koko, a gorilla trained by Francine Patterson (1978), reportedly described a long-nosed Pinocchio doll as an "elephant baby." Lana, a "talking" chimpanzee that punched a crude computer keyboard which translated her entries into English, improvised when she wanted her trainer's orange. She had no word for *orange*, but she did know her colors and the word for *apple*, so she punched in: "?Tim give apple which-is orange" (Rumbaugh, 1977).

Seeing a doll floating in her water, Washoe signed, "Baby in my drink."

Granted, these vocabularies and sentences are simple, rather like those of a 2-year-old child (and nothing like your own 60,000 or so words, which you fluidly combine to create a limitless variety of sentences). Yet, as language reports accumulated, it seemed these apes might indeed be "little lower than human." Then, in the late 1970s, the fascination with "talking apes" turned toward cynicism: Were the chimps language champs or were the researchers chumps? The ape language researchers were making monkeys of themselves, said the skeptics. Consider:

- Unlike speaking or signing children, who effortlessly soak up dozens of new words a week, apes gain their limited vocabularies only with great difficulty (Wynne, 2004, 2008). Saying that apes can learn language because they can sign words is like saying humans can fly because they can jump.

Paul Fusco/Magnum Photos

But is this language?
Chimpanzees' ability to express themselves in American Sign Language (ASL) raises questions about the very nature of language. Here, the trainer is asking, "What is this?" The sign in response is "Baby." Does the response constitute language?

- Chimpanzees can make signs or push buttons in sequence to get a reward, but pigeons, too, can peck a sequence of keys to get grain (Straub et al., 1979). After training a chimpanzee he named Nim Chimsky, Herbert Terrace (1979) concluded that much of apes' signing is nothing more than aping their trainers' signs and learning that certain arm movements produce rewards.
- Presented with ambiguous information, people, thanks to their perceptual set, tend to see what they want or expect to see. Interpreting chimpanzee signs as language may be little more than the trainers' wishful thinking, claimed Terrace. (When Washoe signed *water bird,* she perhaps was separately naming *water* and *bird*.)
- "Give orange me give eat orange me eat orange . . ." is a far cry from the exquisite syntax of a 3-year-old (Anderson, 2004; Pinker, 1995). To the child, "you tickle" and "tickle you" communicate different ideas. A chimpanzee, lacking human syntax, might sign the phrases interchangeably.

"Chimps do not develop language. But that is no shame on them; humans would surely do no better if trained to hoot and shriek like chimps, to perform the waggle-dance of the bee, or any of the other wonderful feats in nature's talent show."

—Steve Pinker (1995)

In science as in politics, controversy can stimulate progress. Further evidence confirmed chimpanzees' abilities to think and communicate. One surprising finding was of Washoe's training her adopted son in the signs she had learned. After her second infant died, Washoe became withdrawn when told, "Baby dead, baby gone, baby finished." Two weeks later, caretaker-researcher Roger Fouts (1992, 1997) signed better news: "I have baby for you." Washoe reacted with instant excitement, hair on end, swaggering and panting while signing over and again, "Baby, my baby." It took several hours for Washoe and the foster infant, Loulis, to warm to each other, whereupon she broke the ice by signing, "Come baby" and cuddling Loulis.

In the months that followed, Loulis picked up 68 signs simply by observing Washoe and three other language-trained chimpanzees. They went on to sign spontaneously, asking one another to *chase, tickle, hug, come,* or *groom*. People who sign were in near-perfect agreement about what the chimpanzees were saying, 90 percent of which pertained to social interaction, reassurance, or play (Fouts & Bodamer, 1987). The chimpanzees even proved to be modestly bilingual, translating spoken English words into signs (Shaw, 1989–1990).

Even more stunning was the report by Sue Savage-Rumbaugh and her colleagues (1993) of pygmy chimpanzees learning to *comprehend syntax* in English spoken to them. Kanzi, a pygmy chimpanzee with the seeming grammatical abilities of a human 2-year-old, happened onto language while observing his adoptive mother during language training. Kanzi has behaved intelligently whether asked, "Can you show me the light?" or "Can you bring me the [flash]light?" or "Can you turn the light on?" Kanzi also knows many spoken words, such as *snake, bite,* and *dog*. Given stuffed animals and asked—for the first time—to "make the dog bite the snake," he put the snake to the dog's mouth. For chimpanzees as for humans, early life is a critical time for learning language. Without early exposure to speech or word symbols, adults will not gain language competence (Rumbaugh & Savage-Rumbaugh, 1994).

"[Our] view that [we are] unique from all other forms of animal life is being jarred to the core."

—Duane Rumbaugh and Sue Savage-Rumbaugh (1978)

The provocative claims that "apes share our capacity for language" and the skeptical counterclaims that "apes no use language" (as Washoe might have put it) have moved psychologists toward a greater appreciation of apes' remarkable abilities and of our own (Friend, 2004; Rumbaugh & Washburn, 2003). Most now agree that humans alone possess language, if by the term we mean verbal or signed expression of complex grammar. If we mean, more simply, an ability to communicate through a meaningful sequence of symbols, then apes are indeed capable of language.

Believing that animals could not think, French philosopher René Descartes and others argued that animals are living robots without any moral rights. Animals, it has been said at one time or another, cannot plan, conceptualize, count, use tools, show compassion, or use language (Thorpe, 1974). Today, we know better. Animal researchers have shown us that primates exhibit insight, show family loyalty, communicate with one another, display altruism, transmit cultural patterns across generations, and comprehend the syntax of human speech. Accepting and working out the moral implications of all this is an unfinished task for our own thinking species.

"Although humans make sounds with their mouths and occasionally look at each other, there is no solid evidence that they actually communicate with each other."

Language and Thought

Module Review

23-1: What are the milestones in language development? The timing varies from one child to another, but all children follow the same sequence. At about 4 months of age, infants *babble*, making a wide range of possible sounds. By about 10 months, babbling is limited to the sounds found in the child's household *language*. Around 12 months of age, children enter the *one-word stage*, which evolves into *two-word (telegraphic)* utterances before their second birthday. Speaking in full sentences follows soon after.

23-2: How do we learn language? Skinner proposed that we learn language by the familiar principles of operant conditioning—association (of sights of things with sounds of words), imitation (of words and syntax modeled by others), and reinforcement (with smiles and hugs after saying something right). Chomsky argued that we are biologically prepared to learn language, by means of a language acquisition device that equips us with a universal grammar, which we use to learn a specific language. Cognitive researchers find childhood to be a critical period for learning spoken and signed language.

23-3: What is the relationship between language and thinking? Although Whorf's *linguistic determinism* hypothesis suggested that language determines thought, it is more accurate to say that language influences thought. Different languages embody different ways of thinking, and immersion in bilingual education can enhance thinking. We often think in images when we use procedural memory—our unconscious memory system for motor and cognitive skills and classically and operantly conditioned associations. Thinking in images can increase our skills when we mentally practice upcoming events.

23-4: What do we know about animal thinking? Do other animals share our capacity for language? Primates and other animals demonstrate impressive abilities to think and communicate, including some abilities once thought possible only for humans, such as forming concepts, displaying insight, using and creating tools, exhibiting numerical abilities, and transmitting cultural innovations. Chimpanzees have learned to communicate with humans by signing or by pushing buttons wired to a computer and have taught their skills to younger animals. Pygmy chimpanzees have learned to comprehend syntax, but only humans possess true language—the ability to master the verbal or signed expression of complex grammar.

Rehearse It!

1. Children reach the one-word stage of speech development at about
   a. 4 months.
   b. 6 months.
   c. 1 year.
   d. 2 years.

2. Skinner's view that we learn language the same way we learn other behaviors—through association, imitation, and reinforcement—is most helpful in explaining
   a. the onset of babbling.
   b. the speech behavior of deaf infants.
   c. the seemingly effortless mastery of grammatical rules by very young children.
   d. why children learn their household's language.

3. According to Chomsky, children are born with a readiness to learn the grammatical rules of language, and all they need to acquire language is
   a. instruction in grammar.
   b. exposure to some language in early childhood.
   c. reinforcement for babbling and other early verbal behaviors.
   d. imitation and drill.

4. Our language influences the way we perceive and think about the world. This idea, adapted from Whorf's hypothesis, helps explain why
   a. a person who learns a second language thinks differently in that language.
   b. children have a built-in readiness to learn grammatical rules.
   c. children's babbling contains sounds not found in the languages spoken in their homes.
   d. artists, athletes, and others are able to think in visual images.

5. Of the examples discussed in this section, the problem-solving behavior that most closely resembled insight was
   a. Loulis the chimpanzee's ability to learn signs by observing Washoe.
   b. Sultan the chimpanzee's use of a short stick to pull in a long stick.
   c. Kanzi the pygmy chimpanzee's ability to understand grammatical differences in English sentences.
   d. Washoe the chimpanzee's use of sign language to request her baby.

6. Most researchers agree that apes can
   a. communicate through symbols.
   b. reproduce most human speech sounds.
   c. master language in adulthood.
   d. surpass a human 3-year-old in language skills.

Answers: 1. c, 2. d, 3. b, 4. a, 5. b, 6. a.

Terms and Concepts to Remember

language, p. 316
babbling stage, p. 317
one-word stage, p. 317
two-word stage, p. 317
telegraphic speech, p. 317
linguistic determinism, p. 320

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. It's been said that the development of language can be compared to the growth of a flower. Explain how, using the theories of Skinner and Chomsky.
2. A Czech proverb says, "Learn a new language and get a new soul." To what extent is this true?
3. How could mental rehearsal help your performance in this class?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 24

Intelligence

No controversy in psychology has been more heated than the question of whether there exists in each person a general intellectual capacity that can be measured and quantified as a number. School boards, courts, and scientists debate the usefulness and fairness of tests that attempt to measure people's mental abilities and assign them a score. Is it discriminatory to use such tests to rank individuals and determine whether to admit them to a particular educational program, university, or job? Do test score differences among individuals or groups reflect nature (heredity) or nurture (environment)? Let's consider findings from a century of research.

What Is Intelligence?

Intelligence is a socially constructed concept: Cultures deem "intelligent" whatever attributes enable success in those cultures (Sternberg & Kaufman, 1998). In the Amazon rain forest, intelligence may be understanding the medicinal qualities of local plants; in an Ontario high school, it may be superior performance on cognitive tasks. In each context, **intelligence** is the ability to learn from experience, solve problems, and use knowledge to adapt to new situations. In research studies, intelligence is what intelligence tests measure. Historically, as we will see, that has been the sort of problem solving displayed as "school smarts."

Is Intelligence One General Ability or Several Specific Abilities?

24-1: What argues for and against considering intelligence as one general mental ability?

You probably know some people with talents in science, others who excel at the humanities, and still others gifted in athletics, art, music, or dance. You may also know a talented artist who is dumbfounded by the simplest mathematical problems, or a brilliant math student with little aptitude for literary discussion. Are all these people intelligent? Could you rate their intelligence on a single scale? Or would you need several different scales?

New York Times *interviewer Deborah Solomon, 2004:* "What is your IQ?" *Physicist Stephen Hawking:* "I have no idea. People who boast about their IQ are losers."

© Maya Goded/Magnum Photos

Hands-on healing The socially constructed concept of intelligence varies from culture to culture. This folk healer in Peru displays his intelligence in his knowledge about his medicinal plants and understanding of the needs of the people he is helping.

intelligence mental quality consisting of the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

"*g* is one of the most reliable and valid measures in the behavioral domain . . . and it predicts important social outcomes such as educational and occupational levels far better than any other trait."

—Behavior geneticist Robert Plomin (1999)

Charles Spearman (1863–1945) believed we have one **general intelligence** (often shortened to ***g***). He granted that people often have special abilities that stand out. Spearman had helped develop **factor analysis,** a statistical procedure that identifies clusters of related items. He had noted that those who score high in one area, such as verbal intelligence, typically score higher than average in other areas, such as spatial or reasoning ability. Spearman believed a common skill set, the *g* factor, underlies all of our intelligent behavior, from navigating the sea to excelling in school.

We might liken mental abilities to physical abilities. Athleticism is not one thing but many. The ability to run fast is distinct from the strength needed for power lifting, which is distinct from the eye-hand coordination required to throw a ball on target. A champion weightlifter rarely has the potential to be a skilled ice skater. Yet there remains some tendency for good things to come packaged together—for running speed and throwing accuracy to correlate, thanks to general athletic ability. So, too, with intelligence. Several distinct abilities tend to cluster together and to correlate enough to define a small general intelligence factor.

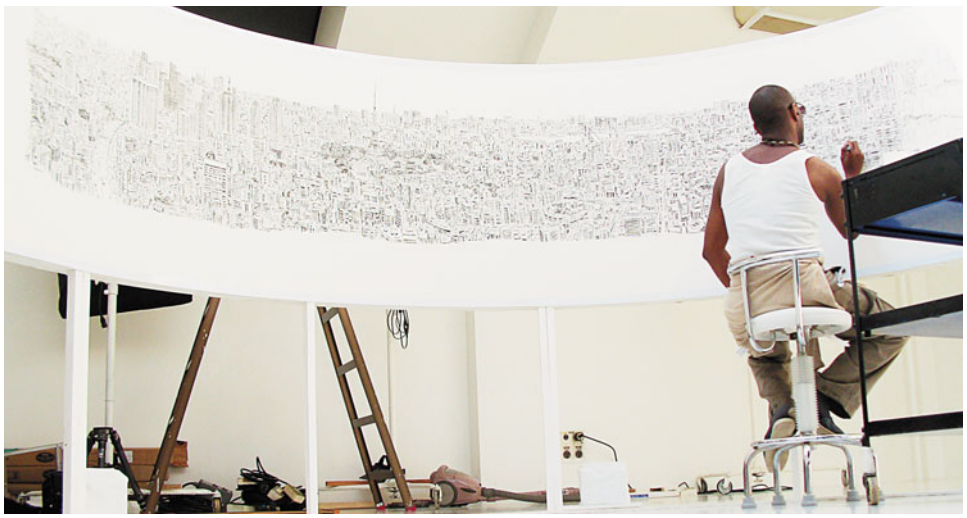
Theories of Multiple Intelligences

Since the mid-1980s some psychologists have sought to extend the definition of *intelligence* beyond Spearman's and others' academic smarts.

Gardner's Eight Intelligences

Howard Gardner (1983, 2006) views intelligence as multiple abilities that come in packages. Gardner finds evidence for this view in studies of people with diminished or exceptional abilities. Brain damage, for example, may destroy one ability but leave others intact. And consider people with **savant syndrome,** who often score low on intelligence tests but have an island of brilliance (Treffert & Wallace, 2002). Some have virtually no language ability, yet are able to compute numbers as quickly and accurately as an electronic calculator, or identify almost instantly the day of the week that corresponds to any given date in history, or render incredible works of art or musical performances (Miller, 1999). About 4 in 5 people with savant syndrome are males, and many also have autism, a developmental disorder.

Memory whiz Kim Peek, a savant who does not have autism, was the inspiration for the movie *Rain Man*. In 8 to 10 seconds, he can read and remember a page, and he has learned 9000 books, including Shakespeare and the Bible, by heart. He learns maps from the front of phone books, and he can provide MapQuest-like travel directions within any major U.S. city. Yet he cannot button his clothes. And he has little capacity for abstract concepts. Asked by his father at a restaurant to "lower your voice," he slid lower in his chair to lower his voice box. Asked for Lincoln's Gettysburg Address, he responded, "227 North West Front Street. But he only stayed there one night—he gave the speech the next day" (Treffert & Christensen, 2005).



Islands of genius: Savant syndrome
After a 30-minute helicopter ride and a visit to the top of a skyscraper, British savant artist Stephen Wiltshire began seven days of drawing that reproduced the Tokyo skyline.

TABLE 24.1 Gardner's Eight Intelligences*

Aptitude	Exemplar
1. *Linguistic*	T. S. Eliot, poet
2. *Logical-mathematical*	Albert Einstein, scientist
3. *Musical*	Igor Stravinsky, composer
4. *Spatial*	Pablo Picasso, artist
5. *Bodily-kinesthetic*	Martha Graham, dancer
6. *Intrapersonal (self)*	Sigmund Freud, psychiatrist
7. *Interpersonal (other people)*	Mahatma Gandhi, leader
8. *Naturalist*	Charles Darwin, naturalist

*Gardner (1998) has also speculated about a ninth possible intelligence—*existential intelligence*—the ability "to ponder large questions about life, death, existence."

general intelligence *(g)* a general intelligence factor that, according to Spearman and others, underlies specific mental abilities and is therefore measured by every task on an intelligence test.

factor analysis a statistical procedure that identifies clusters of related items (called *factors*) on a test; used to identify different dimensions of performance that underlie a person's total score.

savant syndrome a condition in which a person otherwise limited in mental ability has an exceptional specific skill, such as in computation or drawing.

Using such evidence, Gardner argues that we do not have *an* intelligence, but rather *multiple intelligences*. He identifies a total of eight (**TABLE 24.1**), including the verbal and mathematical aptitudes assessed by standard tests. Thus, the computer programmer, the poet, the street-smart adolescent who becomes a crafty executive, and the basketball team's point guard exhibit different kinds of intelligence (Gardner, 1998):

> If a person is strong (or weak) in telling stories, solving mathematical proofs, navigating around unfamiliar terrain, learning an unfamiliar song, mastering a new game that entails dexterity, understanding others, or understanding himself, one simply does not know whether comparable strengths (or weaknesses) will be found in other areas.

A general intelligence score is therefore like the overall rating of a city—which tells you something but doesn't give you much specific information about its schools, streets, or nightlife.

Wouldn't it be wonderful if the world were so just, responded intelligence researcher Sandra Scarr (1989). Wouldn't it be nice if being weak in one area would be compensated by genius in some other area? Alas, the world is not just. General intelligence scores predict performance on various complex tasks, in various jobs, and in varied countries; *g* matters (Bertua et al., 2005; Gottfredson, 2002a,b, 2003a,b; Rindermann, 2007; see also **FIGURE 24.1**).

Even so, "success" is not a one-ingredient recipe. High intelligence may help you get into a profession (via the schools and training programs that take you there), but it won't make you successful once there. The recipe for success combines talent with *grit:* Those who become highly successful are also conscientious, well-connected, and doggedly energetic. Anders Ericsson (2002, 2007; Ericsson

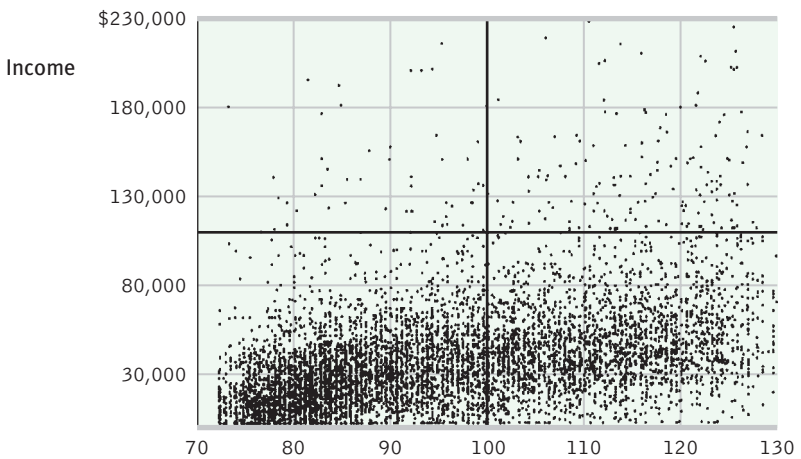


FIGURE 24.1 Smart and rich? Jay Zagorsky (2007) tracked 7403 participants in the U.S. National Longitudinal Survey of Youth across 25 years. As shown in this scatterplot, their intelligence scores correlated +.30, a modest positive correlation, with their later income.

Courtesy of Cameras on Wheels

Spatial intelligence genius In 1998, World Checkers Champion Ron "Suki" King of Barbados set a new record by simultaneously playing 385 players in 3 hours and 44 minutes. Thus, while his opponents often had hours to plot their game moves, King could only devote about 35 seconds to each game. Yet he still managed to win all 385 games!

et al., 2007) reports a *10-year rule:* A common ingredient of expert performance in chess, dancing, sports, computer programming, music, and medicine is "about 10 years of intense, daily practice."

"You have to be careful, if you're good at something, to make sure you don't think you're good at other things that you aren't necessarily so good at. . . . Because I've been very successful at [software development] people come in and expect that I have wisdom about topics that I don't."
—Bill Gates (1998)

Sternberg's Three Intelligences

Robert Sternberg (1985, 1999, 2003) agrees that there is more to success than traditional intelligence. And he agrees with Gardner's idea of multiple intelligences. But he proposes a *triarchic theory* of three, not eight, intelligences:

- ***Analytical (academic problem-solving) intelligence*** is assessed by intelligence tests, which present well-defined problems having a single right answer. Such tests predict school grades reasonably well and vocational success more modestly.
- ***Creative intelligence*** is demonstrated in reacting adaptively to novel situations and generating novel ideas.
- ***Practical intelligence*** is required for everyday tasks, which may be ill-defined, with multiple solutions. Sternberg and Richard Wagner's (1993, 1995) test of practical managerial intelligence measures skill at writing effective memos, motivating people, delegating tasks and responsibilities, reading people, and promoting one's own career. Business executives who score relatively high on this test have tended to earn high salaries and receive high performance ratings.


David R. Frazier Photolibrary, Inc./Alamy

Street smarts This child selling candy on the streets of Manaus, Brazil, is developing practical intelligence at a very young age.

With support from the U.S. College Board (which administers the widely used SAT Reasoning Test to U.S. college and university applicants), Sternberg (2006, 2007) and a team of collaborators have developed new measures of creativity (such as thinking up a caption for an untitled cartoon) and practical thinking (such as figuring out how to move a large bed up a winding staircase). Their initial data indicate that these more comprehensive assessments improve prediction of American students' first-year college grades, and they do so with reduced ethnic-group differences.

Although Sternberg and Gardner differ on specific points, they agree that multiple abilities can contribute to life success and that the differing varieties of giftedness add spice to life and challenges for education. Under their influence, many teachers have been trained to appreciate the varieties of ability and to apply multiple intelligence theory in their classrooms.

Intelligence and Creativity

24-2: What is creativity, and what fosters it?

Pierre de Fermat, a seventeenth-century mischievous genius, challenged mathematicians of his day to match his solutions to various number theory problems. His most famous challenge—*Fermat's last theorem*—baffled the greatest mathematical minds, even after a $2 million prize (in today's dollars) was offered in 1908 to whoever first created a proof.

Princeton mathematician Andrew Wiles had pondered the problem for more than 30 years and had come to the brink of a solution. Then, one morning, out of the blue, the final "incredible revelation" struck him. "It was so indescribably beautiful; it was so simple and so elegant. I couldn't understand how I'd missed it and I just stared at it in disbelief for 20 minutes. Then during the day I walked around the department, and I'd keep coming back to my desk looking to see if it was still there. It was still there. I couldn't contain myself, I was so excited. It was the most important moment of my working life" (Singh, 1997, p. 25).

Wiles' incredible moment illustrates **creativity**—the ability to produce ideas that are both novel and valuable. Studies suggest that a certain level of aptitude—a score of about 120 on a standard intelligence test—is necessary but not sufficient for creativity. Exceptionally creative architects, mathematicians, scientists, and engineers usually score not much higher on intelligence tests than do their less creative peers (MacKinnon & Hall, 1972; Simonton, 2000). So, clearly there is more to creativity than what intelligence tests reveal. Indeed, the two kinds of thinking engage different brain areas. Intelligence tests, which demand a single correct answer, require *convergent thinking*. Injury to the left parietal lobe damages this ability. Creativity tests *(How many uses can you think of for a brick?)* require *divergent thinking*. Injury to certain areas of the frontal lobes can leave reading, writing, and arithmetic skills intact but destroy imagination (Kolb & Whishaw, 2006).

Sternberg and his colleagues have identified five components of creativity (Sternberg, 1988, 2003; Sternberg & Lubart, 1991, 1992):

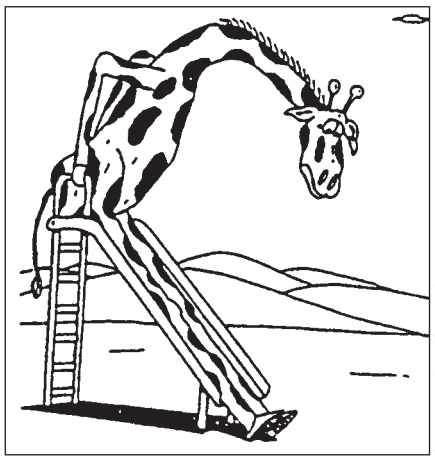
1. ***Expertise,*** a well-developed base of knowledge, furnishes the ideas, images, and phrases we use as mental building blocks. "Chance favors only the prepared mind," observed Louis Pasteur. The more blocks we have, the more chances we have to combine them in novel ways. Wiles' well-developed base of knowledge put the needed theorems and methods at his disposal.
2. ***Imaginative thinking skills*** provide the ability to see things in novel ways, to recognize patterns, and to make connections. Having mastered a problem's basic elements, we redefine or explore it in a new way. Copernicus first developed expertise regarding the solar system and its planets, and then creatively defined the system as revolving around the Sun, not the Earth. Wiles' imaginative solution combined two partial solutions.
3. ***A venturesome personality*** seeks new experiences, tolerates ambiguity and risk, and perseveres in overcoming obstacles. Inventor Thomas Edison tried countless substances before finding the right one for his lightbulb filament.
4. ***Intrinsic motivation*** is being driven more by interest, satisfaction, and challenge than by external pressures (Amabile & Hennessey, 1992). Creative people focus less on extrinsic motivators—meeting deadlines, impressing people, or making money—than on the pleasure and stimulation of the work itself. Asked how he solved such difficult scientific problems, Isaac Newton reportedly answered, "By thinking about them all the time." Wiles concurred: "I was so obsessed by this problem that for eight years I was thinking about it all the time—when I woke up in the morning to when I went to sleep at night" (Singh & Riber, 1997).

creativity the ability to produce novel and valuable ideas.

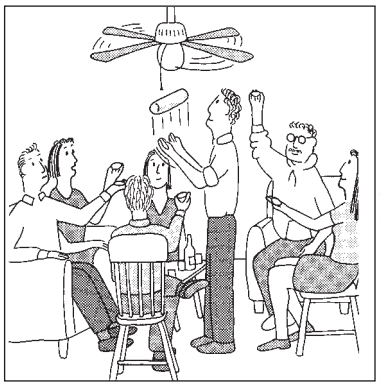
After picking up a Nobel Prize in Stockholm, physicist Richard Feynman stopped in Queens, New York, to look at his high school record. "My grades were not as good as I remembered," he reported, "and my IQ was [a good, though unexceptional] 124" (Faber, 1987).

"If you would allow me any talent, it's simply this: I can, for whatever reason, reach down into my own brain, feel around in all the mush, find and extract something from my persona, and then graft it onto an idea."

—Cartoonist Gary Larson, *The Complete Far Side,* 2003



"For the love of God, is there a doctor in the house?"



Everyone held up their crackers as David threw the cheese log into the ceiling fan.

Imaginative thinking Cartoonists display creativity as they see things in new ways or make unusual connections.

5. ***A creative environment*** sparks, supports, and refines creative ideas. After studying the careers of 2026 prominent scientists and inventors, Dean Keith Simonton (1992) noted that the most eminent among them were mentored, challenged, and supported by their relationships with colleagues. Even Wiles stood on the shoulders of others and wrestled his problem with the collaboration of a former student. Creativity-fostering environments often support contemplation. Jonas Salk solved a problem that led to the polio vaccine while in a monastery. Later, he designed the Salk Institute to provide contemplative spaces where other scientists could work without interruption (Sternberg, 2006).

"You're wise, but you lack tree smarts."

Emotional Intelligence

24-3: What makes up emotional intelligence?

Many creative people network effectively with peers because they are adept at processing and managing social information, a skill some rationally smart people lack (Cantor & Kihlstrom, 1987; Weis & Süß, 2007). Such skills are an aspect of *social intelligence,* a concept first proposed in 1920 by psychologist Edward Thorndike (Goleman, 2006). John Mayer, Peter Salovey, and David Caruso (2002, 2008) have developed a test that assesses four components of what they call **emotional intelligence:** the abilities to *perceive emotions* (to recognize them in faces, music, and stories); *understand emotions* (to predict them and how they change and blend); *manage emotions* (to know how to express them in varied situations); and *use emotions* to enable adaptive or creative thinking. In both the United States and Germany, those scoring high on managing emotions enjoy higher-quality interactions with friends (Lopes et al., 2004). They avoid being hijacked by overwhelming depression, anxiety, or anger. They can read others' emotions and know what to say to soothe a grieving friend, encourage a colleague, and manage a conflict. Across 69 studies in many countries, those scoring high in emotional intelligence also exhibit modestly better job performance (Van Rooy & Viswesvaran, 2004; Zeidner et al., 2008). They can override immediate impulses and delay gratification in pursuit of long-range rewards. Simply said, they are emotionally in tune with others, and thus they often succeed in career, marriage, and parenting situations where academically smarter (but emotionally less intelligent) people fail (Ciarrochi et al., 2006).

Brain damage reports have provided extreme examples of the results of diminished emotional intelligence in people with high general intelligence. Neuroscientist Antonio Damasio (1994) told of Elliot, who had a brain tumor removed: "I never saw a tinge of emotion in my many hours of conversation with him, no sadness, no impatience, no frustration." Shown disturbing pictures of injured people, destroyed communities, and natural disasters, Elliot showed—and realized he felt—no emotion. He knew but he could not feel. Unable to intuitively adjust his behavior in response to

emotional intelligence the ability to perceive, understand, manage, and use emotions.

intelligence test a method for assessing an individual's mental aptitudes and comparing them with those of others, using numerical scores.

mental age a measure of intelligence test performance devised by Binet; the chronological age that most typically corresponds to a given level of performance. Thus, a child who does as well as the average 8-year-old is said to have a mental age of 8.

Stanford-Binet the widely used American revision (by Terman at Stanford University) of Binet's original intelligence test.

others' feelings, Elliot lost his job. He went bankrupt. His marriage collapsed. He remarried and divorced again. At last report, he was dependent on a disability check and custodial care from a sibling.

Some scholars are concerned that the concept of emotional intelligence pushes things too far. Mayer, Salovey, and Caruso have themselves cautioned against stretching "emotional intelligence" to include varied traits, such as self-esteem and optimism. Multiple-intelligence man Howard Gardner (1999) goes a step further. He welcomes our stretching the concept of intelligence into the realms of space, music, and information about ourselves and others. But let us also, he says, respect emotional sensitivity, creativity, and motivation as important but different. Stretch *intelligence* to include everything we prize and it will lose its meaning.

""I worry about [intelligence] definitions that collapse assessments of our cognitive powers with statements about the kind of human beings we favor."

—Howard Gardner, "Rethinking the Concept of Intelligence," 2000

Assessing Intelligence

How do we assess intelligence? And what makes a test credible? Answering those questions begins with a look at why psychologists created **intelligence tests** and how they have used them.

The Origins of Intelligence Testing

24-4: When and why were intelligence tests created?

Alfred Binet: Predicting School Achievement

The modern intelligence-testing movement began at the turn of the twentieth century, when France passed a law requiring that all children attend school. Some children, including many newcomers to Paris, seemed incapable of benefiting from the regular school curriculum and in need of special classes. But how could the schools objectively identify children with special needs?

The French government hesitated to trust teachers' subjective judgments of children's learning potential. Academic slowness might merely reflect inadequate prior education. Also, teachers might prejudge children on the basis of their social backgrounds. To minimize bias, France's minister of public education in 1904 commissioned Alfred Binet (1857–1911) and others to study the problem.

Binet and his collaborator, Théodore Simon, began by assuming that all children follow the same course of intellectual development but that some develop more rapidly. On tests, therefore, a "dull" child should perform as does a typical younger child, and a "bright" child as does a typical older child. Thus, their goal became measuring each child's **mental age,** the level of performance typically associated with a certain chronological age. The average 9-year-old, for example, has a mental age of 9. Children with below-average mental ages, such as 9-year-olds who perform at the level of a typical 7-year-old, would struggle with schoolwork considered normal for their age.

To measure mental age, Binet and Simon tested a variety of reasoning and problem-solving questions on Binet's two daughters, and then on "bright" and "backward" Parisian schoolchildren. They identified items that would predict how well French children would handle their schoolwork. Binet hoped his test would be used to improve children's education, but he also feared it would be used to label children and limit their opportunities (Gould, 1981).

National Library of Medicine

Alfred Binet "Some recent philosophers have given their moral approval to the deplorable verdict that an individual's intelligence is a fixed quantity, one which cannot be augmented. We must protest and act against this brutal pessimism" (Binet, 1909, p. 141).

"The IQ test was invented to predict academic performance, nothing else. If we wanted something that would predict life success, we'd have to invent another test completely."

—Social psychologist Robert Zajonc (1984b)

Lewis Terman: The Innate IQ

Binet's fears were realized soon after his death in 1911, when others adapted his tests for use as a numerical measure of inherited intelligence. Stanford University professor Lewis Terman (1877–1956) adapted some of Binet's original items, added others, and established new age norms for California schoolchildren. Terman also extended the upper end of the test's range from teenagers to "superior adults." He gave his revision the name it retains today—the **Stanford-Binet.**

© Jason Love

Mrs. Randolph takes mother's pride too far.

From such tests, German psychologist William Stern derived the famous **intelligence quotient,** or **IQ.** The IQ was simply a person's mental age divided by chronological age and multiplied by 100 to get rid of the decimal point:

$$\text{IQ} = \frac{\text{mental age}}{\text{chronological age}} \times 100$$

Thus, an average child, whose mental and chronological ages are the same, has an IQ of 100. But an 8-year-old who answers questions as would a typical 10-year-old has an IQ of 125.

The original IQ formula worked fairly well for children but not for adults. (Should a 40-year-old who does as well on the test as an average 20-year-old be assigned an IQ of only 50?) Most current intelligence tests, including the Stanford-Binet, no longer compute an IQ (though the term *IQ* still lingers in everyday vocabulary as a shorthand expression for "intelligence test score"). Instead, they represent the test-taker's performance *relative* to the *average performance of others of the same age*. This average performance is arbitrarily assigned a score of 100, and about two-thirds of all test-takers fall between 85 and 115.

David Wechsler: Verbal and Performance Subtests

Psychologist David Wechsler created what is now the most widely used intelligence test, the **Wechsler Adult Intelligence Scale (WAIS),** with a version for school-age children (the *Wechsler Intelligence Scale for Children [WISC]*), and another for preschool children. As illustrated in **FIGURE 24.2**, the WAIS consists of 11 subtests broken into verbal and performance areas. It yields not only an overall intelligence score, as does the Stanford-Binet, but also separate scores for verbal comprehension, perceptual organization, working memory, and processing speed. Striking differences among these scores can provide clues to cognitive strengths or weaknesses

FIGURE 24.2 Sample items from an earlier edition of Wechsler Adult Intelligence Scale (WAIS) subtests
(Adapted from Thorndike & Hagen, 1977.)

VERBAL

General Information
What day of the year is Independence Day?

Similarities
In what way are *wool* and *cotton* alike?

Arithmetic Reasoning
If eggs cost 60 cents a dozen, what does 1 egg cost?

Vocabulary
Tell me the meaning of corrupt.

Comprehension
Why do people buy fire insurance?

Digit Span
Listen carefully, and when I am through, say the numbers right after me.

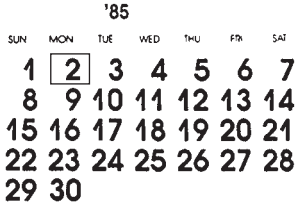
7 3 4 1 8 6

Now I am going to say some more numbers, but I want you to say them backward.

3 8 4 1 6

PERFORMANCE

Picture Completion
I am going to show you a picture with an important part missing. Tell me what is missing.



Picture Arrangement
The pictures below tell a story. Put them in the right order to tell the story.

Block Design
Using the four blocks, make one just like this.

Object Assembly
If these pieces are put together correctly, they will make something. Go ahead and put them together as quickly as you can.

Getty Images/Stockdisc

Digit-Symbol Substitution

Test

1	5	4	2	1	3	5	4	1	5

that teachers or therapists can build upon. For example, a low verbal comprehension score combined with high scores on other subtests could indicate a reading or language disability. Other comparisons can help a psychologist or psychiatrist establish a rehabilitation plan for a stroke patient. Such uses are possible, of course, only when we can trust the test results.

Principles of Test Construction

To be widely accepted, psychological tests must meet three criteria: They must be *standardized*, *reliable*, and *valid*. The Stanford-Binet and Wechsler tests meet these requirements.

Standardization

The number of questions you answer correctly on an intelligence test would tell us almost nothing. To evaluate your performance, we need a basis for comparing it with others' performance. To enable meaningful comparisons, test-makers first give the test to a large representative sample of people. When you later take the test following the same procedures, your score can be compared with the sample's scores to determine your position relative to others. This process of defining meaningful scores relative to a pretested group is called **standardization.**

Group members' scores typically are distributed in a roughly symmetrical shape that forms the **normal curve** shown in FIGURE 24.3. No matter what we measure—heights, weights, or mental aptitudes—people's scores tend to form this *bell-shaped curve*. On an intelligence test, we call the midpoint, the average score, 100. Moving out from the average, toward either extreme, we find fewer and fewer people. For both the Stanford-Binet and the Wechsler tests, a person's score indicates whether that person's performance fell above or below the average. As Figure 24.3 shows, a performance higher than all but about 2 percent of all scores earns an intelligence score of 130. A performance lower than 98 percent of all scores earns an intelligence score of 70.

Reliability

Knowing where you stand in comparison to a standardization group still won't tell us much about your intelligence unless the test has **reliability**—unless it yields dependably consistent scores. To check a test's reliability, researchers retest people. They may use the same test or they may split the test in half and see whether odd-question scores and even-question scores agree. If the two scores generally agree, or *correlate*, the test is reliable. The higher the correlation between the *test-retest* or the *split-half* scores, the higher the test's reliability. The tests we have considered so far—the Stanford-Binet, the WAIS, and the WISC—all have reliabilities of about +.9, which is very high. When retested, people's scores generally match their first score closely.

Lew Merim/Photo Researchers, Inc.

Matching patterns Block design puzzles test the ability to analyze patterns. Wechsler's individually administered intelligence test comes in forms suited for adults and children.

intelligence quotient (IQ) defined originally as the ratio of mental age *(ma)* to chronological age *(ca)* multiplied by 100 (thus, IQ = *ma*/*ca* × 100). On contemporary intelligence tests, the average performance for a given age is assigned a score of 100.

Wechsler Adult Intelligence Scale (WAIS) the WAIS is the most widely used intelligence test; contains verbal and performance (nonverbal) subtests.

standardization defining meaningful scores by comparison with the performance of a pretested group.

normal curve the symmetrical bell-shaped curve that describes the distribution of many physical and psychological attributes. Most scores fall near the average, and fewer and fewer scores lie near the extremes.

reliability the extent to which a test yields consistent results, as assessed by the consistency of scores on two halves of the test, or on retesting.

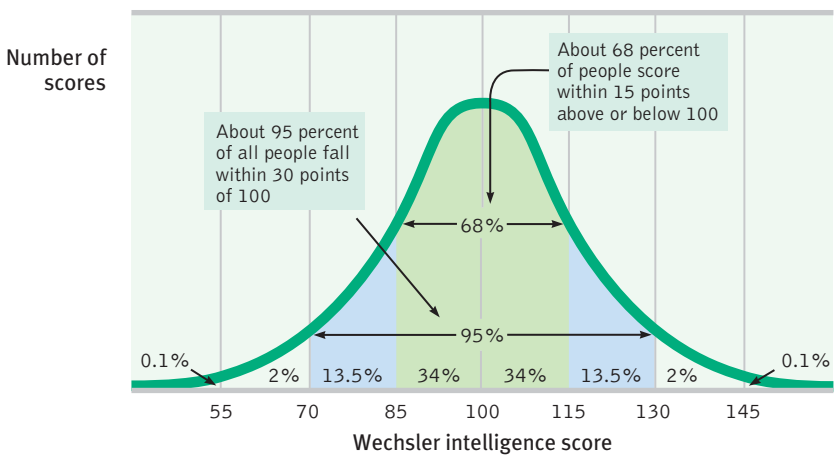


FIGURE 24.3 The normal curve Scores on aptitude tests tend to form a normal, or bell-shaped, curve around an average score. For the Wechsler scale, for example, the average score is 100.

validity the extent to which a test measures or predicts what it is supposed to. (See also *content validity* and *predictive validity*.)

content validity the extent to which a test samples the behavior that is of interest.

Validity

High reliability does not ensure a test's **validity**—the extent to which the test actually measures or predicts what it promises. If you use an inaccurate tape measure to measure people's heights, your height report would have high reliability (consistency) but low validity. It is enough for some tests that they have **content validity,** meaning the test taps the pertinent behavior, or criterion. The road test for a driver's license has content validity because it samples the tasks a driver routinely

Close-Up:

Extremes of Intelligence

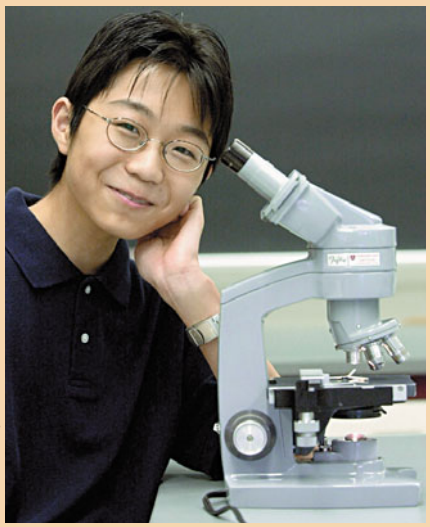
One way to glimpse the validity and significance of any test is to compare people who score at the two extremes of the normal curve. The two groups should differ noticeably, and they do.

Children with extraordinary academic gifts are sometimes more isolated, introverted, and in their own worlds (Winner, 2000). But most thrive. In one famous project begun in 1921, Lewis Terman studied more than 1500 California schoolchildren with IQ scores over 135. These high-scoring children, like others in later studies, were healthy, well-adjusted, and unusually successful academically (Lubinski & Benbow, 2006; Stanley, 1997). Over the next seven decades, most people in Terman's group attained high levels of education (Austin et al., 2002; Holahan & Sears, 1995). They included many doctors, lawyers, professors, scientists, and writers, but no Nobel Prize winners. (Terman had tested two future Nobel laureates in physics, but they failed to score above his gifted-sample cutoff [Hulbert, 2005].)

A more recent study focused on precocious youths who aced the math SAT at age 13—by scoring in the top quarter of 1 percent of their age group. At age 33, they were twice as likely to have patents as were those in the bottom quarter of the top 1 percent (Wai et al., 2005). These whiz kids were more likely to have earned a Ph.D.—1 in 3, compared with 1 in 5 for those in the bottom quarter. Compared with the math aces, 13-year-olds scoring high on verbal aptitude were more likely to have become humanities professors or written a novel (Park et al., 2007).

"Joining Mensa means that you are a genius. . . . I worried about the arbitrary 132 cutoff point, until I met someone with an IQ of 131 and, honestly, he was a bit slow on the uptake."

—Steve Martin, 1997



AP Photo/Anne Ryan

The extremes of intelligence Sho Yano was playing Mozart by age 4, aced the SAT at age 8, and graduated summa cum laude from Loyola University at age 12, at which age he began combined Ph.D.–M.D. studies at the University of Chicago.

At the other extreme of the normal curve are those whose intelligence test scores fall at 70 or below. To be labeled as having an **intellectual disability** (formerly referred to as *mental retardation*), a child must have both a low test score and difficulty adapting to the normal demands of independent living. Only about 1 percent of the population meets both criteria, with males outnumbering females by 50 percent (American Psychiatric Association, 1994). As **TABLE 24.2** indicates, most of these individuals can, with support, live in mainstream society.

Intellectual disability sometimes has a known physical cause. **Down syndrome,** for example, is a disorder of varying severity caused by an extra chromosome 21 in the person's genetic makeup.

During the last two centuries, the pendulum of opinion about how best to care for Americans with intellectual disabilities has made a complete swing. Until the mid-nineteenth century, they were cared for at home. Many of those with the most severe conditions died, but people with milder disabilities often found a place in a farm-based society. Then, residential schools for slow learners were established. By the twentieth century, many of these institutions had become warehouses, providing residents little attention, no privacy, and no hope. Parents often were told to separate themselves permanently from their impaired child before they became attached.

In the last half of the twentieth century, the pendulum swung back to normalization—encouraging people to live in their own communities as normally as their functioning permits. Children with mild impairments are educated in less restrictive environments, and many are integrated, or *mainstreamed,* into regular classrooms. Most grow up with their own families, then move into a protected living arrangement, such as a group home.

faces. Course exams have content validity if they assess one's mastery of a representative sample of course material. But we expect intelligence tests to have **predictive validity:** They should predict the criterion of future performance, and to some extent they do. (See Close-Up: Extremes of Intelligence.)

Are general aptitude tests as predictive as they are reliable? As critics are fond of noting, the answer is plainly *no*. The predictive power of aptitude tests is fairly strong in the early school years, but later it weakens. Past grades, which reflect both aptitude and motivation, are better predictors of future achievements.

predictive validity the success with which a test predicts the behavior it is designed to predict; it is assessed by computing the correlation between test scores and the criterion behavior. (Also called *criterion-related validity.*)

TABLE 24.2 Degrees of Intellectual Disability

Level	Approximate Intelligence Scores	Adaptation to Demands of Life
Mild	50–70	May learn academic skills up to sixth-grade level. Adults may, with assistance, achieve self-supporting social and vocational skills.
Moderate	35–50	May progress to second-grade level academically. Adults may contribute to their own support by laboring in sheltered workshops.
Severe	20–35	May learn to talk and to perform simple work tasks under close supervision but are generally unable to profit from vocational training.
Profound	Below 20	Require constant aid and supervision.

Source: Reprinted with permission from the *Diagnostic and Statistical Manual of Mental Disorders,* Fourth Edition, text revision. Copyright 2000 American Psychiatric Association.

Reuters/Claudia Daut

Mainstreaming in Chile Most Chilean children with Down syndrome attend separate schools for children with special needs. However, this boy is a student at The Altamira school, where children with differing abilities share the classrooms.

The hope, and often the reality, is a happier and more dignified life.

But consider another reason people diagnosed with a mild intellectual disability—those just below the 70 score—might be better able to live independently today than many decades ago. What if people who score near 70 are getting smarter?

For reasons no one quite understands, overall intelligence test performance has been rising during the twentieth century. (Is it greater test sophistication? Better nutrition? More stimulating environments? More education? Smaller families?) This worldwide phenomenon is called the *Flynn effect* in honor of New Zealand researcher James Flynn (1987, 2007) who first calculated its magnitude. The average person's intelligence score 80 years ago was—by today's standard—only a 76! Such rising performance has been observed in 20 countries, from Canada to rural Australia (Daley et al., 2003).

Thanks to the Flynn effect, the tests have been periodically restandardized. As that happened, individuals who scored near 70 suddenly lost about 6 IQ points. Two people with the same ability level could thus be classified differently, depending on when they were tested (Kanaya et al., 2003). As the boundary shifts, more people become eligible for special education and for Social Security payments for those with an intellectual disability. And in the United States (one of only a few countries with the death penalty), fewer people are eligible for execution—the U.S. Supreme Court ruled in 2002 that the execution of people with an intellectual disability is "cruel and unusual punishment." For people near that score of 70, intelligence testing can be a high-stakes competition.

intellectual disability ***(formerly referred to as mental retardation)*** a condition of limited mental ability, indicated by an intelligence score of 70 or below and difficulty in adapting to the demands of life; varies from mild to profound.

Down syndrome a condition of mild to severe intellectual disability and associated physical disorders caused by an extra copy of chromosome 21.

"There are more studies addressing the genetics of *g* than any other human characteristic."
—Robert Plomin (1999)

"I told my parents that if grades were so important they should have paid for a smarter egg donor."

Genetic and Environmental Influences on Intelligence

24-5: What does evidence reveal about hereditary and environmental influences on intelligence?

Intelligence runs in families. But why? Are our intellectual abilities mostly inherited? Or are they molded by our environment?

Few issues arouse such passion or have such serious political implications. Consider: If we mainly inherit our differing mental abilities, and if success reflects those abilities, then people's socioeconomic standing will correspond to their inborn differences. This could lead to those on top believing that their intellectual birthright justifies their social positions.

But if mental abilities are primarily nurtured by the environments that raise and inform us, then children from disadvantaged environments can expect to lead disadvantaged lives. In this case, people's standing will result from their unequal opportunities.

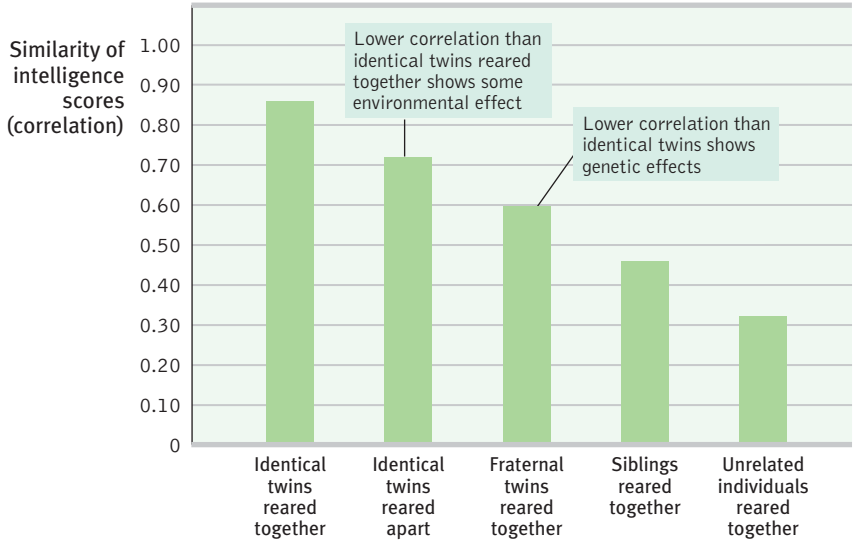
For now, as best we can, let's set aside such political implications and examine the evidence.

Genetic Influences

Do people who share the same genes also share comparable mental abilities? Twin studies provide some clues. As you can see from **FIGURE 24.4**, which summarizes many studies, the answer is clearly *yes*. In support of the genetic contribution to intelligence, researchers cite three sets of findings:

- The intelligence test scores of identical twins reared together are virtually as similar as those of the same person taking the same test twice (Lykken, 1999; Plomin, 2001). (The scores of fraternal twins, who typically share only half their genes, are much less similar.) Likewise, the test scores of identical twins reared separately are similar enough to have led twin researcher Thomas Bouchard (1996a) to estimate that "about 70 percent" of intelligence test score variation "can be attributed to genetic variation." Other estimates range from 50 to 75 percent (Devlin et al., 1997; Neisser et al., 1996; Plomin, 2003).
- Brain scans reveal that identical twins have very similar gray matter volume, and that their brains (unlike those of fraternal twins) are virtually the same in

FIGURE 24.4 Intelligence: Nature and nurture The most genetically similar people have the most similar intelligence scores. Remember: 1.0 indicates a perfect correlation; zero indicates no correlation at all. (Data from McGue et al., 1993.)



areas associated with verbal and spatial intelligence (Koten et al., 2009; Thompson et al., 2001).

- Are there genes for genius? Today's researchers have identified chromosomal regions important to intelligence, and they have pinpointed specific genes that seemingly influence variations in intelligence and learning disabilities (Dick et al., 2007; Plomin & Kovas, 2005; Posthuma & de Geus, 2006). Intelligence appears to be *polygenetic,* with many genes involved, each accounting for much less than 1 percent of intelligence variations (Butcher et al., 2008).

So it's clear that genes make a difference. But other evidence points to the effects of environment.

"Selective breeding has given me an aptitude for the law, but I still love fetching a dead duck out of freezing water."

Environmental Influences

Even if we were all raised in the same intellectually stimulating environment, we would have differing aptitudes because of our genetic differences. Fraternal twins, who are genetically no more alike than any other siblings, are treated more alike because they are the same age. And they tend to score more alike than other siblings. Seeking to disentangle genes and environment, researchers have studied adopted children and their families.

Adoption Studies

What have we learned from comparisons of intelligence test scores of adopted children with those of (a) their adoptive siblings; (b) their biological parents, the providers of their genes; and (c) their adoptive parents, the providers of their home environment? During childhood, the intelligence test scores of adoptive siblings correlate modestly. Over time, adopted children accumulate experience in their differing adoptive families. So would you expect the family environment effect to grow with age and the genetic legacy effect to shrink?

If you would, behavior geneticists have a surprise for you. Mental similarities between adopted children and their adoptive families wane with age, until the correlation approaches zero by adulthood (McGue et al., 1993). This is even true of *virtual twins*—same age, biologically unrelated siblings reared together from infancy (Segal et al., 2007). Genetic influences—not environmental ones—become more apparent as we accumulate life experience (Bouchard, 1995, 1996b). Identical twins' similarities, for example, continue or increase into their eighties (McClearn et al., 1997; Plomin et al., 1997). Similarly, adopted children's intelligence scores over time become more like those of their biological parents (**FIGURE 24.5**).

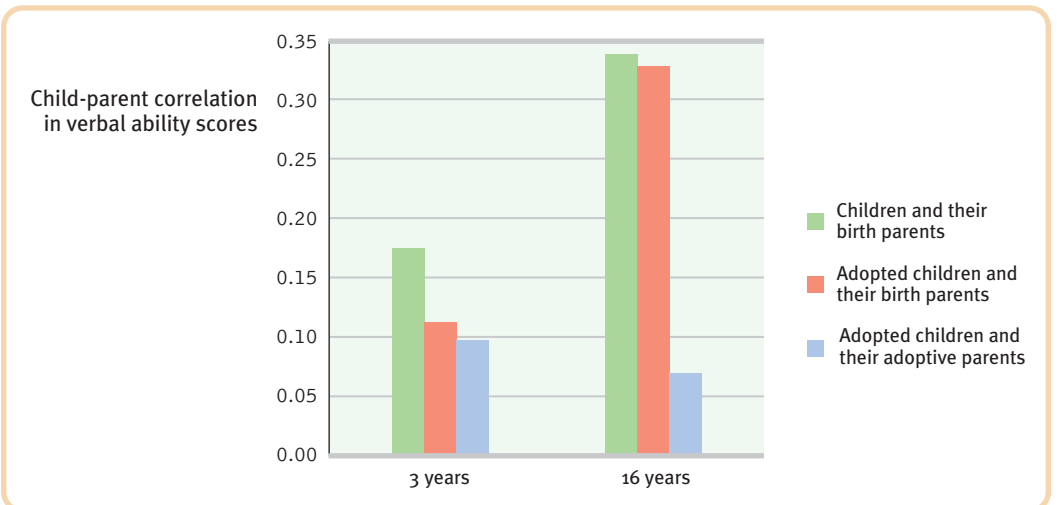


FIGURE 24.5 Who do adopted children resemble? As the years went by in their adoptive families, children's verbal ability scores became modestly more like their *biological* parents' scores. (Adapted from Plomin & DeFries, 1998.)

Josef Polleross/The Image Works

Devastating neglect Romanian orphans who had minimal interaction with caregivers, such as this child in the Lagunul Pentro Copii orphanage in 1990, suffered delayed development.

Early Environmental Influences

Biology and experience intertwine in their influence on intellectual development, and nowhere is this more apparent than in extremely impoverished human environments. Severe deprivation can leave footprints on the brain, as J. McVicker Hunt (1982) observed in a destitute Iranian orphanage. The typical child Hunt observed there could not sit up unassisted at age 2 or walk at age 4. The little care infants received was not in response to their crying, cooing, or other behaviors, so the children developed little sense of personal control over their environment. Extreme deprivation was bludgeoning native intelligence, and these infants were becoming passive "glum lumps."

Aware of both the dramatic effects of early experiences and the impact of early intervention, Hunt began a program of *tutored human enrichment*. He trained caregivers to play language-fostering games with 11 infants, imitating the babies' babbling, then engaging them in vocal follow-the-leader, and finally teaching them sounds from the Persian language. The results were dramatic. By 22 months of age, the infants could name more than 50 objects and body parts and so charmed visitors that most were adopted—an unprecedented success for the orphanage. (Institutionalized Romanian orphans also benefited cognitively if transferred early to more enriched home care [Nelson et al., 2007].) Studies show that adoption enhances the intelligence scores of mistreated or neglected children (van IJzendoorn & Juffer, 2005, 2006).

Hunt's findings are an extreme case of a more general finding: Among the poor, environmental conditions can override genetic differences, depressing cognitive development. Unlike children of affluence, siblings within impoverished families have more similar intelligence scores (Turkheimer et al., 2003). Schools with lots of poverty-level children often have less-qualified teachers, as one study of 1450 Virginia schools found. And even after controlling for poverty, having less-qualified teachers predicted lower achievement scores (Tuerk, 2005). Malnutrition also plays a role. Relieve infant malnutrition with nutritional supplements, and poverty's effect on physical and cognitive development lessens (Brown & Pollitt, 1996).

Schooling and Intelligence

Schooling also pays dividends, boosting children's chances for success by developing their cognitive and social skills. Schooling and intelligence interact, and both enhance later income (Ceci & Williams, 1997).

Hunt's 1961 book, *Intelligence and Experience,* helped launch Project Head Start in 1965. This U.S. government-funded preschool program serves more than 900,000 children, most of whom come from families below the poverty level (Head Start, 2005). Does it succeed? Researchers study Head Start and other preschool programs such as Sure Start in Britain by comparing children who experience the program with their counterparts who don't. Quality programs, offering individual attention,

Getting a Head Start Project Head Start offers educational activities designed to increase readiness for schoolwork and expand children's notions of where school might lead them. Here children in a classroom learn about colors, and children on a field trip prepare for the annual Head Start parade in Boston.

Jacques Chenet/Woodfin Camp & Associates

AP Photo/Paul Sakuma

increase children's school readiness, which decreases their likelihood of repeating a grade or being placed in special education. Although the aptitude benefits generally dissipate over time (reminding us that life experience *after* Head Start matters, too), there may be long-term effects (Ripple & Zigler, 2003; Zigler & Styfco, 2001). High-quality preschool programs provide at least a small boost to emotional intelligence—creating better attitudes toward learning and reducing school dropouts and criminality (Reynolds et al., 2001). And attitudes matter. What we accomplish with our intelligence depends also on our own beliefs and motivation (Dweck, 2006, 2007). Those who believe that intelligence is biologically fixed and unchanging tend to focus on proving and defending their identity. Those who instead believe that intelligence is changeable will focus more on learning and growing. Indeed, as we noted earlier, superior achievements in fields from sports to science to music arise from disciplined effort and sustained practice (Ericsson et al., 2007).

"It is our choices . . . that show what we truly are, far more than our abilities."

—Professor Dumbledore to Harry Potter in J. K. Rowling's *Harry Potter and the Chamber of Secrets,* 1999

Heritability

So what portion of the variation in intelligence test scores can we attribute to genetic factors? Estimates of the **heritability** of intelligence put it at about 50 percent. Does this mean *your* genes are responsible for 50 percent of your intelligence and your environment for the rest? No. It means we credit heredity with 50 percent of the variation in intelligence *among people being studied.* This point is so often misunderstood that I repeat: Heritability never pertains to an individual, only to why people differ from one another.

Heritability differences among people due to genes can vary from study to study. Where environments vary widely, as they do among children of less-educated parents, environmental differences are more predictive of intelligence scores (Rowe et al., 1999; Turkheimer et al., 2003). To see why, consider Mark Twain's fantasy of raising boys in barrels to age 12, feeding them through a hole. Given the boys' equal environments, differences in their individual intelligence test scores at age 12 could be explained only by their heredity. Thus, heritability for their differences would be nearly 100 percent. But if we raise people with similar heredities in drastically different environments (barrels versus advantaged homes), the environment effect will be huge, and heritability will therefore be lower. In a world of clones, heritability would be zero.

A check on your understanding of heritability: If environments become more equal, the heritability of intelligence would
a. increase.
b. decrease.
c. be unchanged.
See inverted answer below.

Heritability—variation explained by genetic influences—will increase as environmental variation decreases.

Remember, too, that genes and environment work together. If you try out for a basketball team and are just slightly taller and quicker than others, notes James Flynn (2003, 2007), you will more likely be picked, play more, and get more coaching. The same would be true for your separated identical twin—who might, *not just for genetic reasons,* also come to excel at basketball. Likewise, if you have a natural aptitude for academics, you will more likely stay in school, read books, and ask questions—all of which will amplify your cognitive brain power. Thanks to such gene-environment interactions, modest genetic advantages can be socially multiplied into big performance advantages. Our genes shape the experiences that shape us.

Group Differences in Intelligence Test Scores

24-6: How and why do gender and racial groups differ in mental ability scores?

If there were no group differences in aptitude scores, psychologists could politely debate hereditary and environmental influences in their ivory towers. But there are group differences. What are they? And what shall we make of them?

Gender Similarities and Differences

In science, as in everyday life, differences, not similarities, excite interest. Compared with the anatomical and physiological similarities between men and women, our differences are relatively minor. Yet it is the differences we find exciting. Similarly, in the

heritability the proportion of variation among individuals that we can attribute to genes. The heritability of a trait may vary, depending on the range of populations and environments studied.

Despite the gender equivalence in intelligence test scores, males are more likely than females to overestimate their own test scores. Both males and females tend to rate their father's scores higher than their mother's, their brothers' scores higher than their sisters', and their sons' scores higher than their daughters' (Furnham, 2001; Furnham et al., 2002a,b, 2004a,b,c).

psychological domain, our gender similarities vastly outnumber our gender differences. In a 1921 testing of all Scottish 11-year-olds, for example, girls' average intelligence score was 100.6 and boys' was 100.5 (Deary et al., 2003). On a 2001 to 2003 Cognitive Ability Test administered to 324,000 British 11- and 12-year-olds, boys averaged 99.1 and girls a similar 99.9 (Strand et al., 2006). So far as *g* is concerned, boys and girls, men and women, are the same species. Yet, most people find differences more newsworthy. And here they are.

Spelling Females are better spellers: At the end of high school, only 30 percent of U.S. males spell better than the average female (Lubinski & Benbow, 1992).

Verbal ability Females excel at verbal fluency and remembering words (Halpern et al., 2007). And, year after year, among nearly 200,000 students taking Germany's Test for Medical Studies, young women have surpassed men in remembering facts from short medical cases (Stumpf & Jackson, 1994). (My wife, who remembers many of my experiences for me, tells me that if she died I'd be a man without a past.)

Nonverbal memory Females have an edge in remembering and locating objects (Voyer et al., 2007). In studies of more than 100,000 American adolescents, girls also modestly surpassed boys in memory for picture associations (Hedges & Nowell, 1995).

Sensation Females are more sensitive to touch, taste, and odor.

Emotion-detecting ability Females are better emotion detectors. Robert Rosenthal, Judith Hall, and their colleagues (1979; McClure, 2000) discovered this while studying sensitivity to emotional cues (an aspect of emotional intelligence). They showed hundreds of people brief film clips of portions of a person's emotionally expressive face or body, sometimes with a garbled voice added. For example, after showing a 2-second scene revealing only the face of an upset woman, the researchers asked people to guess whether the woman was criticizing someone for being late or was talking about her divorce. Some people, many of them women, detected emotions much better than others. Could such skills have helped our ancestral mothers read emotions in their infants and would-be lovers, in turn fueling cultural tendencies to encourage women's empathic skills? Some evolutionary psychologists believe so.

In the first 56 years of the college Putnam Mathematical Competition, all of the nearly 300 awardees were men (Arenson, 1997). In 1997, a woman broke the male grip by joining 5 men in the winner's circle. In 1998, Melanie Wood became the first female member of a U.S. math Olympics team (Shulman, 2000). Her training began at an early age: When mall-shopping with her then-4-year-old daughter, Melanie's mother would alleviate her child's boredom by giving her linear equations to solve.

Math and spatial aptitudes On math tests given to more than 3 million representatively sampled people in 100 independent studies, males and females obtained nearly identical average scores (Hyde et al., 1990, 2008). But again—despite greater diversity within the genders than between them—group differences make

Robert Strawn/National Academy of Sciences/Einstein Statue, sculptor, Robert Berks

World Math Olympics champs After outscoring thousands of their U.S. peers, these young people became the U.S. Math Team in 2002 and placed third in the worldwide competition.

the news. In 20 of 21 countries, females displayed an edge in math computation, but males scored higher in math problem solving (Bronner, 1998; Hedges & Nowell, 1995). Gender score differences are sharpest at the extremes. Among 12- to 14-year-olds scoring extremely high on SAT math, boys have outnumbered girls 13 to 1, and within that precocious group, the boys have more often gone on to earn a degree in the inorganic sciences and engineering (Benbow et al., 2000).

The average male edge seems most reliable in spatial ability tests like the one shown in **FIGURE 24.6**, which involves speedily rotating three-dimensional objects in one's mind (Collins & Kimura, 1997; Halpern, 2000). Exposure to high levels of male sex hormones during the prenatal period does enhance spatial abilities (Berenbaum et al., 1995). So, one recent experiment indicates, does action video game playing (Feng et al., 2007).

Spatial abilities skills help when doing certain types of geometry problems, fitting suitcases into a car trunk, and playing chess. From an evolutionary perspective (Geary, 1995, 1996; Halpern et al., 2007), those skills may also have helped our ancestral fathers track prey and make their way home. The survival of our ancestral mothers may have benefited more from a keen memory for the location of edible plants—a legacy that lives today in women's superior memory for objects and their location.

Among entering American collegians, 22 percent of men and 4 percent of women report having played video/computer games six or more hours a week (Pryor et al., 2006).

Evolutionary psychologist Steven Pinker (2005) argues that biological as well as social influences appear to affect gender differences in life priorities (women's greater interest in people versus men's in money and things), in risk-taking (with men more reckless), and in math reasoning and spatial abilities. Such differences are, he notes, observed across cultures, stable over time, influenced by prenatal hormones, and observed in genetic boys raised as girls. Other researchers are exploring a brain basis for male-female cognitive differences (Halpern et al., 2007).

Elizabeth Spelke (2005), however, has urged caution in charting male-female intellectual worlds. It oversimplifies to say that women have more "verbal ability" and men more "math ability." Women excel at verbal fluency, men at verbal analogies. Women excel at rapid math calculations, men at rapid math reasoning. Women excel at remembering objects' spatial positions, men at remembering geometric layouts.

AP Photo/Paul Sakuma

Nature or nurture? At this 2005 Google Inc.-sponsored computer coding competition, programmers competed for cash prizes and possible jobs. What do you think accounted for the fact that only one of the 100 finalists was female?

Other critics urge us to remember that social expectations and divergent opportunities shape boys' and girls' interests and abilities (Crawford et al., 1995; Eccles et al., 1990). Gender-equal cultures, such as Sweden and Iceland, exhibit little of the gender math gap found in gender-unequal cultures, such as Turkey and Korea (Guiso et al., 2008). In the United States, the male edge in math problem solving is detectable only after children begin school. As more parents encourage their daughters to develop their abilities in math and science, the gender gap is narrowing (Nowell & Hedges, 1998). In some fields, including psychology, women now earn most of the Ph.D.s. Yet, notes Diane Halpern (2005) with a twinkle in her eye, "no one has asked if men have the innate ability to succeed in those academic disciplines where *they* are underrepresented."

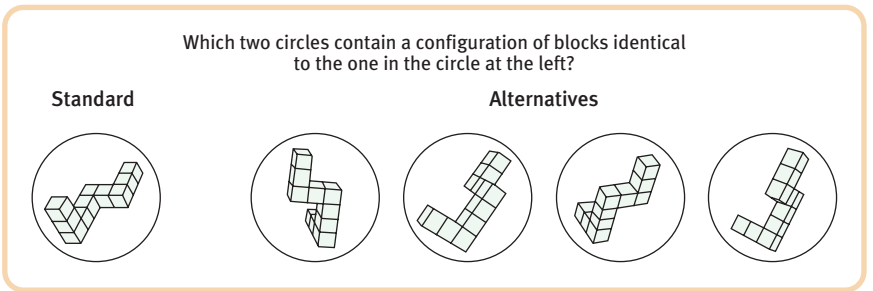


FIGURE 24.6 The mental rotation test
This is a test of spatial abilities. (From Vandenberg & Kuse, 1978.) See inverted answer below.

The first and fourth alternatives.

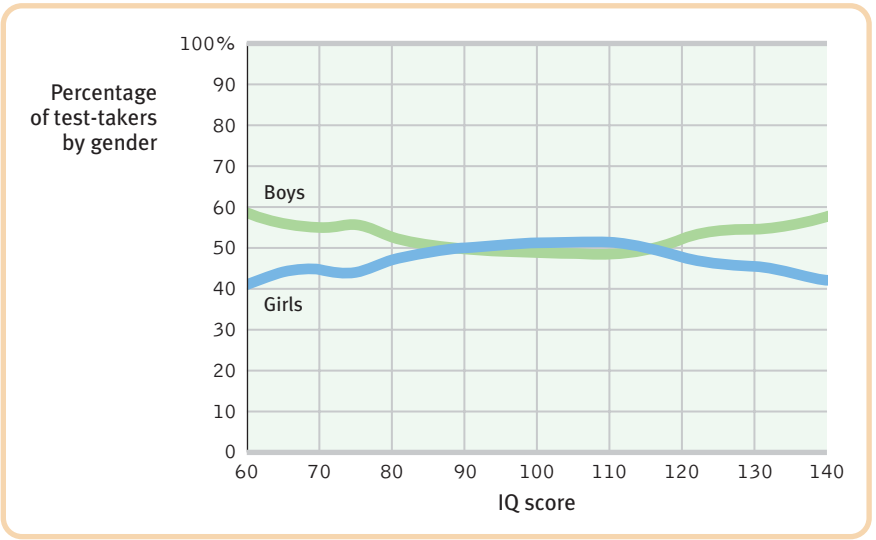


FIGURE 24.7 Gender and variability In the 1932 intelligence testing of nearly 90,000 Scottish 11-year-olds, the average IQ scores for girls and boys was essentially identical. But as other studies have found, boys were overrepresented at the low and high extremes. (Adapted from Deary et al., 2003.)

Greater male variability Finally, intelligence research consistently reports a peculiar tendency for males' mental ability scores to vary more than females' (Halpern et al., 2007). Thus, boys outnumber girls at both the low extreme and the high extreme (Kleinfeld, 1998; Strand et al., 2006; also see **FIGURE 24.7**). This peculiar phenomenon of greater male variability also is observed on reading and math test performance worldwide (Machin & Pekkarinen, 2008). Boys are, therefore, more often found in special education classes. They talk later. They stutter more.

Ethnic Similarities and Differences

Fueling the group-differences debate are two other disturbing but agreed-upon facts:

- Racial groups differ in their average intelligence test scores.
- High-scoring people (and groups) are more likely to attain high levels of education and income.

"The bell curve for Whites is centered roughly around IQ 100; the bell curve for American Blacks roughly around 85; and those for different subgroups of Hispanics roughly midway between those for Whites and Blacks," a statement by 52 intelligence researchers explained (Avery et al., 1994). Since that time, the Black-White test-score difference has diminished somewhat, dropping to 10 points among children in some studies (Dickens & Flynn, 2006). Yet the gap stubbornly persists, and other studies suggest the gap stopped narrowing among those born after 1970 (Murray, 2006, 2007).

There are differences between other groups as well. New Zealanders of European descent outscore native Maori New Zealanders. Israeli Jews outscore Israeli Arabs. Most Japanese outscore the stigmatized Burakumin minority in Japan. And those who can hear outscore those born deaf (Braden, 1994; Steele, 1990; Zeidner, 1990).

Everyone further agrees that such *group* differences provide little basis for judging *individuals*. Women outlive men by six years, but knowing someone's sex doesn't tell us with any precision how long that person will live. Even Charles Murray and Richard Herrnstein (1994), whose writings drew attention to Black-White differences, reminded us that "millions of Blacks have higher IQs than the average White."

Swedes and Bantus differ in complexion and language. That first factor is genetic, the second environmental. So what about intelligence scores?

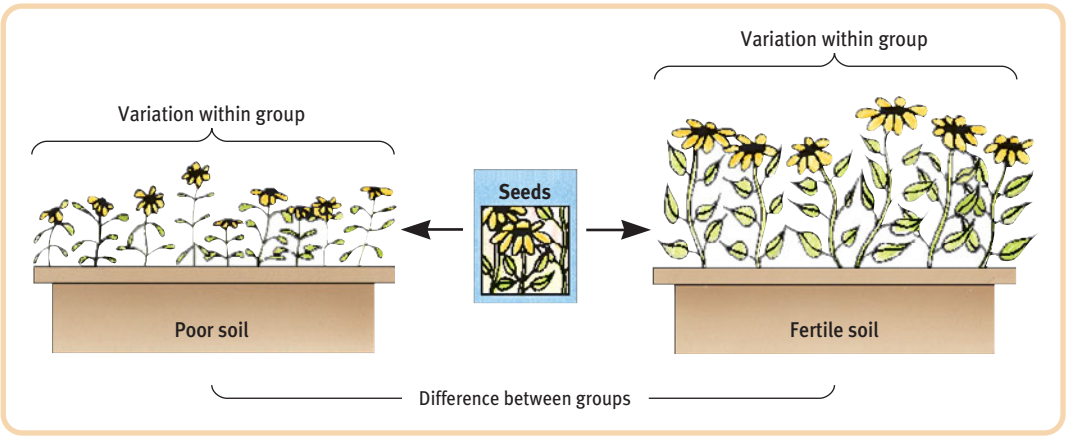


FIGURE 24.8 Group differences and environmental impact Even if the variation between members within a group reflects genetic differences, the average difference between groups may be wholly due to the environment. Imagine that seeds from the same mixture are sown in different soils. Although height differences *within* each window box will be genetic, the height difference *between* the two groups will be environmental. (From Lewontin, 1976.)

As we have seen, heredity contributes to individual differences in intelligence. Does that mean it also contributes to group differences? Some psychologists believe it does, perhaps because of the world's differing climates and survival challenges (Herrnstein & Murray, 1994; Lynn, 1991, 2001; Rushton & Jensen, 2005, 2006).

But we have also seen that group differences in a heritable trait may be entirely environmental, as in our earlier barrel-versus-home–reared boys example. Consider one of nature's experiments: Allow some children to grow up hearing their culture's dominant language, while others, born deaf, do not. Then give both groups an intelligence test rooted in the dominant language, and (no surprise) those with expertise in that language will score highest. Although individual performance differences may be substantially genetic, the group difference is not (**FIGURE 24.8**).

Also consider: If each identical twin were exactly as tall as his or her co-twin, heritability would be 100 percent. Imagine that we then separated some young twins and gave only half of them a nutritious diet, and that the well-nourished twins all grew to be exactly 3 inches taller than their counterparts—an environmental effect comparable to that actually observed in both Britain and America, where adolescents are several inches taller than their counterparts were a half-century ago. What would the heritability of height now be for our well-nourished twins? Still 100 percent, because the variation in height within the group would remain entirely predictable from the heights of their malnourished identical siblings. So even perfect heritability within groups would not eliminate the possibility of a strong environmental impact on the group differences.

In prosperous country X everyone eats all they want. In country Y the rich are well fed, but the semistarved poor are often thin. In which country will the heritability of body weight be greater? See inverted answer below.

Heritability—differences due to genes—will be greater in country X, where environmental differences in nutrition are minimal.

Since 1830, the average Dutch man has grown from 5 feet 5 inches to nearly 6 feet.

Might the racial gap be similarly environmental? Consider:

Genetics research reveals that under the skin, the races are remarkably alike (Cavalli-Sforza et al., 1994; Lewontin, 1982). Individual differences within a race are much greater than differences between races. The average genetic difference between two Icelandic villagers or between two Kenyans greatly exceeds the group difference between Icelanders and Kenyans. Moreover, looks can deceive. Light-skinned Europeans and dark-skinned Africans are genetically closer than are dark-skinned Africans and dark-skinned Aboriginal Australians.

Nature's own morphing
Nature draws no sharp boundaries between races, which blend gradually one into the next around the Earth. Thanks to the human urge to classify, however, people socially define themselves in racial categories, which become catch-all labels for physical features, social identity, and nationality.

Race is not a neatly defined biological category. Some scholars argue that there is a reality to race, noting that there are genetic markers for race (the continent of one's ancestry) and that medical risks (such as skin cancer or high blood pressure) vary by race. Behavioral traits may also vary by race. "No runner of Asian or European descent—a majority of the world's population—has broken 10 seconds in the 100-meter dash, but dozens of runners of West African descent have done so," observes psychologist David Rowe (2005). Many social scientists, though, see race primarily as a social construction without well-defined physical boundaries (Helms et al., 2005; Smedley & Smedley, 2005; Sternberg et al., 2005). People with varying ancestry may categorize themselves in the same race. Moreover, with increasingly mixed ancestries, more and more people defy neat racial categorization. (What race is Tiger Woods?)

The intelligence test performance of today's better-fed, better-educated, and more test-prepared population exceeds that of the 1930s population—by the same margin that the intelligence test score of the average White today exceeds that of the average Black. No one attributes the generational group difference to genetics.

White and Black infants have scored equally well on an infant intelligence measure (preference for looking at novel stimuli—a crude predictor of future intelligence scores [Fagan, 1992]).

When Blacks and Whites have or receive the same pertinent knowledge, they exhibit similar information-processing skill. "The data support the view that cultural differences in the provision of information may account for racial differences in IQ," report researchers Joseph Fagan and Cynthia Holland (2007).

In different eras, different ethnic groups have experienced golden ages—periods of remarkable achievement. Twenty-five-hundred years ago, it was the Greeks and the Egyptians, then the Romans; in the eighth and ninth centuries, genius seemed to reside in the Arab world; 500 years ago it was the Aztec Indians and the peoples of Northern Europe. Today, people marvel at Asians' technological genius. Cultures rise and fall over centuries; genes do not. That fact makes it difficult to attribute a natural superiority to any race.

"Do not obtain your slaves from Britain, because they are so stupid and so utterly incapable of being taught."
—Cicero, 106–43 B.C.E.

The Question of Bias

24-7: Are intelligence tests inappropriately biased?

If one assumes that race is a meaningful concept, the debate over race differences in intelligence divides into three camps, note Earl Hunt and Jerry Carlson (2007):

- There are genetically disposed race differences in intelligence.
- There are socially influenced race differences in intelligence.
- There are race differences in test scores, but the tests are inappropriate or biased.

Are intelligence tests biased? The answer depends on which of two very different definitions of *bias* are used, and on an understanding of stereotypes.

Two Meanings of Bias

A test may be considered biased if it detects not only innate differences in intelligence but also performance differences caused by cultural experiences. This in fact happened to Eastern European immigrants in the early 1900s. Lacking the experience to answer questions about their new culture, many were classified as feebleminded. (David Wechsler, who entered the United States as a 6-year-old Romanian just before this group, designed the WAIS.) In this popular sense, intelligence tests are biased. They measure your developed abilities, which reflect, in part, your education and experiences.

The *scientific* meaning of *bias* is different. It hinges on a test's validity—on whether it predicts future behavior only for some groups of test-takers. For example, if the U.S. SAT accurately predicted the college achievement of women but not

of men, then the test would be biased. In this statistical meaning of the term, the near-consensus among psychologists (as summarized by the U.S. National Research Council's Committee on Ability Testing and the American Psychological Association's Task Force on Intelligence) is that the major U.S. aptitude tests are not biased (Hunt & Carlson, 2007; Neisser et al., 1996; Wigdor & Garner, 1982). The tests' predictive validity is roughly the same for women and men, for Blacks and Whites, and for rich and poor. If an intelligence test score of 95 predicts slightly below-average grades, that rough prediction usually applies equally to both genders and all ethnic and economic groups.

Test-Takers' Expectations

Throughout this text, we see evidence that our expectations and attitudes can influence our perceptions and behaviors. This effect appears also in intelligence testing. When equally capable men and women took a difficult math test, women did not perform as well as men—except when they had been led to expect that women usually do as well as men on the test (Spencer et al., 1997). Otherwise, the women apparently felt apprehensive, and it affected their performance. This self-fulfilling **stereotype threat** appeared again when Black students, taking verbal aptitude tests under conditions designed to make them feel threatened, performed at a lower level (Steele et al., 2002). Critics note that stereotype threat does not fully account for the Black-White aptitude score difference (Sackett et al., 2004, 2008). But it does help explain why Blacks have scored higher when tested by Blacks than when tested by Whites (Danso & Esses, 2001; Inzlicht & Ben-Zeev, 2000). And it gives us insight into why women have scored higher on math tests when no male test-takers were in the group, and why women's chess play drops sharply when they *think* they are playing a male rather than female opponent (Maass et al., 2008).

Telling students they probably won't succeed (as is sometimes implied by remedial "minority support" programs) may function as a stereotype that erodes test and school performance (Steele, 1995, 1997). Over time, students hearing this message may detach their self-esteem from academics and look for recognition elsewhere. Indeed, from eighth to twelfth grade, some African-American boys have tended to underachieve as the disconnect between grades and self-esteem becomes pronounced (Osborne, 1997). One experiment challenged this trend by randomly assigning some seventh-graders to write for 15 minutes about their most important values (Cohen et al., 2006). This simple exercise in self-affirmation had the apparent effect of boosting their semester grade point average by 0.26 in a first experiment and 0.34 in a replication. Minority students in university programs that challenge them to believe in their potential, or to focus on the idea that intelligence is malleable and not fixed, have likewise produced markedly higher grades and had lower dropout rates (Wilson, 2006).

"Math class is tough!"

—"Teen talk" talking Barbie doll (introduced February 1992, recalled October 1992)

What, then, can we realistically conclude about aptitude tests and bias? The tests do seem biased (appropriately so, some would say) in one sense—sensitivity to performance differences caused by cultural experience. But they are not biased in the scientific sense of making valid statistical predictions for different groups.

Bottom line: Are the tests discriminatory? Again, the answer can be *yes* or *no*. In one sense, *yes,* their purpose is to discriminate—to distinguish among individuals. In another sense, *no,* their purpose is to reduce discrimination by reducing reliance on subjective criteria for school and job placement—who you know, how you dress, or whether you are the "right kind of person." Banning aptitude tests would lead those who decide on jobs and admissions to rely more on other considerations, such as their personal opinions.

Perhaps, then, our goals for tests of mental abilities should be threefold. First, we should realize the benefits Alfred Binet envisioned—to enable schools to recognize who might profit most from early intervention. Second, we must remain alert to Binet's fear that intelligence test scores may be misinterpreted as literal

stereotype threat a self-confirming concern that one will be evaluated based on a negative stereotype.

Untestable compassion Intelligence test scores are only one part of the picture of a whole person. They don't measure the abilities, talent, and commitment of, for example, people who devote their lives to helping others.

measures of a person's worth and potential. And finally, we must remember that the competence that general intelligence tests sample is important; it helps enable success in some life paths. But it reflects only one aspect of personal competence. Our practical intelligence and emotional intelligence matter, too, as do other forms of creativity, talent, and character. The carpenter's spatial ability differs from the programmer's logical ability, which differs from the poet's verbal ability. Because there are many ways of being successful, our differences are variations of human adaptability.

"Almost all the joyful things of life are outside the measure of IQ tests."
—Madeleine L'Engle, *A Circle of Quiet,* 1972

Intelligence

Module Review

24-1: What argues for and against considering intelligence as one general mental ability? *Factor analysis* is a statistical procedure that has revealed some underlying commonalities in different mental abilities. Spearman named this common factor the *g* factor for *general intelligence (g)*. Gardner views *intelligence* as multiple abilities forming at least eight different aptitudes—linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, intrapersonal, interpersonal, and naturalist. Sternberg proposes a triarchic theory of three intelligences—analytical, creative, and practical.

24-2: What is creativity, and what fosters it? *Creativity* is the ability to produce novel and valuable ideas. An intelligence test score of about 120 correlates with creativity but does not guarantee it. Expertise, imaginative thinking skills, a venturesome personality, intrinsic motivation, and the support offered by a creative environment are important components of creativity.

24-3: What makes up emotional intelligence? Those with *emotional intelligence* are able to perceive, understand, manage, and use emotions, and they tend to achieve greater personal and professional success. However, critics question whether we stretch the idea of intelligence too far when we apply it to emotions.

24-4: When and why were intelligence tests created? Binet started the modern *intelligence-testing* movement in France in 1904 by developing questions to predict children's future progress in the Paris school system. Terman's *Stanford-Binet* test revised Binet's work for use in the United States. More than Binet, Terman believed intelligence is inherited, and that test scores could be used to guide people toward appropriate opportunities. Weschler created the tests that are now most widely used—the *WAIS* and *WISC*. These and other psychological tests must meet three criteria to be useful. They must be *standardized*, *reliable*, and *valid*. Scores on a standardized test usually form a *normal curve*.

24-5: What does evidence reveal about hereditary and environmental influences on intelligence? The *heritability* of intelligence is about 50 percent—this is the proportion of variation among individuals that can be attributed to genes. Genes and environment interact to influence intelligence. The effect of heredity can be seen in the intelligence test scores of family members, such as (a) fraternal twins raised together (more similar scores than those of other siblings), (b) identical twins raised together (nearly identical scores), and (c) identical twins raised apart (very slightly less similar than the scores of identical twins raised together). Other studies, of children from extremely impoverished environments or of children placed in enriched educational programs, indicate that life experiences can influence intelligence test performance.

24-6: How and why do gender and racial groups differ in mental ability scores? Males and females' average scores are nearly identical in overall intelligence. Psychologists debate evolutionary, brain-based, and cultural explanations for the small gender differences found in specific abilities. Girls are better spellers, more verbally fluent, better at locating objects, better at detecting emotions, and more sensitive to touch, taste, and color. Boys outperform girls at spatial ability and math problem solving, though girls outperform boys in math computation. Boys also outnumber girls at the low and high extremes of mental abilities. As a group, Whites score higher than their Hispanic and Black counterparts, though the gap is narrowing. The evidence suggests that environmental differences are largely, perhaps entirely, responsible for these group differences.

24-7: Are intelligence tests inappropriately biased? Intelligence tests are "biased" in the sense that they are designed to detect developed abilities, which reflect cultural experiences such as education and life experience. But these tests are not biased in the way psychologists commonly use the term—the tests do not predict less accurately for one group than for another. *Stereotype threat*, a self-confirming concern that one will be evaluated based on a negative stereotype, affects performance on all kinds of tests.

Rehearse It!

1. The existence of savant syndrome—limited mental ability combined with an exceptional specific skill—seems to support
   a. Sternberg's distinction among three aspects of intelligence.
   b. Spearman's notion of general intelligence, or *g* factor.
   c. Gardner's theory of multiple intelligences.
   d. Thorndike's view of social intelligence.

2. Sternberg's three aspects of intelligence are
   a. spatial, academic, and artistic.
   b. musical, athletic, and academic.
   c. academic, practical, and creative.
   d. emotional, practical, and spatial.

3. Emotionally intelligent people tend to
   a. seek immediate gratification.
   b. understand their own emotions but not those of others.
   c. understand others' emotions but not their own.
   d. succeed in their careers.

4. Which of the following is NOT a characteristic of a creative person?
   a. Expertise
   b. Extrinsic motivation
   c. A venturesome personality
   d. Imaginative thinking skills

5. Intelligence quotient, or IQ, was originally defined as mental age divided by chronological age and multiplied by 100. By this definition, the IQ of a 6-year-old with a measured mental age of 9 would be
   a. 67.
   b. 133.
   c. 86.
   d. 150.

6. The Wechsler Adult Intelligence Scale (WAIS) yields an overall intelligence score as well as separate verbal and performance (nonverbal) scores. The WAIS is best able to tell us
   a. what part of an individual's intelligence is determined by genetic inheritance.
   b. whether the test-taker will succeed in a job.
   c. how the test-taker compares with other adults in vocabulary and arithmetic reasoning.

d. whether the test-taker has specific skills for music and the performing arts.

7. The Stanford-Binet, the Wechsler Adult Intelligence Scale, and the Wechsler Intelligence Scale for Children are known to have very high reliability (about +.9). This means that
a. a pretest has been given to a representative sample.
b. the test yields consistent results, for example on retesting.
c. the test measures what it is supposed to measure.
d. the results of the test will predict future behavior, such as college grades or success in business.

8. The strongest support for heredity's influence on intelligence is the finding that
a. identical twins, but not other siblings, have nearly identical intelligence test scores.
b. the correlation between intelligence test scores of fraternal twins is higher than that for other siblings.
c. mental similarities between adopted siblings increase with age.
d. children in impoverished families have similar intelligence scores.

9. To say that the heritability of intelligence is about 50 percent means that 50 percent of
a. an individual's intelligence is due to genetic factors.
b. the similarities between men and women are attributable to genes.
c. the variation in intelligence within a group of people is attributable to genetic factors.
d. intelligence is due to the mother's genes and the rest is due to the father's genes.

10. The environmental influence that has the clearest, most profound effect on intellectual development is
a. being enrolled in a Head Start program.
b. growing up in an economically disadvantaged home or neighborhood.
c. being raised in conditions of extreme deprivation.
d. being an identical twin.

Answers: 1. c, 2. c, 3. d, 4. b, 5. d, 6. c, 7. b, 8. a, 9. c, 10. c.

Terms and Concepts to Remember

intelligence, p. 329
general intelligence *(g)*, p. 331
factor analysis, p. 331
savant syndrome, p. 331
creativity, p. 333
emotional intelligence, p. 334
intelligence test, p. 334
mental age, p. 334
Stanford-Binet, p. 334
intelligence quotient (IQ), p. 337
Wechsler Adult Intelligence Scale (WAIS), p. 337
standardization, p. 337
normal curve, p. 337
reliability, p. 337
validity, p. 338
content validity, p. 338
intellectual disability, p. 339
Down syndrome, p. 339
predictive validity, p. 339
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Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. When asked to report his IQ, Nobel Prize-winning physicist Stephen Hawking responded, "I have no idea. People who boast about their IQ are losers." How important are intelligence test scores to success in life?

2. As society succeeds in creating equality of opportunity, it will also increase the heritability of ability. The heritability of intelligence scores will be greater in a society marked by equal opportunity than in a society of peasants and aristocrats. Why?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Motivation

Motivation

"What's my motivation?" the actor asks the director. In our everyday conversation, "What motivated you to do *that*?" is a way of asking "What *caused* your behavior?" To psychologists, a *motivation* is a need or desire that *energizes* behavior and *directs* it toward a goal.

After an ill-fated Saturday morning in the spring of 2003, experienced mountaineer Aron Ralston understands the extent to which motivation can energize and direct behavior. Having bagged nearly all of Colorado's tallest peaks, many of them solo and in winter, Ralston ventured some solo canyon hiking that seemed so risk-free he didn't bother to tell anyone where he was going. In Utah's narrow Bluejohn Canyon, just 150 yards above his final rappel, he was climbing over an 800-pound rock when disaster struck: It shifted and pinned his right wrist and arm. He was, as the title of his book says, caught *Between a Rock and a Hard Place*.

Realizing no one would be rescuing him, Ralston tried with all his might to dislodge the rock. Then, with his dull pocket knife, he tried chipping away at the rock. When that, too, failed, he rigged up ropes to lift the rock. Alas, nothing worked. Hour after hour, then cold night after cold night, he was stuck.

By Tuesday, he had run out of food and water. On Wednesday, as thirst and hunger gnawed, he began saving and sipping his own urine. Using his video recorder, he said his good-byes to family and friends, for whom he now felt intense love: "So again love to everyone. Bring love and peace and happiness and beautiful lives into the world in my honor. Thank you. Love you."

On Thursday, surprised to find himself still alive, Ralston had a seemingly divine insight into his reproductive future, a vision of a preschool boy being scooped up by a one-armed man. With this inspiration, he summoned his remaining strength and his enormous will to live and, over the next hour, willfully broke his bones and then proceeded to use that dull knife to cut off his arm. The moment after putting on a tourniquet, chopping the last piece of skin, and breaking free—and before rappelling with his bleeding half-arm down a 65-foot cliff and hiking 5 miles until finding someone—he was, in his own words, "just reeling with this euphoria . . . having been dead and standing in my grave, leaving my last will and testament, etching 'Rest in peace' on the wall, all of that, gone and then replaced with having my life again. It was undoubtedly the sweetest moment that I will ever experience" (Ralston, 2004).

AP Photo/*Rocky Mountain News*, Judy Walgren

Motivation personified Aron Ralston's motivation to live and belong energized and directed his sacrificing half of his arm.

Ralston's thirst and hunger, his sense of belonging to others, and his brute will to live and become a father highlight motivation's energizing and directing power. In Modules 25 and 26, we explore motivation by focusing on three motives—hunger, sex, and the need to belong. Although other identifiable motives exist (including thirst and curiosity), a close look at these three reveals the interplay between nature (the physiological "push") and nurture (the cognitive and cultural "pulls"). Before considering hunger in Module 25, we'll take time to see how psychologists have approached the study of motivation.

MODULE 25

Basic Concepts and Hunger

Motivational Concepts

25-1: From what perspectives do psychologists view motivated behavior?

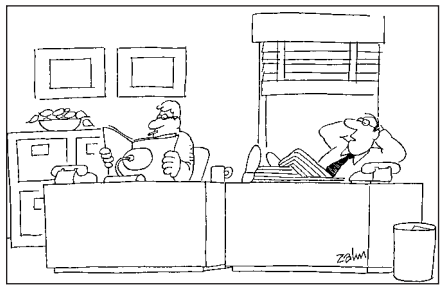
Psychologists today define **motivation** as a need or desire that energizes and directs behavior. In their attempt to understand motivated behaviors, psychologists have used four perspectives. *Instinct theory* (now replaced by the *evolutionary perspective*) focuses on genetically predisposed behaviors. *Drive-reduction theory* focuses on how our inner pushes and external pulls interact. *Arousal theory* focuses on finding the right level of stimulation. And Abraham Maslow's *hierarchy of needs* describes how some of our needs take priority over others.

Instincts and Evolutionary Psychology

Early in the twentieth century, as the influence of Charles Darwin's evolutionary theory grew, it became fashionable to classify all sorts of behaviors as instincts. If people criticized themselves, it was because of their "self-abasement instinct." If they boasted, it reflected their "self-assertion instinct." After scanning 500 books, one sociologist compiled a list of 5759 supposed human instincts! Before long, this fad for naming instincts collapsed under its own weight. Rather than *explaining* human behaviors, the early instinct theorists were simply *naming* them. It was like "explaining" a bright child's low grades by labeling the child an "underachiever." To name a behavior is *not* to explain it.

To qualify as an **instinct,** a complex behavior must have a fixed pattern throughout a species and be unlearned (Tinbergen, 1951). Such behaviors are common in other species. Newly hatched ducks and geese form attachments to the first moving thing they see. And mature salmon swim hundreds of miles upstream to mate and then die in the place they were born. Human behavior, too, exhibits certain unlearned fixed patterns, including infants' innate reflexes for rooting and sucking. Most psychologists, though, view human behavior as directed both by physiological needs and by psychological wants.

Although instinct theory failed to explain human motives, the underlying assumption that genes predispose species-typical behavior remains as strong as ever in *evolutionary psychology* today. Psychologists may apply this perspective, for example, in explanations of our human similarities, of animals' biological predispositions to learn certain behaviors, and of ways evolution might influence our phobias, our helping behaviors, and our romantic attractions.



"What do you think . . . should we get started on that motivation research or not?"

motivation a need or desire that energizes and directs behavior.

instinct a complex behavior that is rigidly patterned throughout a species and is unlearned.

Same motive, different wiring The more complex the nervous system, the more adaptable the organism. Both humans and Weaver birds satisfy their need for shelter in ways that reflect their inherited capacities. Human behavior is flexible; we can learn whatever skills we need to build a house. The bird's behavior pattern is fixed; it can build only this kind of nest.

drive-reduction theory the idea that a physiological need creates an aroused tension state (a drive) that motivates an organism to satisfy the need.

homeostasis a tendency to maintain a balanced or constant internal state; the regulation of any aspect of body chemistry, such as blood glucose, around a particular level.

incentive a positive or negative environmental stimulus that motivates behavior.

hierarchy of needs Maslow's pyramid of human needs, beginning at the base with physiological needs that must first be satisfied before higher-level safety needs and then psychological needs become active.

Drives and Incentives

When the original instinct theory of motivation collapsed, it was replaced by **drive-reduction theory**—the idea that a physiological need creates an aroused state that drives the organism to reduce the need by, say, eating or drinking. With few exceptions, when a physiological need increases, so does a psychological *drive*—an aroused, motivated state.

The physiological aim of drive reduction is **homeostasis**—the maintenance of a steady internal state. An example of homeostasis (literally "staying the same") is the body's temperature-regulation system, which works like a room thermostat. Both systems operate through feedback loops: Sensors feed temperature to a control center. If the room temperature cools, the thermostat's controls trigger a switch that turns on the furnace. Likewise, if our body temperature cools, blood vessels constrict to conserve warmth, and we feel driven to put on more clothes or seek a warmer environment.

Not only are we *pushed* by our "need" to reduce drives, we also are *pulled* by **incentives**—positive or negative stimuli that lure or repel us. This is one way our individual learning influences our motives. Depending on our learning history, the aroma of fresh roasted peanuts or toasted ants can motivate our behavior. So can the sight of those we find attractive or threatening.

When there is both a need and an incentive, we feel strongly driven. The food-deprived person who smells baking bread feels a strong hunger drive. In the presence of that drive, the baking bread becomes a compelling incentive. For each motive, we can therefore ask, "How is it pushed by our inborn physiological needs and pulled by incentives in the environment?"

Optimum Arousal

We are much more than homeostatic systems, however. Some motivated behaviors actually *increase* arousal. Well-fed animals will leave their shelter to explore and gain information, seemingly in the absence of any need-based drive. Curiosity drives monkeys to monkey around trying to figure out how to unlock a latch that opens nothing or how to open a window that allows them to see outside their room (Butler, 1954). It drives the 9-month-old infant who investigates every accessible corner of the house. It drives the scientists whose work this text discusses. And it drives explorers and adventurers such as Aron Ralston and George Mallory. Asked why he wanted to climb Mount Everest, Mallory answered, "Because it is there." Those who, like Mallory and Ralston, enjoy high arousal are most likely to enjoy intense music, novel foods, and risky behaviors (Zuckerman, 1979).

In our drive to experience stimulation, we hunger for information. We are *infovores*, say neuroscientists Irving Biederman and Edward Vessel (2006), after identifying brain mechanisms that reward us for acquiring information. Lacking stimulation, we feel bored and look for a way to increase arousal to some optimum level. However, given too much stimulation, we feel stressed and look for a way to decrease arousal.

Harlow Primate Laboratory, University of Wisconsin

Glenn Swier

Driven by curiosity Baby monkeys and young children are fascinated by things they've never handled before. Their drive to explore the relatively unfamiliar is one of several motives that do not fill any immediate physiological need.

A Hierarchy of Motives

Some needs take priority over others. Having all your biological needs satisfied, you seek increased levels of arousal. But let your need for water go unsatisfied and your thirst will preoccupy you. Just ask Aron Ralston. If you were deprived of air, your thirst would disappear.

Abraham Maslow (1970) described these priorities as a **hierarchy of needs** (**FIGURE 25.1**). At the base of this pyramid are our physiological needs, such as those for food and water. Only if these needs are met are we prompted to meet our need for safety, and then to satisfy the uniquely human needs to give and receive love and to enjoy self-esteem. Beyond this, said Maslow (1971), lies the need to actualize one's full potential.

"Hunger is the most urgent form of poverty."
—Alliance to End Hunger, 2002

Near the end of his life, Maslow proposed that some people also reach a level of self-transcendence. At the self-actualization level, people seek to realize their own potential. At the self-transcendence level, people strive for meaning, purpose, and communion that is beyond the self, that is *transpersonal* (Koltko-Rivera, 2006).

Maslow's hierarchy is somewhat arbitrary; the order of such needs is not universally fixed. People have starved themselves to make a political statement. Nevertheless, the simple idea that some motives are more compelling than others provides a framework for thinking about motivation. Life-satisfaction surveys in 39 nations support this basic idea (Oishi et al., 1999). In poorer nations that lack easy access to money and the food and shelter it buys, financial satisfaction more strongly predicts feelings of well-being. In wealthy nations, where most are able to meet basic needs, home-life satisfaction is a better predictor. Self-esteem matters most in individualist nations, whose citizens tend to focus more on personal achievements than on family and community identity.

Let's now consider hunger, a motive at the most basic physiological level, and see how environmental factors interact with what is physiologically given.

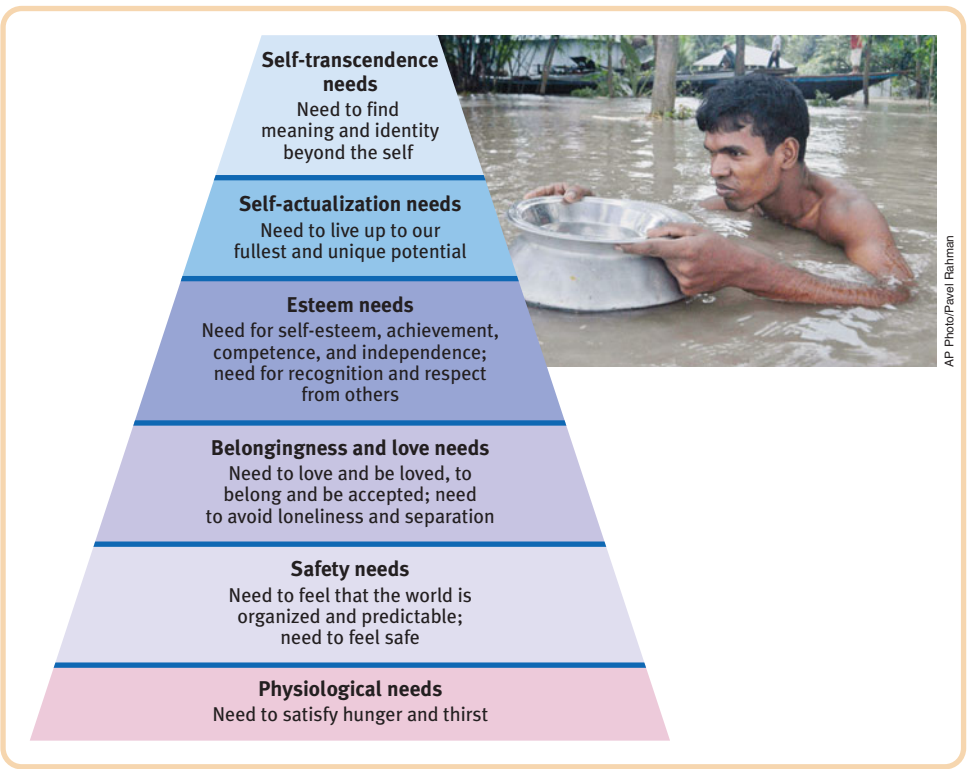
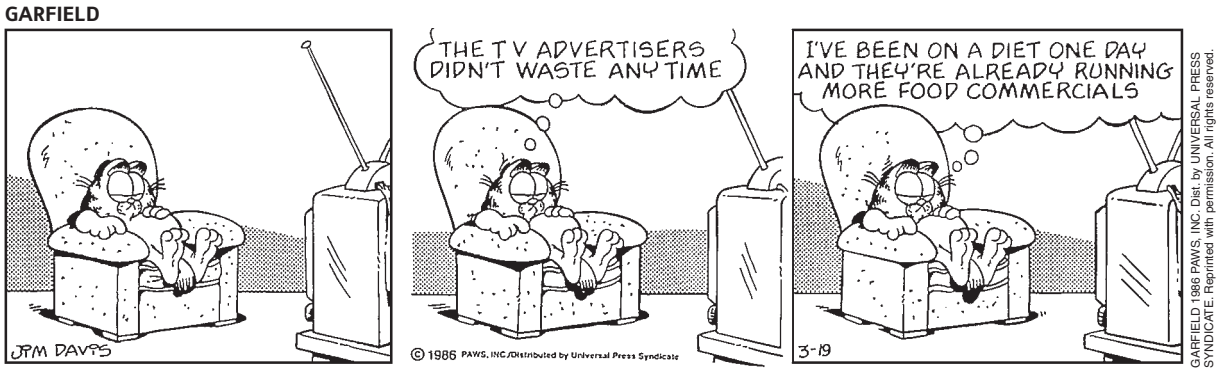


FIGURE 25.1 Maslow's hierarchy of needs Once our lower-level needs are met, we are prompted to satisfy our higher-level needs. (From Maslow, 1970.) For survivors of the disastrous 2007 Bangladeshi flood, such as this man carefully carrying his precious load of clean water, satisfying very basic needs for water, food, and safety become top priority. Higher-level needs on Maslow's hierarchy, such as those for respect, self-actualization, and meaning, tend to become far less important during such times.

Hunger

A vivid demonstration of the supremacy of physiological needs came from starvation experiences in World War II prison camps. David Mandel (1983), a Nazi concentration camp survivor, recalled how a starving "father and son would fight over a piece of bread. Like dogs." One father, whose 20-year-old son stole his bread from under his pillow while he slept, went into a deep depression, asking over and over how his son could do such a thing. The next day the father died. "Hunger does something to you that's hard to describe," Mandel explained.

To learn more about the results of semistarvation, a research team led by physiologist Ancel Keys (1950), the creator of World War II Army K rations, fed 36 male volunteers—all conscientious objectors to the war—just enough to maintain their initial weight. Then, for six months, they cut this food level in half. The effects soon became visible. Without thinking about it, the men began conserving energy; they appeared listless and apathetic. After dropping rapidly, their body weights eventually stabilized at about 25 percent below their starting weights. Especially dramatic



were the psychological effects. Consistent with Maslow's idea of a needs hierarchy, the men became food-obsessed. They talked food. They daydreamed food. They collected recipes, read cookbooks, and feasted their eyes on delectable forbidden foods. Preoccupied with their unfulfilled basic need, they lost interest in sex and social activities. As one participant reported, "If we see a show, the most interesting part of it is contained in scenes where people are eating. I couldn't laugh at the funniest picture in the world, and love scenes are completely dull."

"Nobody wants to kiss when they are hungry."
—Dorothea Dix, 1801–1887

The semistarved men's preoccupations illustrate how motives can hijack our consciousness. When we are hungry, thirsty, fatigued, or sexually aroused, little else may seem to matter. When we're not, food, water, sleep, or sex just doesn't seem like that big a thing in life, now or ever. In University of Amsterdam studies, Loran Nordgren and his colleagues (2006, 2007) found that people in a motivational "hot" state (from fatigue, hunger, or sexual arousal) become more aware of such feelings in their own past and as driving forces in others' behavior. Motives matter mightily. Grocery shop with an empty stomach and you are more likely to think that those jelly-filled doughnuts are just what you've always loved and will be wanting tomorrow.

"The full person does not understand the needs of the hungry."
—Irish proverb

The Physiology of Hunger

25-2: What physiological factors produce hunger?

Keys' semistarved volunteers felt their hunger in response to a homeostatic system designed to maintain normal body weight and an adequate nutrient supply. But what precisely triggers hunger? Is it the pangs of an empty stomach? To find out, A. L. Washburn, working with Walter Cannon (Cannon & Washburn, 1912), intentionally swallowed a balloon that, when inflated, filled his stomach and transmitted its contractions to a recording device (**FIGURE 25.2**). During this monitoring, Washburn pressed a key each time he felt hungry. The discovery: Washburn was indeed having stomach contractions whenever he felt hungry.

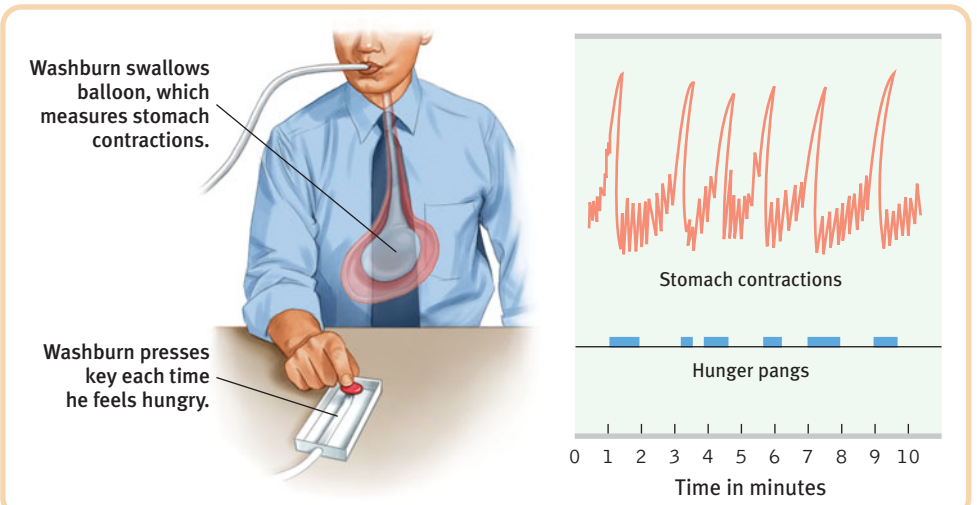


FIGURE 25.2 Monitoring stomach contractions Using this procedure, Washburn showed that stomach contractions (transmitted by the stomach balloon) accompany our feelings of hunger (indicated by a key press). (From Cannon, 1929.)

Would hunger persist without stomach pangs? To answer that question, researchers removed some rats' stomachs and attached their esophagi to their small intestines (Tsang, 1938). Did the rats continue to eat? Indeed they did. Some hunger persists similarly in humans whose ulcerated or cancerous stomachs have been removed.

If the pangs of an empty stomach are not the only trigger of hunger, what else matters?

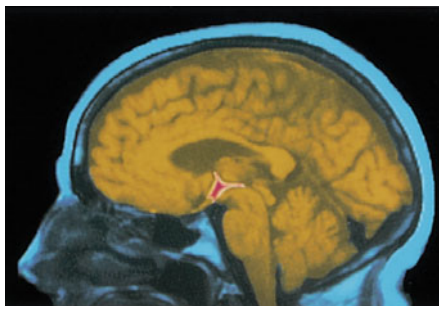
Body Chemistry and the Brain

People and other animals automatically regulate their caloric intake to prevent energy deficits and maintain a stable body weight. This suggests that somehow, somewhere, the body is keeping tabs on its available resources. One such resource is the blood sugar **glucose.** Increases in the hormone *insulin* (secreted by the pancreas) diminish blood glucose, partly by converting it to stored fat. If your blood glucose level drops, you won't consciously feel this change. But your brain, which is automatically monitoring your blood chemistry and your body's internal state, will trigger hunger. Signals from your stomach, intestines, and liver (indicating whether glucose is being deposited or withdrawn) all signal your brain to motivate eating or not.

glucose the form of sugar that circulates in the blood and provides the major source of energy for body tissues. When its level is low, we feel hunger.

set point the point at which an individual's "weight thermostat" is supposedly set. When the body falls below this weight, an increase in hunger and a lowered metabolic rate may act to restore the lost weight.

But how does the brain integrate and respond to these messages? More than a half-century ago, researchers began unraveling this puzzle when they located hunger controls within the *hypothalamus,* that small but complex neural traffic intersection deep in the brain (**FIGURE 25.3**).



Pix* Elation from Fran Heyl Associates

FIGURE 25.3 The hypothalamus The hypothalamus (colored red) performs various body maintenance functions, including control of hunger. Blood vessels supply the hypothalamus, enabling it to respond to our current blood chemistry as well as to incoming neural information about the body's state.

Two distinct hypothalamic centers influence eating. Activity along the sides of the hypothalamus (the *lateral hypothalamus*) brings on hunger. If electrically stimulated there, well-fed animals begin to eat. (If the area is destroyed, even starving animals have no interest in food.) Recent research helps explain this behavior. When a rat is food-deprived, its blood sugar levels wane and the lateral hypothalamus churns out the hunger-triggering hormone *orexin*. When given orexin, rats become ravenously hungry (Sakurai et al., 1998).

Activity in the second center—the lower mid-hypothalamus (the *ventromedial hypothalamus*)—depresses hunger. Stimulate this area and an animal will stop eating; destroy it and the opposite occurs (Duggan & Booth, 1986; Hoebel & Teitelbaum, 1966). Rats with mid-hypothalamus lesions eat more often, produce more fat, and use less fat for energy, rather like a miser who runs every bit of extra money to the bank and resists taking any out (Pinel, 1993). This discovery helped explain why some patients with tumors near the base of the brain (in what we now realize is the hypothalamus) eat excessively and become very overweight (Miller, 1995).

In addition to producing orexin, the hypothalamus monitors levels of the body's other appetite hormones (**FIGURE 25.4** on the next page). *Ghrelin,* a hunger-arousing hormone, is secreted by an empty stomach. When people with severe obesity undergo surgery to seal off part of their stomach, the remaining stomach produces much less ghrelin, and their appetite lessens (Lemonick, 2002). *Obestatin,* a sister hormone to ghrelin, sends out a fullness signal that suppresses hunger (Zhang et al., 2005). Other appetite-suppressants include *PYY,* a hormone secreted by the digestive tract, and *leptin,* a protein that is secreted by fat cells and acts to diminish the rewarding pleasure of food (Farooqi et al., 2007).

The complex interaction of appetite hormones and brain activity may help explain the body's apparent predisposition to maintain itself at a particular stable weight, or **set point** (Keesey & Corbett, 1983). When semistarved rats fall below their normal weight, this "weight thermostat" signals the

Richard Howard

Evidence for the brain's control of eating A lesion near the ventromedial area of the hypothalamus caused this rat to overeat, tripling its weight.

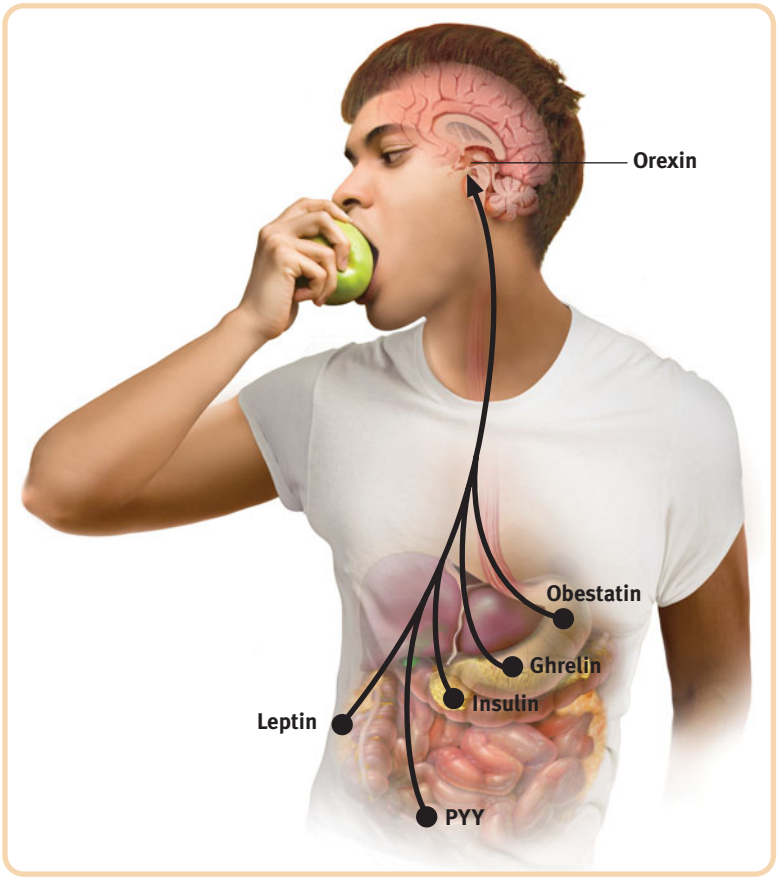


FIGURE 25.4 The appetite hormones
Insulin: Secreted by pancreas; controls blood glucose.
Orexin: Secreted by hypothalamus; triggers hunger.
Ghrelin: Secreted by empty stomach; sends "I'm hungry" signals to the brain.
Obestatin: Secreted by stomach; sends "I'm full" signals to the brain.
PYY: Secreted by digestive tract; sends "I'm *not* hungry" signals to the brain.
Leptin: Secreted by fat cells; sends signals to the brain diminishing the rewarding pleasure of food.

body to restore the lost weight: Hunger increases and energy expenditure decreases. If body weight rises—as happens when rats are force-fed—hunger decreases and energy expenditure increases.

Heredity influences body type and set point, but our bodies also regulate weight by controlling food intake and energy output. At the end of their 24 weeks of semi-starvation, the men who participated in Keys' experiment had stabilized at three-quarters of their normal weight, while taking in half their previous calories. How did they manage this? By reducing their energy expenditure, partly through inactivity but partly because of a 29 percent drop in their **basal metabolic rate**—the rate of energy expenditure for maintaining basic body functions when the body is at rest.

Over the next 40 years you will eat about 20 tons of food. If, during those years, you increase your daily intake by just .01 ounce more than required for your energy needs, you will gain 24 pounds (Martin et al., 1991).

Noting that food intake and energy output are influenced by environment as well as biology, some researchers have abandoned the idea of a biologically fixed *set point* (Assanand et al., 1998). They point out that slow, sustained changes in body weight can alter set point, and that psychological factors also sometimes drive feelings of hunger. Given unlimited access to a wide variety of tasty foods, people and other animals tend to overeat and gain weight (Raynor & Epstein, 2001). For all these reasons, some psychologists use the term *settling point* to indicate the level at which a person's weight settles in response to caloric intake and expenditure.

The Psychology of Hunger

25-3: What psychological and cultural factors influence hunger?

Our eagerness to eat is indeed pushed by our physiological state—our body chemistry and hypothalamic activity. Yet there is more to hunger than meets the stomach. This was strikingly apparent when Paul Rozin and his trickster colleagues (1998) tested two patients who had no memory for events occurring more than a minute ago. If, 20 minutes after eating a normal lunch, the patients were offered another,

basal metabolic rate the body's resting rate of energy expenditure.

both readily consumed it . . . and usually a third meal offered 20 minutes after the second was finished. This suggests that part of knowing when to eat is our memory of our last meal. As time passes, we anticipate eating again and start feeling hungry.

Psychological influences on eating behavior are most striking when the desire to be thin overwhelms normal homeostatic pressures. (See Close-Up: Eating Disorders on the next page.)

Taste Preferences: Biology and Culture

Body chemistry and environmental factors together influence not only when we feel hungry, but also what we hunger for—our taste preferences. When feeling tense or depressed, do you crave starchy, carbohydrate-laden foods? Carbohydrates help boost levels of the neurotransmitter serotonin, which has calming effects. When stressed, even rats find it extra rewarding to scarf Oreos (Artiga et al., 2007; Boggiano et al., 2005).

Our preferences for sweet and salty tastes are genetic and universal. Other taste preferences are conditioned, as when people given highly salted foods develop a liking for excess salt (Beauchamp, 1987), or when people who have been sickened by a food develop an aversion to it. (The frequency of children's illnesses provides many chances for them to learn food aversions.)

Culture affects taste, too. Bedouins enjoy eating the eye of a camel, which most North Americans would find repulsive. But then North Americans and Europeans also shun horse, dog, and rat meat, all of which are prized elsewhere.

Rats tend to avoid unfamiliar foods (Sclafani, 1995). So do we, especially animal-based foods. Such *neophobia* (dislike of things unfamiliar) surely was adaptive for our ancestors, protecting them from potentially toxic substances. Nevertheless, in experiments people who repeatedly sample an initially novel fruit drink or ethnic food typically experience increasing appreciation for the new taste. Moreover, exposure to one set of novel foods increases a person's willingness to try another (Pliner, 1982; Pliner et al., 1993).

Other taste preferences are also adaptive. For example, the spices most commonly used in hot-climate recipes—where food, especially meat, spoils more quickly—inhibit the growth of bacteria (**FIGURE 25.5**). Pregnancy-related nausea is another example of adaptive taste preferences. Its associated food aversions peak about the tenth week, when the developing embryo is most vulnerable to toxins.

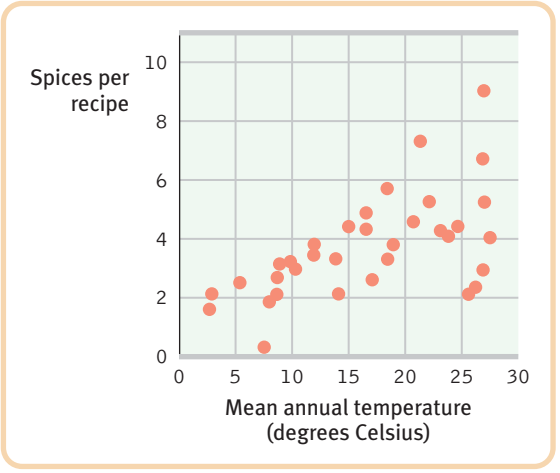


FIGURE 25.5 Hot cultures like hot spices Countries with hot climates, in which food historically spoiled more quickly, feature recipes with more bacteria-inhibiting spices (Sherman & Flaxman, 2001). India averages nearly 10 spices per meat recipe; Finland, 2 spices.

Richard Olsenius/Black Star

Victor Englebert

An acquired taste For Alaska Natives (left), but not for most other North Americans, whale blubber is a tasty treat. For these Campa Indians in Peru (right), roasted ants are similarly delicious. People everywhere learn to enjoy the foods prescribed by their culture.

Close-Up:

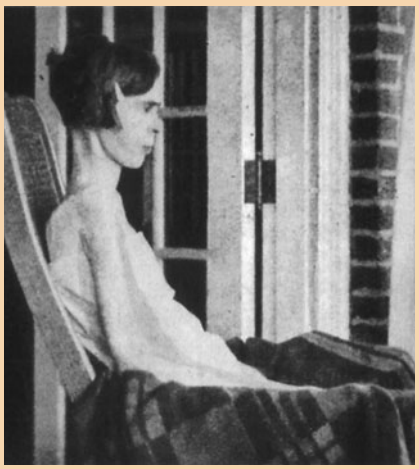
Eating Disorders

Our bodies are naturally disposed to maintain a normal weight, including stored energy reserves for times when food becomes unavailable. Yet sometimes psychological influences overwhelm biological wisdom. This becomes painfully clear in three eating disorders.

- **Anorexia nervosa** typically begins as a weight-loss diet. People with anorexia—usually adolescents and 3 out of 4 times females—drop significantly (typically 15 percent or more) below normal weight. Yet they feel fat, fear gaining weight, and remain obsessed with losing weight. About half display a binge-purge-depression cycle. Anorexia sufferers often have low self-evaluations, set perfectionist standards, fret about falling short of expectations, and are intensely concerned with how others perceive them (Pieters et al., 2007; Polivy & Herman, 2002; Striegel-Moore et al., 1993, 2007). Some of these factors also predict teen boys' pursuit of unrealistic muscularity (Ricciardelli & McCabe, 2004).
- Unlike anorexia, **bulimia nervosa** is marked by weight fluctuations within or above normal ranges, making the condition easy to hide. It, too, may be triggered by a weight-loss diet, broken by gorging on forbidden foods, sometimes in the company of friends who are also bingeing (Crandall, 1988). In a repeating cycle, overeating is followed by compensatory purging (through vomiting, laxative use), fasting, or excessive exercise (Wonderlich et al., 2007). Craving sweet and high-fat foods but fearful of becoming overweight, binge-purge eaters—mostly women in their late teens or early twenties—experience bouts of depression and anxiety, most severe during and following binges (Hinz & Williamson, 1987; Johnson et al., 2002).
- **Binge-eating disorder** is characterized by significant binge eating, followed by remorse—but not by purging, fasting, or excessive exercising.

A national study funded by the U.S. National Institute of Mental Health reports that, at some point during their lifetime, 0.6 percent of people meet the criteria for anorexia, 1 percent for bulimia, and 2.8 percent for binge-eating disorder (Hudson et al., 2007). So, how can we explain these disorders?

Genetics may influence susceptibility to eating disorders. Twins are somewhat more likely to share the disorder if they are identical rather than fraternal (Fairburn et al., 1999; Kaplan, 2004). In follow-up molecular studies, scientists are searching for culprit genes, which may influence the body's available serotonin and estrogen (Klump & Culbert, 2007). But these disorders also have environmental components.



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Dying to be thin Anorexia was identified and named in the 1870s, when it appeared among affluent adolescent girls (Brumberg, 2000). This 1930s photo illustrates the physical condition.

Eating disorders do *not* provide (as some have speculated) a telltale sign of childhood sexual abuse (Smolak & Murnen, 2002; Stice, 2002). However, the family environment may provide a fertile ground for the growth of eating disorders in other ways.

- Mothers of girls with eating disorders tend to focus on their own weight and on their daughters' weight and appearance (Pike & Rodin, 1991).
- Families of bulimia patients have a higher-than-usual incidence of childhood obesity and negative self-evaluation (Jacobi et al., 2004).
- Families of anorexia patients tend to be competitive, high-achieving, and protective (Pate et al., 1992; Yates, 1989, 1990).

Other environmental components include culture and gender. Body ideals, for example, vary across culture and time. In India, women students rate their ideal shape as close to their actual shape. In much of Africa—where plumpness means prosperity and thinness can signal poverty, AIDS, and hunger—bigger seems better (Knickmeyer, 2001).

Bigger does not seem better in Western cultures, where, according to 222 studies of 141,000 people, the rise in eating disorders over the last 50 years has coincided with a dramatic increase in women having a poor body image (Feingold & Mazzella, 1998). In one national survey, nearly one-half of all U.S. women reported feeling negative about their appearance and preoccupied with being or becoming overweight (Cash & Henry, 1995).

Obesity and Weight Control

25-4: What factors predispose some people to become and remain obese?

Why do some people gain weight while others eat the same amount and seldom add a pound? And why do so few overweight people win the battle of the bulge? Is there weight-loss hope for the 66 percent of Americans who, according to the Centers for Disease Control, are overweight?

Gender differences in body image have surfaced in several studies. In one study of New Zealand university students and 3500 British bank and university staff, men were more likely to *be* overweight and women were more likely to *perceive* themselves as overweight (Emslie et al., 2001; Miller & Halberstadt, 2005). In another study at the University of Michigan, men and women donned either a sweater or a swimsuit and completed a math test while alone in a changing room (Fredrickson et al., 1998). For the women but not the men, wearing the swimsuit triggered self-consciousness and shame that disrupted their math performance. That surely explains why a survey of 52,677 adults found that 16 percent of men and 31 percent of women avoid wearing a swimsuit in public (Frederick et al., 2006). In another informal survey of 60,000 people, 9 in 10 women said they would rather have a perfect body than have a mate with a perfect body; 6 of 10 men preferred the reverse (Lever, 2003).

Those most vulnerable to eating disorders are also those (usually women) who most idealize thinness and have the greatest body dissatisfaction (Striegel-Moore & Bulik, 2007). In one study, some adolescent girls (but not others) received a 15-month subscription to a U.S. teen-fashion magazine. Compared with their counterparts who had not received the magazine, girls defined as vulnerable—as already dissatisfied, idealizing thinness, and lacking social support—exhibited increased body dissatisfaction and eating disorder tendencies (Stice et al., 2001).

Viewing real and doctored images of unnaturally thin models and celebrities, women often feel ashamed, depressed, and dissatisfied with their own bodies—the very attitudes that predispose eating disorders (Grabe et al., 2008). But even ultra-thin models do not reflect the impossible standard of the classic Barbie doll, who had, when adjusted to a height of 5 feet 7 inches, a 32–16–29 figure (in centimeters, 82–41–73) (Norton et al., 1996).

It seems clear that the sickness of today's eating disorders lies in part within our weight-obsessed culture—a culture that says, in countless ways, "Fat is bad," that motivates millions of women to be "always dieting," and that encourages eating binges by pressuring women to live in a constant state of semistarvation.

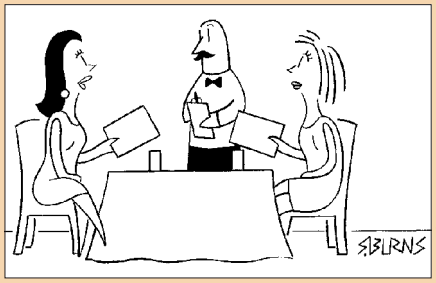
If cultural learning contributes to eating disorders, then might prevention programs increase acceptance of one's body? From their review of 66 prevention studies, Eric Stice and his colleagues (2007) answer *yes,* especially if the programs are interactive and focused on girls over age 15.

Reuters/David Gray (Australia)

"Skeletons on parade" A recent article used this headline in criticizing superthin models. Do such models make self-starvation fashionable?

"Why do women have such low self-esteem? There are many complex psychological and societal reasons, by which I mean Barbie."

—Dave Barry, 1999



"Thanks, but we don't eat."

anorexia nervosa an eating disorder in which a person (usually an adolescent female) diets and becomes significantly (15 percent or more) underweight, yet, still feeling fat, continues to starve.

bulimia nervosa an eating disorder characterized by episodes of overeating, usually of high-calorie foods, followed by vomiting, laxative use, fasting, or excessive exercise.

binge-eating disorder significant binge-eating episodes, followed by distress, disgust, or guilt, but without the compensatory purging, fasting, or excessive exercise that marks bulimia nervosa.

Our bodies store fat for good reasons. Fat is an ideal form of stored energy—a high-calorie fuel reserve to carry the body through periods when food is scarce—a common occurrence in the feast-or-famine existence of our prehistoric ancestors. (Think of that spare tire around the middle as an energy storehouse—biology's counterpart to a hiker's waist-borne snack pack.) No wonder that wherever people haved faced famine—whether in developing societies today, or in Europe in earlier centuries—obesity has signaled affluence and social status (Furnham & Baguma, 1994).

"If we do nothing, in a few years the French will be as fat as Americans."

—Olivier Andrault, food expert with the French Union of Consumers, 2007

In those parts of the world where food and sweets are now abundantly available, the rule that once served our hungry distant ancestors *(When you find energy-rich fat or sugar, eat it!)* has become dysfunctional.

Pretty much everywhere this book is being read, people have a growing problem. Worldwide, more than 1 billion people are overweight (WHO, 2007), and 300 million of them are clinically *obese* (defined as a body mass index of 30 or more—see **FIGURE 25.6**). The U.S. adult obesity rate has more than doubled in the last 40 years, reaching 34 percent, and child-teen obesity has quadrupled (CDC, 2007; NCHS, 2007). Australia classifies 54 percent of its population as overweight or obese, with Canada close behind at 49 percent, and France at 42 percent (Australian Bureau of Statistics, 2007; Statistics Canada, 2007). In all these and many other countries, rising obesity rates trail the U.S. rates by just a few years and are projected to increase further, resulting in a "global epidemic" of diabetes (Yach et al., 2006).

Fitness matters more than being obese, which poses only modest health risks (Dolan et al., 2007; Gibbs, 2005). But significant obesity increases the risk of diabetes, high blood pressure, heart disease, gallstones, arthritis, and certain types of cancer (Olshansky et al., 2005). The risks are greater for apple-shaped people who carry their weight in pot bellies than for pear-shaped people with ample hips and thighs (Greenwood, 1989; Price et al., 2006). Research also links women's obesity to their risk of late-life Alzheimer's disease and brain tissue loss (Gustafson et al., 2003, 2004).

Not surprisingly, then, one 14-year study (Calle et al., 1999) of more than 1 million Americans revealed that being significantly overweight can cut life short. Those overweight at age 40 die three years earlier than their slim counterparts, reports another long-term study (Peeters et al., 2003). The death rate is especially high among very overweight men. Understandably, in 2004 the U.S. Medicare system began recognizing obesity as an illness. And in 2008 in Japan, a new national law mandated waistline measurements as part of annual checkups for those ages 40 to 74, with dieting guidance and re-education for those persistently over 33.5 inches for men and 35.4 inches for women (Onishi, 2008).

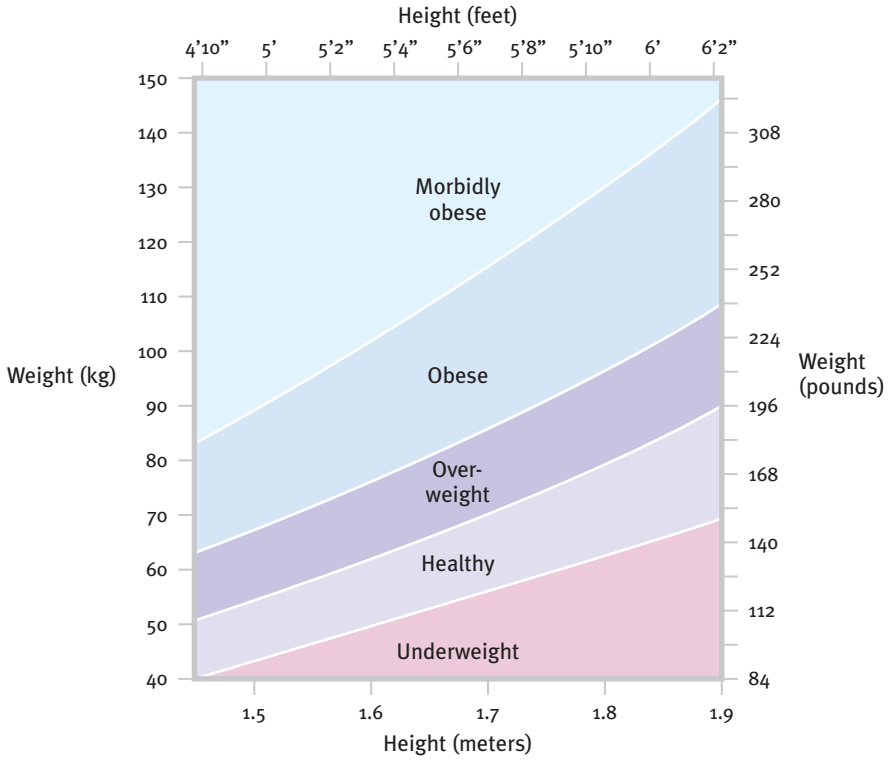


FIGURE 25.6 Obesity measured as body mass index (BMI) U.S. government guidelines encourage a BMI under 25. The World Health Organization and many countries define *obesity* as a BMI of 30 or more (although muscular bodies may also have a high BMI). The shading in this graph is based on BMI measurements for these heights and weights. BMI is calculated by using the following formula:

$$\frac{\text{Weight in kg (pounds} \times .45)}{\text{Squared height in meters (inches} \div 39.4)^2} = \text{BMI}$$

The Social Effects of Obesity

Obesity can also be socially toxic, by affecting both how you are treated and how you feel about yourself. Obese people know the stereotype: slow, lazy, and sloppy (Crandall, 1994, 1995; Ryckman et al., 1989). Widen people's images on a video monitor (making them look fatter) and observers suddenly rate them as less sincere, less friendly, meaner, and more obnoxious (Gardner & Tockerman, 1994). The social effects of obesity were clear in a study that followed 370 obese 16- to 24-year-old women (Gortmaker et al., 1993). When restudied seven years later, two-thirds of the women were still obese. They also were making less money—$7000 a year less—than an equally intelligent comparison group of some 5000 nonobese women. And they were less likely to be married. In personal ads, men often state their preference for, and women often advertise, slimness (Miller et al., 2000; Smith et al., 1990).

Obesity sterotype: "The [obesity lawsuit] bill says, 'Don't run off and file a lawsuit if you are fat.' It says, 'Look in the mirror because you're the one to blame.'"

—U.S. Senator F. James Sensenbrenner, 2004

Regina Pingitore and her colleagues (1994) demonstrated weight discrimination in a clever experiment. They filmed mock job interviews in which professional actors appeared either as normal-weight or as overweight applicants (wearing makeup and prostheses to make them look 30 pounds heavier). When appearing overweight, the same person—using the same lines, intonations, and gestures—was rated less worthy of hiring (**FIGURE 25.7**). The weight bias was especially strong against women. Other studies reveal that weight discrimination, though hardly discussed, is greater than race and gender discrimination. It occurs at every stage of the employment cycle—hiring, placement, promotion, compensation, discipline, and discharge—and is, indeed, much more likely to affect women (Roehling et al., 1999, 2007). Anti-fat prejudice even extends to applicants who are *seen* with an obese person (Hebl & Mannix, 2003)! This prejudice appears early. Children scorn fat children and express less liking of normal-weight children who are seen with an obese child (Penny & Haddock, 2007; Puhl & Latner, 2007).

"For fat students, the school experience is one of almost constant harassment."

—Report on Size Discrimination, National Education Association, 1994

Obesity has been associated with lower psychological well-being in Western cultures, especially among women, and with a 25 percent increase in depression and anxiety (Bookwala & Boyar, 2008; Petry et al., 2008; Simon et al., 2006). In studies of patients who had been especially unhappy with their weight and had lost an average of 100 pounds after short-cutting digestion with intestinal bypass surgery, 4 in 5 said their children had asked them not to attend school functions. And 9 in 10 said they would rather have a leg amputated than be obese again (Rand & Macgregor, 1990, 1991).

Why don't obese people drop their excess baggage and free themselves of all this pain? An answer lies in the physiology of fat.

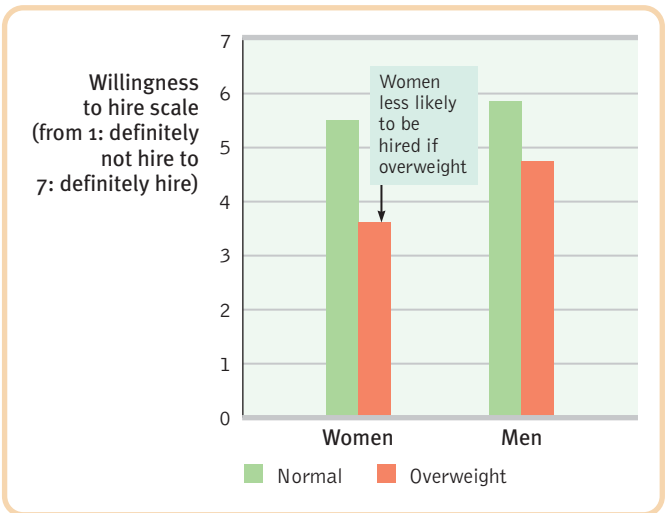


FIGURE 25.7 Gender and weight discrimination When women applicants were made to look overweight, university students were less willing to think they would hire them. Among men applicants, weight mattered less. (Data from Pingitore et al., 1994.)

The Physiology of Obesity

Research on the physiology of obesity challenges the stereotype of severely overweight people being weak-willed gluttons. First, consider the arithmetic of weight gain: People get fat by consuming more calories than they expend. The energy equivalent of a pound of fat is 3500 calories; therefore, dieters have been told they will lose a pound for every 3500-calorie reduction in their diet. Surprise: This conclusion is false. (Read on.)

Fat Cells The immediate determinants of body fat are the size and number of fat cells. A typical adult has 30 to 40 billion of these miniature fuel tanks, half of which lie near the skin's surface. A fat cell can vary from relatively empty, like a deflated balloon, to overly full. In an obese person, fat cells may swell to two or three times their normal size and then divide or trigger nearby immature fat cells to divide—resulting in up to 75 billion fat cells (Hirsch, 2003). Once the number of fat cells increases—due to genetic predisposition, early childhood eating patterns, or adult overeating—it never decreases (**FIGURE 25.8**). During a diet, fat cells may shrink, but their number does not (Sjöstrum, 1980; Spalding et al., 2008).

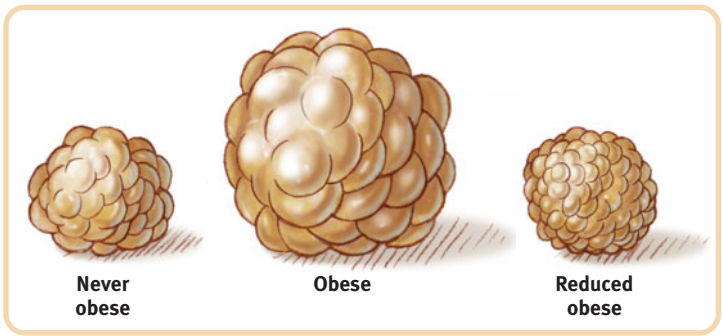


FIGURE 25.8 Fat cells We store energy in fat cells, which become larger and more numerous if we are obese, and smaller (but still more numerous) if we then lose weight. (Adapted from Jules Hirsch, 2003.)

Set Point and Metabolism Once we become fat, we require less food to maintain our weight than we did to attain it. Why? Because compared with other tissue, fat has a lower metabolic rate—it takes less food energy to maintain. When an overweight person's body drops below its previous set point (or settling point), the person's hunger increases and metabolism decreases. Thus, the body adapts to starvation by burning off fewer calories.

In a classic month-long experiment (Bray, 1969), obese patients whose daily food intake was reduced from 3500 to 450 calories lost only 6 percent of their weight—partly because their bodies reacted as though they were being starved, and their metabolic rates dropped about 15 percent (**FIGURE 25.9**). That is why reducing your food intake by 3500 calories may not reduce your weight by 1 pound. That is also why further weight loss comes slowly following the rapid losses during the initial three weeks or so of a rigorous diet. And that is why amounts of food that worked to maintain weight before a diet began may increase it when a diet ends—the body is still conserving energy. Given two people who weigh and look the same, the formerly overweight one will likely need to eat fewer calories to maintain that weight than will the never-overweight one. (Who said life is fair?)

Thirty years after the Bray study, researchers performed a reverse experiment (Levine et al., 1999). They overfed volunteers an extra 1000 calories a day for eight weeks. Those who gained the least weight tended to spend the extra caloric energy by fidgeting more. Lean people are naturally disposed to fidget and move about more, and to burn more calories, than are energy-conserving overweight people who tend to sit still longer, report James Levine and his colleagues (2005). (How did the researchers know this? They outfitted people with undergarments that for 10 days monitored their movements every half-second.) These individual differences in resting metabolism help explain why two people of the same height, age, and activity level can maintain the same weight, even if one of them eats much less than the other does.

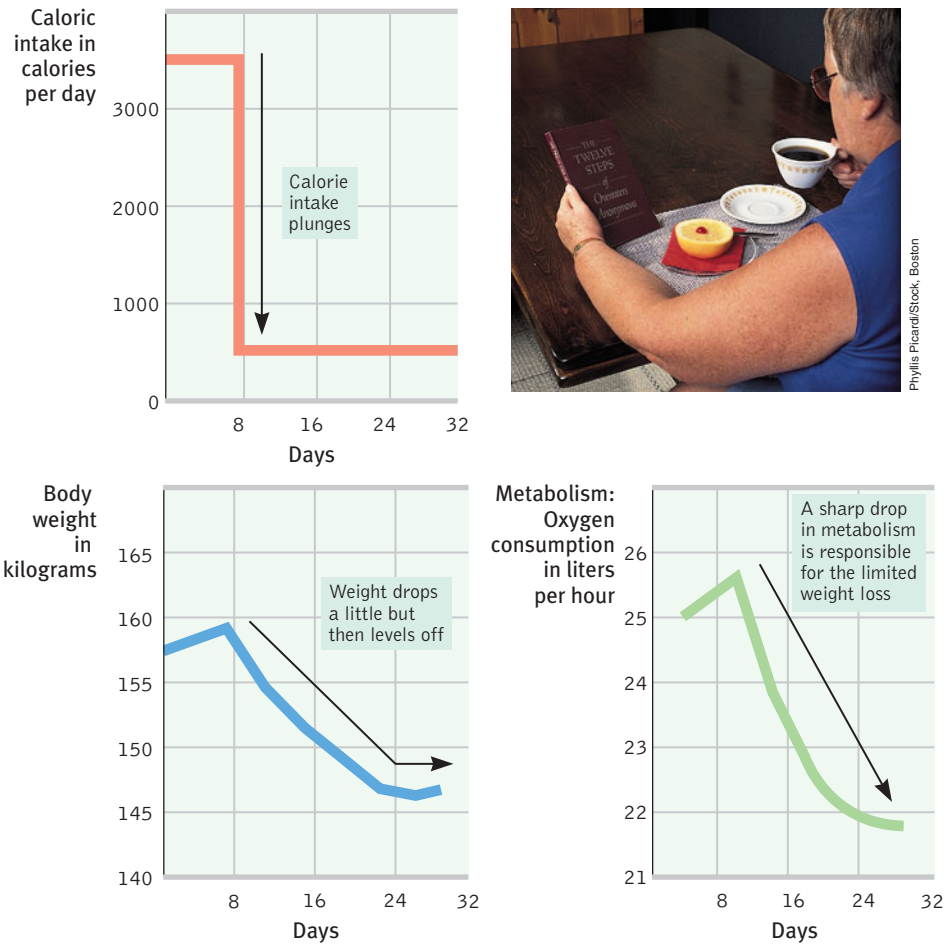


FIGURE 25.9 The effects of a severe diet on obese patients' body weight and metabolism After 7 days on a 3500-calorie diet, six obese patients were given only 450 calories a day for the next 24 days. Body weight declined only 6 percent and then leveled off, because metabolism dropped about 15 percent. (From Bray, 1969.)

Genetic Influences Do our genes predispose us to fidget or sit still? Possibly. Studies do reveal a genetic influence on body weight. Consider:

- Despite shared family meals, adoptive siblings' body weights are uncorrelated with one another or with those of their adoptive parents. Rather, people's weights resemble those of their biological parents (Grilo & Pogue-Geile, 1991).
- Identical twins have closely similar weights, even when reared apart (Plomin et al., 1997; Stunkard et al., 1990). Across studies, their weight correlates +.74. The much lower +.32 correlation among fraternal twins suggests that genes explain two-thirds of our varying body mass (Maes et al., 1997).
- Given an obese parent, a boy is three times, and a girl six times, more likely to be obese than their counterparts with normal-weight parents (Carrière, 2003).
- Scientists have discovered many different genes that influence body weight. One gene scan of 40,000 people worldwide identified a variant of a gene called *FTO,* which nearly doubles the risk of becoming obese (Flier & Maratos-Flier, 2007; Frayling et al., 2007). Researchers hope that identifying such culprit genes will lead them to the trail of the hunger-signaling proteins encoded by those genes.

So, the specifics of our genes predispose the size of our jeans. But the genetic influence is surely complex, with different genes, like differing band members, making music by playing together. Some genes might influence when our intestines signal "full," with others dictating how efficiently we burn calories or convert extra calories to fat, and, yes, still others prompting us to fidget or sit still.

Environmental Influences on Obesity

Genes tell an important part of the obesity story. But research reveals that environmental factors are mighty important, too.

Social influence is one such factor. One research team followed the social networks of 12,067 people whom they had closely studied for 32 years (Christakis & Fowler, 2007). Their discovery: People were most likely to become obese when a friend became obese. If that friend was a close mutual friend, the odds almost tripled. Moreover, the correlation among friends' weights was not simply a matter of seeking out similar people as friends. Friends matter.

Sleep loss also matters. Studies in France, Japan, Spain, the United States, and Switzerland show that children and adults who skimp on sleep are more vulnerable to obesity (Keith et al., 2006; Taheri, 2004a,b). With sleep deprivation, the levels of leptin (which reports body fat to the brain) fall and ghrelin (the stomach hormone that stimulates appetite) rise.

The strongest evidence that environment influences weight comes from our fattening world. Although the developed nations lead the trend, people *across the globe* are getting heavier. Since 1989, the percentage of overweight people in Mexico has expanded from 1 in 10 to today's nearly 7 in 10 (Popkin, 2007). Changing *activity levels* are partly to blame, as activity-inhibiting TV watching spreads across the world. One massive long-term study of 50,000 North American nurses found—even after controlling for exercise, smoking, age, and diet—that each two-hour increase in daily TV watching predicted a 23 percent obesity increase and a 7 percent diabetes increase (Hu et al., 2003). Energy-saving tools, trucks, and cars also play a role. Among Ontario's Old Order Amish, where farming and gardening is labor intensive and pedometers reveal that men walk nine miles a day and women seven miles, the obesity rate is one-seventh the U.S. rate (Bassett et al., 2004). And within the United States, people living in walking-dependent communities such as Manhattan tend to weigh less than more sedentary folks in car-dependent suburbs (Ewing et al., 2003).

Western cultures have become like animal feedlots (where farmers fatten inactive animals). But *food consumption* patterns are also changing, as sugar-laden soft drinks, energy-rich cooking oils, and ever-larger portions of high-calorie foods compound inactivity. Compared with their counterparts in the early 1900s, North Americans are eating a higher-fat, higher-sugar diet, expending fewer calories, and suffering higher rates of diabetes at younger ages (Popkin, 2007). Just since 1971, women are eating 300 more calories a day and men nearly 200 calories more (O'Connor, 2004). And they are eating three times as many meals in fast-food restaurants (Farley & Cohen, 2001). Small wonder that your parents and grandparents at age 30 likely weighed less than you did or will. Since 1960, the average adult American has grown one inch and gained 23 pounds (Ogden et al., 2004).

Too much food, and too little It is ironic that in a world where 800 million still live with hunger, obesity rates continue to rise in Western countries, endangering the lives of the severely overweight (Pinstrup-Andersen & Cheng, 2007; Popkin, 2007).

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Schwarzbach/Peter Arnold

Today's teens consume twice as much soda as milk—the reverse of a quarter-century ago (Brownell & Nestle, 2004). And when it's time for college, they'll find limitless soft drinks in campus food buffets, along with multiple serving stations offering all-you-can-eat entrees and make-your-own waffles (Brody, 2003). For many, the understandable result will be the "freshman 5" (Holm-Denoma et al., 2008).

Taken together, Big Macs, Double Whoppers, sugar-laden drinks, sleep loss, and inactivity form a weapon of mass destruction. And they've produced a new "bottom" line: Stadiums, theaters, and subway cars are widening their own seats to accommodate this population growth (Hampson, 2000). Washington State Ferries abandoned a 50-year-old standard of 18 inches per person: "Eighteen-inch butts are a thing of the past," explained a spokesperson (Shepherd, 1999). New York City, facing a large problem with Big Apple bottoms, has mostly replaced 17.5-inch bucket-style subway seats with bucketless seats (Hampson, 2000). In the end, today's people need more room.

If the changing environment explains the expanding obesity problem, then environmental reform is part of the remedy, reasoned the 53 European health ministers who signed a new World Health Organization anti-obesity charter (Cheng, 2006). The charter beckons the private sector to "substantially reduce" its advertising of fatty, sugary foods to children

and commits governments to increasing the availability of healthy foods and roadways that promote cycling and walking. Psychologist Kelly Brownell (2002) has campaigned for these and other U.S. environmental reforms, such as establishing a fast-food–free zone around schools and slapping a "Twinkie Tax" (modeled on existing cigarette taxes) on calorie-laden junk food and soft drinks, with revenues used to subsidize healthy foods and to finance health-supportive nutritional advertising.

Note how research on global obesity reinforces a familiar lesson: There can be high levels of heritability (genetic influence on individual differences) without heredity explaining group differences. Genes mostly determine why one person today is heavier than another. Environment mostly determines why people today are heavier than their counterparts 50 years ago. Our eating behavior also demonstrates the familiar interaction among biological, psychological, and social-cultural factors.

Losing Weight

Perhaps you are shaking your head: "Slim chance I have of becoming and staying thin. If I lose weight on a diet, my metabolism slows and my hungry fat cells cry out, 'Feed me!' I'm fated for fat!" Indeed, the condition of an obese person's body reduced to average weight is much like that of a semistarved body. Held under its normal settling point, the body "thinks" it is starving. Having lost weight, formerly obese people look normal, but their fat cells may be abnormally small, their metabolism slowed, and their minds obsessed with food.

The battle of the bulge rages on as intensely as ever, and it is most intense among those with two X chromosomes. Nearly two-thirds of women and half of men say they want to lose weight; about half of those women and men say they are "seriously trying" (Moore, 2006). Asked if they would rather "be five years younger or weigh 15 pounds less," 29 percent of men and 48 percent of women said they would prefer losing the weight (Responsive Community, 1996).

"Some people daydream heroic deeds or sex scenes or tropical vacations. I daydream crab legs dipped in hot butter."

—Judith Moore, *Fat Girl,* 2005

With fat cells, settling points, metabolism, and genetic and environmental factors all tirelessly conspiring against shedding excess pounds, what advice can psychology offer these people? Perhaps the most important point is that permanent weight loss is not easy. Millions can vouch that it is possible to lose weight; they have done it lots of times. But short of drastic surgery to tie off part of the stomach and small intestine, most who succeed on a weight-loss program eventually regain the lost weight or more (Mann et al., 2007).

Those who do manage to keep pounds off set realistic and moderate goals, undertaking programs that modify their life-style and ongoing eating behavior. They realize that being moderately heavy is less risky than being extremely thin (Ernsberger & Koletsky, 1999). They lose weight gradually: "A reasonable time line for a 10 percent reduction in body weight is six months," advised the National Institutes of Health (1998). And they exercise regularly. For other helpful hints, see Close-Up: Waist Management on the next page.

A losing battle Ryan Benson lost 122 pounds to win the first season of the TV reality show, *The Biggest Loser.* But then, like so many, he found maintaining the loss an even bigger challenge.

Close-Up:

Waist Management

People struggling with obesity are well advised to seek medical evaluation and guidance. For others who wish to take off a few pounds, researchers have offered these tips.

Begin only if you feel motivated and self-disciplined. For most people, permanent weight loss requires making a career of staying thin—a lifelong change in eating habits combined with gradually increased exercise.

Minimize exposure to tempting food cues. Keep tempting foods out of the house or out of sight. Shop only on a full stomach, and avoid the sweets and chips aisles. Eat simple meals, with only a few different foods; given more variety, people consume more.

Take steps to boost your metabolism. Inactive people are often overweight (**FIGURE 25.10**). In studies of thousands of young people ages 8 through 17, obesity was more common among those who watched the most TV (Andersen et al., 1998; Dietz & Gortmaker, 1985). Of course, overweight people may avoid activity, preferring to sit and watch TV. But the association between TV watching and obesity remained when many other factors were controlled, suggesting that inactivity and snacking while watching TV do contribute to obesity. The good news is that one of the few predictors of successful long-term weight loss is exercise, both during and after changing your eating patterns (Jeffery et al., 2000; McGuire et al., 1999; Wadden et al., 1998). Exercise, supported by 7 to 8 hours sleep a night, empties fat cells, builds muscle, speeds up metabolism, and helps lower your settling point (Bennett, 1995; Kolata, 1987; Thompson et al., 1982).

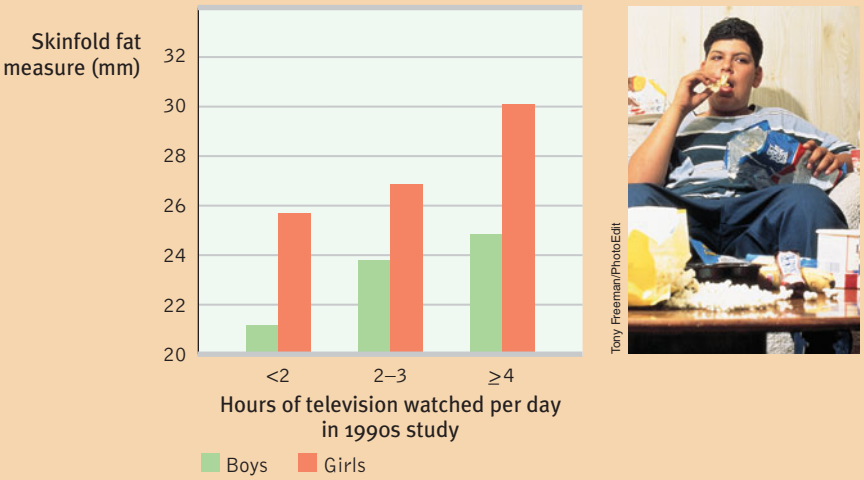
© Spencer Platt/Getty Images

A successful loser After losing 110 pounds, former Arkansas governor and U.S. presidential candidate Mike Huckabee posed with a girl who weighs what he lost. "Look at Huckabee," said his longtime adversary, former U.S. President Bill Clinton. "You've got to consume less and burn more. There is no other alternative. And to do that, you've got to change the culture."

Eat healthy foods. Whole grains, fruits, vegetables, and healthy fats such as those found in olive oil and fish help regulate appetite and artery-clogging cholesterol (Taubes, 2001, 2002). Better crispy greens than Krispy Kremes.

Don't starve all day and eat one big meal at night. This eating pattern, common among overweight people, slows metabolism. Moreover, those who eat a balanced breakfast are, by late morning, more alert and less fatigued (Spring et al., 1992).

Beware of the binge. Especially for men, eating more slowly leads to eating less (Martin et al., 2007). Among people who do consciously restrain their eating, drinking alcohol or feeling anxious or depressed can unleash the urge to eat (Herman & Polivy, 1980). So can being distracted from monitoring your eating (Ward & Mann, 2000). (Ever notice that you eat more when out with friends?) Once the diet is broken, the person often thinks "What the heck" and then binges (Polivy & Herman, 1985, 1987). A lapse need not become a full collapse: Remember, most people occasionally lapse.



Tony Freeman/PhotoEdit

FIGURE 25.10 American idle: Couch potatoes beware—TV watching correlates with obesity As life-styles have become more sedentary and TV watching has increased, so has the percentage of overweight people in Britain, North America, and elsewhere. When California children were placed in a TV-reduction educational program, they watched less—and lost weight (Robinson, 1999).

Basic Concepts and Hunger

Module Review

25-1: From what perspectives do psychologists view motivated behavior? The *instinct*/evolutionary perspective explores genetic influences on complex behaviors, including *motivation. Drive-reduction theory* explores how physiological needs create aroused tension states (drives) that direct us to satisfy those needs. Arousal theory proposes that we are motivated to maintain an optimum level of arousal, which explains behaviors that do not reduce physiological needs. Maslow's *hierarchy of needs* proposes a pyramid of human needs, from basic needs such as hunger and thirst up to higher-level needs such as actualization and transcendence.

25-2: What physiological factors produce hunger? Hunger's pangs correspond to the stomach's contractions. Appetite hormones that influence hunger include insulin, leptin, orexin, ghrelin, obestatin, and PYY. Two hypothalamus areas regulate the body's weight by affecting feelings of hunger and satiety. The body may have a *set point* (a biologically fixed tendency to maintain an optimum weight) or a looser settling point (also influenced by the environment).

25-3: What psychological and cultural factors influence hunger? Hunger also reflects individual learning and cultural expectations of what and when we should eat. Some tastes (such as sweet and salty) are species-wide, and some taste preferences (such as the avoidance of new foods or of foods that have made us ill) have survival value.

25-4: What factors predispose some people to become and remain obese? Twin and adoption studies indicate that body weight is genetically influenced (in the number of fat cells and *basal metabolic rate*). Lack of exercise, combined with abundant high-calorie food, has led to increased rates of obesity, showing the influence of environment. Losing weight requires a lifelong change in habits, minimizing exposure to tempting food cues, exercising to expend energy, eating healthy foods, spacing meals throughout the day, avoiding binges, and forgiving the occasional lapses.

Rehearse It!

1. Today's evolutionary psychology shares an idea that was an underlying assumption of instinct theory. That idea is that
   a. physiological needs arouse psychological states.
   b. genes predispose species-typical behavior.
   c. physiological needs increase arousal.
   d. external needs energize and direct behavior.

2. In drive-reduction theory, the maintenance of a balanced internal state is called
   a. instinct.
   b. pursuit of stimulation.
   c. a hierarchy of needs.
   d. homeostasis.

3. _____ theory attempts to explain behaviors that do NOT reduce physiological needs.
   a. Instinct
   b. Evolutionary
   c. Drive-reduction
   d. Arousal

4. The effects of external incentives, such as the smell of baking bread, are best explained in terms of
   a. biological needs.
   b. instinct.
   c. individual learning histories.
   d. homeostasis.

5. According to Maslow's hierarchy of needs, our most basic needs are physiological, including the need for food, water, and oxygen; just above these are _____ needs.
   a. safety
   b. self-esteem
   c. belongingness
   d. self-transcendence

6. Hunger occurs in response to high blood insulin and
   a. high blood glucose and low levels of ghrelin.
   b. low blood glucose and high levels of ghrelin.
   c. a low basal metabolic rate.
   d. a high basal metabolic rate.

7. According to set point theory, our body maintains itself at a particular weight level. This "weight thermostat" is an example of
   a. homeostasis.
   b. an eating disorder.
   c. individual learning.
   d. binge-purge episodes.

8. Which of the following is a genetically disposed response to food?
   a. An aversion to eating cats and dogs
   b. An interest in novel foods
   c. A preference for sweet and salty foods
   d. An aversion to carbohydrates

9. Which of the following statements is true of bulimia nervosa?
   a. People with bulimia continue to want to lose weight even when they are underweight.
   b. Bulimia is marked by weight fluctuations within or above normal ranges.
   c. Bulimia patients often come from middle-class families that are competitive, high-achieving, and protective.
   d. If one twin is diagnosed with bulimia, the chances of the other twin's sharing the disorder are greater if they are fraternal rather than identical twins.

10. Obese people find it very difficult to lose weight permanently. This is due to several factors, including the fact that
    a. with dieting, fat cells shrink and then disappear.
    b. the set point of obese people is lower than average.
    c. with dieting, basal metabolic rate increases.
    d. there is a genetic influence on body weight.

Answers: 1. b, 2. d, 3. d, 4. c, 5. a, 6. b, 7. a, 8. c, 9. b, 10. d.

Terms and Concepts to Remember

motivation, p. 355
instinct, p. 355
drive-reduction theory, p. 356
homeostasis, p. 356
incentive, p. 356
hierarchy of needs, p. 357
glucose, p. 359
set point, p. 359
basal metabolic rate, p. 360
anorexia nervosa, p. 362
bulimia nervosa, p. 362
binge-eating disorder, p. 362

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Dorothea Dix (1801–1887) once remarked, "Nobody wants to kiss when they are hungry." Which theory of motivation best supports her statement?
2. Sanjay recently adopted the typical college diet high in fat and sugar. He knows he may gain weight, but he figures it's no big deal because he can lose the extra pounds in the future. How would you evaluate Sanjay's plan?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 26

Sexual Motivation

Sex is part of life. Had this not been so for all your ancestors, you would not be reading this book. Sexual motivation is nature's clever way of making people procreate, thus enabling their genes' survival. When two people feel attracted, they hardly stop to think of themselves as guided by their genes. As the pleasure we take in eating is nature's inventive method of getting our body nourishment, so the desires and pleasures of sex are our genes' way of preserving and spreading themselves. Life is sexually transmitted.

"It is a near-universal experience, the invisible clause on one's birth certificate stipulating that one will, upon reaching maturity, feel the urge to engage in activities often associated with the issuance of more birth certificates."

—Science writer Natalie Angier, 2007

The Physiology of Sex

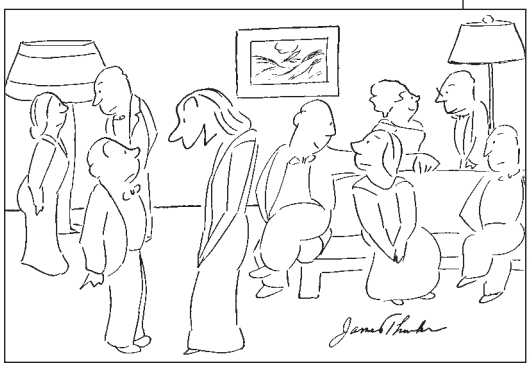
Sexual arousal depends on the interplay of internal and external stimuli. To understand sexual motivation, we must consider both.

The Sexual Response Cycle

26-1: What stages mark the human sexual response cycle?

In the 1960s, gynecologist-obstetrician William Masters and his collaborator Virginia Johnson (1966) made headlines by recording the physiological responses of volunteers who masturbated or had intercourse. With the help of 382 female and 312 male volunteers—a somewhat atypical sample, consisting only of people able and willing to display arousal and orgasm while being observed in a laboratory—Masters and Johnson monitored or filmed more than 10,000 sexual "cycles." Their description of the **sexual response cycle** identified four stages, similar in men and women. During the initial *excitement phase,* men's and women's genital areas become engorged with blood, a woman's vagina expands and secretes lubricant, and her breasts and nipples may enlarge.

In the *plateau phase,* excitement peaks as breathing, pulse, and blood pressure rates continue to increase. The penis becomes fully engorged and some fluid—frequently containing enough live sperm to enable conception—may appear at its tip. Vaginal secretion continues to increase, the clitoris retracts, and orgasm feels imminent.



"I love the idea of there being two sexes, don't you?"

Masters and Johnson observed muscle contractions all over the body during *orgasm;* these were accompanied by further increases in breathing, pulse, and blood pressure rates. A woman's arousal and orgasm facilitate conception by helping propel semen from the penis, positioning the uterus to receive sperm, and drawing the sperm further inward. A woman's orgasm therefore not only reinforces intercourse, which is essential to natural reproduction, it also increases retention of deposited sperm (Baker & Bellis, 1995). In the excitement of the moment, men and women are hardly aware of all this as their rhythmic genital contractions create a pleasurable feeling of sexual release.

The feeling apparently is much the same for both sexes. In one study, a panel of experts could not reliably distinguish between descriptions of orgasm written by men and those written by women (Vance & Wagner, 1976). University of Groningen neuroscientist Gerg Holstege and his colleagues (2003a,b) understand why. They discovered that when men and women undergo PET scans while having orgasms, the same subcortical brain regions glow. And when people who

A nonsmoking 50-year-old male has about a 1-in-a-million chance of a heart attack during any hour. This increases to merely 2-in-a-million during the hour following sex (with no increase for those who exercise regularly). Compared with risks associated with heavy exertion or anger, this risk seems not worth losing sleep (or sex) over (Muller et al., 1996).

sexual response cycle the four stages of sexual responding described by Masters and Johnson—excitement, plateau, orgasm, and resolution.

refractory period a resting period after orgasm, during which a man cannot achieve another orgasm.

sexual disorder a problem that consistently impairs sexual arousal or functioning.

estrogens sex hormones, such as estradiol, secreted in greater amounts by females than by males and contributing to female sex characteristics. In nonhuman female mammals, estrogen levels peak during ovulation, promoting sexual receptivity.

testosterone the most important of the male sex hormones. Both males and females have it, but the additional testosterone in males stimulates the growth of the male sex organs in the fetus and the development of the male sex characteristics during puberty.

are passionately in love undergo fMRI (functional MRI) scans while viewing photos of their beloved or of a stranger, men's and women's brain responses to their partner are pretty similar (Fisher et al., 2002).

The body gradually returns to its unaroused state as the engorged genital blood vessels release their accumulated blood—relatively quickly if orgasm has occurred, relatively slowly otherwise. (It's like the nasal tickle that goes away rapidly if you have sneezed, slowly otherwise.) During this *resolution phase,* the male enters a **refractory period,** lasting from a few minutes to a day or more, during which he is incapable of another orgasm. The female's much shorter refractory period may enable her to have more orgasms if restimulated during or soon after resolution.

Masters and Johnson sought not only to describe the human sexual response cycle but also to understand and treat the inability to complete it. **Sexual disorders** are problems that consistently impair sexual arousal or functioning. Some involve sexual motivation, especially lack of sexual energy and arousability. For men, others include *premature ejaculation* and *erectile dysfunction* (inability to have or maintain an erection). For women, the problem may be *orgasmic dysfunction* (infrequently or never experiencing orgasm). Most women who experience sexual distress relate it to their emotional relationship with the partner during sex, not to physical aspects of the activity (Bancroft et al., 2003).

Men or women with sexual disorders can often be helped by receiving therapy. In behaviorally oriented therapy, for example, men learn ways to control their urge to ejaculate, and women are trained to bring themselves to orgasm. Starting with the introduction of Viagra in 1998, erectile dysfunction has been routinely treated by taking a pill.

Hormones and Sexual Behavior

26-2: Do hormones influence human sexual motivation?

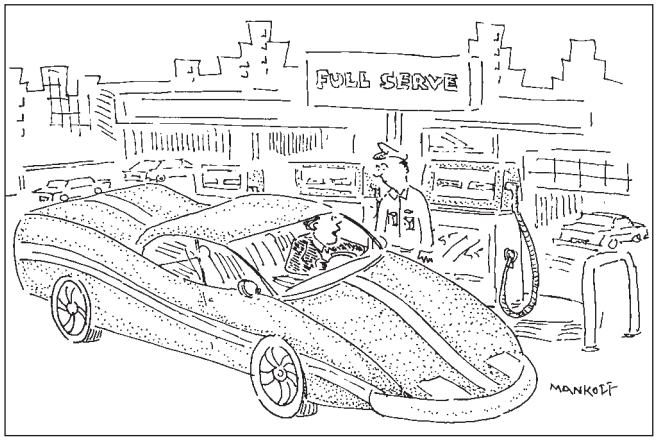
Sex hormones have two effects: They direct the physical development of male and female sex characteristics, and (especially in nonhuman animals) they activate sexual behavior. In most mammals, nature neatly synchronizes sex with fertility. The female becomes sexually receptive ("in heat") when secretion of the female hormones, the **estrogens** (such as estradiol), peaks during ovulation. In experiments, researchers can stimulate receptivity by injecting female animals with estrogen. Male hormone levels are more constant, and researchers cannot so easily manipulate the sexual behavior of male animals with hormones (Feder, 1984). Nevertheless, castrated male rats—having lost their testes, which manufacture the male sex hormone **testosterone**—gradually lose much of their interest in receptive females. They gradually regain it if injected with testosterone.

In humans, hormones more loosely influence sexual behavior, although sexual desire rises slightly at ovulation among women with mates (Pillsworth et al., 2004). One study invited partnered women not at risk for pregnancy to keep a diary of their sexual activity. (These women were either using intrauterine devices or had undergone surgery to prevent pregnancy.) On the days around ovulation, intercourse was 24 percent more frequent (Wilcox et al., 2004). Other studies find that women fantasize more about sex with desirable partners and wear more sexually attractive clothing around ovulation (Haselton et al., 2006; Pillsworth & Haselton, 2006; Sheldon et al., 2006). In a study of 5300 strip-club lap dances, hourly tips almost doubled on the days near ovulation, compared with days during menstruation (Miller et al., 2007).

Women's sexuality differs from that of other mammalian females in being more responsive to testosterone level than to estrogen levels (Meston & Frohlich, 2000; Reichman, 1998). If a woman's natural testosterone level drops, as happens with removal of the ovaries or adrenal glands, her sexual interest may wane. But testosterone-replacement therapy sometimes restores diminished sexual appetite. That is the finding of experiments with hundreds of surgically or naturally

menopausal women, for whom a testosterone-replacement patch restored sexual activity, arousal, and desire more than did a placebo (Braunstein et al., 2005; Buster et al., 2005; Davis et al., 2003; Kroll et al., 2004).

In men, normal fluctuations in testosterone levels, from man to man and hour to hour, have little effect on sexual drive (Byrne, 1982). Indeed, fluctuations in male hormones are partly a *response* to sexual stimulation. When James Dabbs and his colleagues (1987, 2000) had heterosexual male collegians converse separately with another male student and with a female student, the men's testosterone levels rose with the social arousal, but especially after talking with the female. Thus, sexual arousal can be a cause as well as a consequence of increased testosterone levels. At the other end of the mating spectrum, studies in both North America and China find that married fathers tend to have lower testosterone levels than do bachelors and married men without children (Gray et al., 2006).



"Fill'er up with testosterone."

Although normal short-term hormonal changes have little effect on men's and women's desire, large hormonal shifts over the life span have a greater effect. A person's interest in dating and sexual stimulation usually increases with the pubertal surge in sex hormones, as happens with male testosterone levels during puberty. If the hormonal surge is precluded—as it was during the 1600s and 1700s for prepubertal boys who were castrated to preserve their soprano voices for Italian opera—the normal development of sex characteristics and sexual desire does not occur (Peschel & Peschel, 1987). When adult men are castrated, sex drive typically falls as testosterone levels decline (Hucker & Bain, 1990). Male sex offenders taking Depo-Provera, a drug that reduces testosterone level to that of a prepubertal boy, similarly lose much of their sexual urge (Money et al., 1983).

In later life, as sex hormone levels decline, the frequency of sexual fantasies and intercourse declines as well (Leitenberg & Henning, 1995). For men with abnormally low testosterone levels, testosterone-replacement therapy often increases sexual desire and also energy and vitality (Yates, 2000).

To summarize: We might compare human sex hormones, especially testosterone, to the fuel in a car. Without fuel, a car will not run. But if the fuel level is minimally adequate, adding more fuel to the gas tank won't change how the car runs. The analogy is imperfect, because hormones and sexual motivation interact. However, the analogy correctly suggests that biology is a necessary but not sufficient explanation of human sexual behavior. The hormonal fuel is essential, but so are the psychological stimuli that turn on the engine, keep it running, and shift it into high gear.

In a National Center for Health Statistics survey of adult Americans, using computer-assisted self-interviews that guaranteed privacy, nearly 98 percent of 30- to 59-year-olds reported having had sex (Fryar et al., 2007).

The Psychology of Sex

26-3: How do internal and external stimuli influence sexual motivation?

Hunger and sex are different sorts of motivations. Hunger responds to a *need*. If we do not eat, we die. Sex is not in this sense a need. If we do not have sex, we may feel like dying, but we do not. Nevertheless, there are similarities between hunger and sexual motivation. Both depend on internal physiological factors. And both are influenced by external and imagined stimuli, as well as cultural expectations (**FIGURE 26.1** on the next page). Thus, despite the shared biology that underlies sexual motivation, the 281 expressed reasons for having sex (at last count) range widely—from "to get closer to God" to "to get my boyfriend to shut up" (Buss, 2008; Meston & Buss, 2007).


Sotographs/The Gamma-Liaison Network/Getty Images

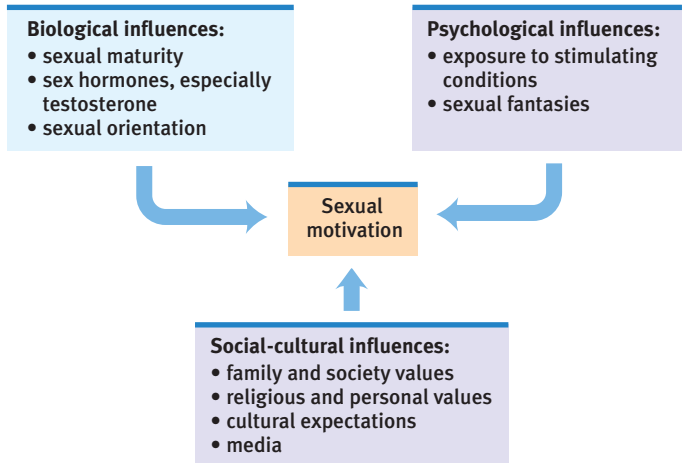


FIGURE 26.1 Levels of analysis for sexual motivation Compared with our motivation for eating, our sexual motivation is less influenced by biological factors. Psychological and social-cultural factors play a bigger role.

External Stimuli

Many studies confirm that men become aroused when they see, hear, or read erotic material. Surprising to many (because sexually explicit materials are sold mostly to men) is that most women—at least the less-inhibited women who volunteer to participate in such studies—report or exhibit nearly as much arousal to the same stimuli (Heiman, 1975; Stockton & Murnen, 1992). (Their brains do, however, respond differently, with fMRI scans revealing a more active amygdala in men viewing erotica [Hamann et al., 2004].)

People may find such arousal either pleasing or disturbing. (Those who find it disturbing often limit their exposure to such materials, just as those wishing to control hunger limit their exposure to tempting cues.) With repeated exposure, the emotional response to any erotic stimulus often lessens, or *habituates*. During the 1920s, when Western women's hemlines first reached the knee, an exposed leg was a mildly erotic stimulus, as were modest (by today's standards) two-piece swimsuits and movie scenes of a mere kiss.

"There is no difference between being raped and being run over by a truck except that afterward men ask if you enjoyed it."

—Marge Piercy, "Rape Poem," 1976

Can sexually explicit material have adverse effects? Research indicates that it can. Depictions of women being sexually coerced—and enjoying it—tend to increase viewers' acceptance of the false idea that women enjoy rape, and they tend to increase male viewers' willingness to hurt women (Malamuth & Check, 1981; Zillmann, 1989). Viewing images of sexually attractive women and men may also lead people to devalue their own partners and relationships. After male collegians view TV or magazine depictions of sexually attractive women, they often find an average woman, or their own girlfriend or wife, less attractive (Kenrick & Gutierres, 1980; Kenrick et al., 1989; Weaver et al., 1984). Viewing X-rated sex films similarly tends to diminish people's satisfaction with their own sexual partner (Zillmann, 1989). Some sex researchers suspect that reading or watching erotica may create expectations that few men and women can fulfill.

© Anthony Singer

Imagined Stimuli

The brain, it has been said, is our most significant sex organ. The stimuli inside our heads—our imagination—can influence sexual arousal and desire. People who, because of a spinal cord injury, have no genital sensation can still feel sexual desire (Willmuth, 1987).

Wide-awake people become sexually aroused not only by memories of prior sexual activities but also by fantasies. In one survey of masturbation-related fantasies (Hunt, 1974), 19 percent of women and 10 percent of men reported imagining being "taken" by someone overwhelmed with desire for them. Fantasy is not reality, however. To paraphrase Susan Brownmiller (1975), there's a big difference between

fantasizing that Christian Bale just won't take no for an answer and having a hostile person actually force himself on you.

About 95 percent of both men and women say they have had sexual fantasies. Men (whether gay or straight) fantasize about sex more often, more physically, and less romantically. They also prefer less personal and faster-paced sexual content in books and videos (Leitenberg & Henning, 1995). Fantasizing about sex does *not* indicate a sexual problem or dissatisfaction. If anything, sexually active people have more sexual fantasies.

Sexually explicit TV programs also divert attention from TV ads, making the ads more forgettable. Ads embedded in nonsexual and nonviolent programs more often produce memory for the products (Bushman & Bonacci, 2002).

Adolescent Sexuality

26-4: What factors influence teen pregnancy and risk of sexually transmitted infections?

Sexual expression varies dramatically with time and culture. Among American women born before 1900, a mere 3 percent had experienced premarital sex by age 18 (Smith, 1998). In 2005, 47 percent of high school students acknowledged having had sexual intercourse (CDC, 2006). Teen intercourse rates are roughly similar in Western Europe and in Latin America but are much lower in Arab and Asian countries and among North Americans of Asian descent (McLaughlin et al., 1997; Wellings et al., 2006). Given the wide variation across time and place, it's no surprise that a recent twin study found that environmental factors accounted for almost three-fourths of the individual variation in age of sexual initiation (Bricker et al., 2006). Family and cultural values matter.

Teen Pregnancy

Sex during the teen years is often unprotected, leading to risks of pregnancy and *sexually transmitted infections* (*STIs;* also called *STDs* for *sexually transmitted diseases*). Compared with European teens, American teens have a lower rate of contraceptive use and thus a higher rate of teen pregnancy and abortion (Call et al., 2002). Why?

Ignorance One survey of Canadian teens revealed gaps in knowledge about sex and sexual health (Ipsos, 2006). For example, although 9 in 10 claimed to be knowledgeable, many were unaware that STIs can be transmitted through oral sex (which two-thirds had engaged in). Most teens also overestimate their peers' sexual activity, a misperception that may influence their own behavior (Child Trends, 2001). A World Health Organization report found that contraceptive sex education increases the "intention to practice safer sex," and may even *delay* "rather than hasten the onset of sexual activity" (Wellings et al., 2006).

"Will your child learn to multiply before she learns to subtract?"

—Anti–teen-pregnancy poster, Children's Defense Fund

Minimal communication about birth control Many teenagers are uncomfortable discussing contraception with their parents, partners, and peers. Teens who talk freely with parents and are in an exclusive relationship with a partner with whom they communicate openly are more likely to use contraceptives (Aspy et al., 2007; Milan & Kilmann, 1987).

"Condoms should be used on every conceivable occasion."

—Anonymous

Guilt related to sexual activity In one survey, 72 percent of sexually active 12- to 17-year-old American girls said they regretted having had sex (Reuters, 2000). Sexual inhibitions or ambivalence can reduce sexual activity, but they may also reduce attempts at birth control if passion overwhelms intentions (Gerrard & Luus, 1995; MacDonald & Hynie, 2008).

Alcohol use Sexually active teens are typically alcohol-using teens (Albert et al., 2003; CASA, 2004), and those who use alcohol prior to sex are less likely to use condoms (Kotchick et al., 2001). By depressing the brain centers that control judgment, inhibition, and self-awareness, alcohol tends to break down normal restraints, a phenomenon well known to sexually coercive males.

Mass media norms of unprotected promiscuity Media help write the "social scripts" that affect our perceptions and actions. So what sexual scripts do today's media write on our minds? An average hour of prime-time television on the

"All of us who make motion pictures are teachers, teachers with very loud voices."

—Film producer George Lucas, Academy Award ceremonies, 1992

three major U.S. networks contains approximately 15 sexual acts, words, and innuendos. The partners are usually unmarried, with no prior romantic relationship, and few communicate any concern for birth control or sexually transmitted infections (Brown et al., 2002; Kunkel, 2001; Sapolsky & Tabarlet, 1991). The more sexual content adolescents view (even when controlling for other predictors of early sexual activity), the more likely they are to perceive their peers as sexually active, to develop sexually permissive attitudes, and to experience early intercourse (Escobar-Chaves et al., 2005; Martino et al., 2005; Ward & Friedman, 2006).

Teens and STIs

Unprotected sex has led to increased rates of sexually transmitted infections. Two-thirds of new infections occur in people under 25 (CASA, 2004). Teenage girls, because of their not yet fully mature biological development and lower levels of protective antibodies, seem especially vulnerable (Dehne & Riedner, 2005; Guttmacher, 1994). A recent Centers for Disease Control study of sexually experienced 14- to 19-year-old U.S. females found 39.5 percent had STIs (Forhan et al., 2008).

To comprehend the mathematics of transmitting these infections, imagine this scenario: Over the course of a year, Pat has sex with 9 people, each of whom over the same period has sex with 9 other people, who in turn have sex with 9 others. How many "phantom" sex partners (past partners of partners) will Pat have? Laura Brannon and Timothy Brock (1993) report that the actual number—511—is more than five times the estimate given by the average student.

Given these odds, the rapid spread of STIs is not surprising. Condoms offer little protection against certain skin-to-skin STIs (Medical Institute, 1994; NIH, 2001). Across the available studies, condoms have, however, been 80 percent effective in preventing transmission of HIV (human immunodeficiency virus—the virus that causes AIDS) from an infected partner (Weller & Davis-Beaty, 2002; WHO, 2003). The effects were clear when Thailand promoted 100 percent condom use by commercial sex workers. Over a four-year period, as condom use soared from 14 to 94 percent, the annual number of bacterial STIs plummeted from 410,406 to 27,362 (WHO, 2000).

In the United States, STI facts of life have led to another response: a greater emphasis on teen abstinence within some comprehensive sex-education programs. A National Longitudinal Study of Adolescent Health among 12,000 teens found several predictors of sexual restraint:

High intelligence Teens with high rather than average intelligence test scores more often delay sex, evidently because they appreciate possible negative consequences and are more focused on future achievement than on here-and-now pleasures (Halpern et al., 2000).

Religious engagement Actively religious teens and adults more often reserve sex for marital commitment (Rostosky et al., 2004; Smith, 1998).

Father presence In studies following hundreds of New Zealand and U.S. girls from age 5 to 18, a father's absence was linked to sexual activity before age 16 and teen pregnancy (Ellis et al., 2003). These associations held even after adjusting for other adverse influences, such as poverty.

Participation in service learning programs Several experiments have found lower pregnancy rates among teens volunteering as tutors or teachers' aides or participating in community projects, than found among comparable teens randomly assigned to control conditions (Kirby, 2002; O'Donnell et al., 2002). Researchers are unsure why. Does service learning promote a sense of personal competence, control, and responsibility? Does it encourage more future-oriented thinking? Or does it simply reduce opportunities for unprotected sex?

* * *

In recent history, the pendulum of sexual values has swung from the European eroticism of the early 1800s to the conservative Victorian era of the late 1800s, from the libertine flapper era of the 1920s to the family values period of the 1950s. The

pendulum may have begun a new swing toward commitment in the twenty-first century, with declining teen birth rates since 1991. This decline reflects both increasing condom use among sexually active high school students (from 46 to 63 percent between 1991 and 2005) and decreasing sexual intercourse (from 54 to 47 percent) (CDC, 2006).

Sexual Orientation

26-5: What has research taught us about sexual orientation?

To motivate is to energize and direct behavior. So far, we have considered the energizing of sexual motivation but not its direction. We express the direction of our sexual interest in our **sexual orientation**—our enduring sexual attraction toward members of our own sex *(homosexual orientation)* or the other sex *(heterosexual orientation)*. Cultures vary in their attitudes toward homosexuality. In Chile, 32 percent of people say homosexuality "is never justified," as do 50 percent of Americans and 98 percent of Kenyans and Nigerians (Pew, 2006). Yet, as far as we know, all cultures in all times have been predominantly heterosexual (Bullough, 1990). Whether a culture condemns or accepts homosexuality, heterosexuality prevails and homosexuality survives.

Gay men and lesbians often recall childhood play preferences like those of the other sex (Bailey & Zucker, 1995). But most homosexual people report not becoming aware of same-sex attraction until during or shortly after puberty, and not thinking of themselves as gay or lesbian (their socially influenced identity) until later in their teens or twenties (Garnets & Kimmel, 1990; Hammack, 2005). As adolescents, their friendship quality is similar to that of "straight" teenagers, and as adults, their partnerships are "remarkably similar" in love and satisfaction to those of heterosexual couples (Busseri et al., 2006; Peplau & Fingerhut, 2007).

sexual orientation an enduring sexual attraction toward members of either one's own sex (homosexual orientation) or the other sex (heterosexual orientation).

Sexual Orientation Statistics

How many people are exclusively homosexual? About 10 percent, as the popular press has often assumed? A little more than 20 percent, as average Americans estimated in a 2002 Gallup survey (Robinson, 2002)? Not according to more than a dozen national surveys that explored sexual orientation in Europe and the United States in the early 1990s, using methods protecting the respondents' anonymity. The most accurate figure seems to be about 3 or 4 percent of men and 1 or 2 percent of women (Laumann et al., 1994; Mosher et al., 2005; Smith, 1998). Estimates derived from the sexual activity of unmarried partners reported in the 2000 U.S. Census suggest that 2.5 percent of the population is gay or lesbian (Tarmann, 2002). Fewer than 1 percent of survey respondents—for example, 12 people out of 7076 Dutch adults in one survey (Sandfort et al., 2001)—reported being actively bisexual. A larger number of adults in that study reported having had an isolated homosexual experience. And most people report having had an occasional homosexual fantasy. Health experts find it helpful to know sexual statistics, but numbers do not decide issues of human rights.

In one British survey, of the 18,876 people contacted, 1 percent were seemingly asexual, having "never felt sexually attracted to anyone at all" (Bogaert, 2004, 2006).

In a study of self-described heterosexual, bisexual, and homosexual men, those who described themselves as bisexual responded as did homosexual men—with genital arousal primarily to same-sex erotic stimuli (Rieger et al., 2005). They also exhibit interests and traits more like gay than heterosexual men (Lippa, 2005).

What does it feel like to be homosexual in a heterosexual culture? If you are heterosexual, one way to understand is to imagine how you would feel if you were shunned or fired for openly admitting or displaying your feelings toward someone of the other sex; if you overheard people making crude jokes about heterosexual people; if most movies, TV shows, and advertisements portrayed (or implied) homosexuality; and if your family members were pleading with you to change your heterosexual life-style and to enter into a homosexual marriage.

Sexual orientation is not an indicator of mental health. "Homosexuality, in and of itself, is not associated with mental disorders or emotional or social problems," declares the American Psychological Association (2007). Moreover, same-sex civil unions provide emotional, social, and health benefits similar to those of heterosexual unions (Herek, 2006; King & Bartlett, 2006; Kurdek, 2005). But some homosexual

individuals, especially during adolescence, struggle with their sexual attractions and are at increased risk for thinking about and attempting suicide (Balsam et al., 2005; Kitts, 2005; Plöderl & Fartacek, 2005). They may at first try to ignore or deny their desires, hoping they will go away. But they don't. Then they may try to change, through psychotherapy, willpower, or prayer. But the feelings typically persist, as do those of heterosexual people—who are similarly incapable of becoming homosexual (Haldeman, 1994, 2002; Myers & Scanzoni, 2005). Most of today's psychologists therefore view sexual orientation as neither willfully chosen nor willfully changed. Sexual orientation in some ways is like handedness: Most people are one way, some the other. A very few are truly ambidextrous. Regardless, the way one is endures.

"Efforts to change sexual orientation are unlikely to be successful and involve some risk of harm."

—American Psychological Association, 2009

This conclusion is most strongly established for men. Compared with men's sexual orientation, women's tends to be less strongly felt and potentially more fluid and changing (Chivers, 2005; Diamond, 2007; Peplau & Garnets, 2000). Men's lesser sexual variability is apparent in many ways, notes Roy Baumeister (2000). Across time, across cultures, across situations, and across differing levels of education, religious observance, and peer influence, adult women's sexual drive and interests are more flexible and varying than are adult men's. Women, more than men, for example, prefer to alternate periods of high sexual activity with periods of almost none, and they are somewhat more likely than men to feel and act on bisexual attractions (Mosher et al., 2005).

In men, a high sex drive is associated with increased attraction to women (if heterosexual) or men (if homosexual). In women, a high sex drive is associated with increased attraction to both men and women (Lippa, 2006, 2007). When shown pictures of heterosexual couples, in either erotic or nonerotic contexts, heterosexual men look mostly at the woman; heterosexual women look more equally at both the man and the woman (Lykins et al., 2008). And when shown sexually explicit film clips, men's genital and subjective sexual arousal is mostly to preferred sexual stimuli (for heterosexual viewers, depictions of women). Women respond more nonspecifically to depictions of sexual activity involving males or females (Chivers et al., 2007). Baumeister calls this phenomenon the gender difference in *erotic plasticity*.

Gays and lesbians suffer elevated rates of depression and risk of suicide attempts, which researchers suspect result from their experiences with bullying, harassment, and discrimination (Sandfort et al., 2001; Warner et al., 2004). Most people, whether straight or gay, accept their orientation—by electing celibacy, by engaging in promiscuous sex (a choice more commonly made by gay men than by lesbian women), or by entering into a committed, long-term love relationship (a choice more often made by lesbians than by gays) (Kulkin et al., 2000; Peplau, 1982; Remafedi, 1999; Weinberg & Williams, 1974). Mental health professionals are now more accepting of clients' sexual orientation. The American Psychiatric Association dropped homosexuality from its list of "mental illnesses" in 1973, as did the World Health Organization in 1993, and Japan's and China's psychiatric associations in 1995 and 2001.

Personal values affect sexual orientation less than they affect other forms of sexual behavior. Compared with people who rarely attend religious services, for example, those who attend regularly are one-third as likely to have cohabited before marriage, and they report having had many fewer sex partners. But (if male) they are just as likely to be homosexual (Smith, 1998).

Origins of Sexual Orientation

If our sexual orientation is indeed something we do not choose and seemingly cannot change (most clearly so for males), then where do these preferences—heterosexual or homosexual—come from? See if you can anticipate the consensus that has emerged from hundreds of research studies by responding *yes* or *no* to the following questions:

1. Is homosexuality linked with problems in a child's relationships with parents, such as with a domineering mother and an ineffectual father, or a possessive mother and a hostile father?
2. Does homosexuality involve a fear or hatred of people of the other gender, leading individuals to direct their sexual desires toward members of their own sex?

Note that the scientific question is not "What causes homosexuality?" (or "What causes heterosexuality?") but "What causes differing sexual orientations?" In pursuit of answers, psychological science compares the backgrounds and physiology of people whose sexual orientations differ.

3. Is sexual orientation linked with levels of sex hormones currently in the blood?
4. As children, were many homosexuals molested, seduced, or otherwise sexually victimized by an adult homosexual?

The answer to all these questions appears to be *no* (Storms, 1983). In interviews with nearly 1000 homosexuals and 500 heterosexuals, Kinsey Institute investigators assessed nearly every imaginable psychological cause of homosexuality—parental relationships, childhood sexual experiences, peer relationships, dating experiences (Bell et al., 1981; Hammersmith, 1982). Their findings: Homosexuals are no more likely than heterosexuals to have been smothered by maternal love, neglected by their father, or sexually abused. And consider this: If "distant fathers" were more likely to produce homosexual sons, then shouldn't boys growing up in father-absent homes more often be gay? (They are not.) And shouldn't the rising number of such homes have led to a noticeable increase in the gay population? (It has not.)

Homosexual people do, however, appear more often in certain populations. One study (Ludwig, 1995) of the biographies of 1004 eminent people found homosexual and bisexual people overrepresented, especially among poets (24 percent), fiction writers (21 percent), and artists and musicians (15 percent). Gay more than straight men also express interest in occupations that attract many women, such as decorator, florist, and flight attendant (Lippa, 2002). (Given that some 96 percent of men are not gay, most men in such occupations may nevertheless be straight.)

Men who have older brothers are also somewhat more likely to be gay, report Ray Blanchard (1997, 2008) and Anthony Bogaert (2003)—about one-third more likely for each additional older brother. If the odds of homosexuality are roughly 2 percent among first sons, they would rise to nearly 3 percent among second sons, 4 percent for third sons, and so on for each additional older brother (see **FIGURE 26.2**). The reason for this curious phenomenon—the *fraternal birth-order effect*—is unclear. Blanchard suspects a defensive maternal immune response to foreign substances produced by male fetuses. With each pregnancy with a male fetus, the maternal antibodies may become stronger and may prevent the fetus' brain from developing in a male-typical pattern. Consistent with this biological explanation, the fraternal birth-order effect occurs only in men with older brothers born to the same mother (whether reared together or not). Sexual orientation is unaffected by adoptive brothers (Bogaert, 2006). The birth-order effect on sexual orientation is not found among women with older sisters, women who were womb-mates of twin brothers, and men who are not right-handed (Rose et al., 2002).

So, what else might influence sexual orientation? One theory has proposed that people develop same-sex erotic attachments if segregated by gender at the time their sex drive matures (Storms, 1981). Indeed, gay men tend to recall going through puberty somewhat earlier, when peers are more likely to be all males (Bogaert et al., 2002). But even in tribal cultures in which homosexual behavior is expected of all boys before marriage, heterosexuality prevails (Hammack, 2005; Money, 1987). (As this illustrates, homosexual *behavior* does not always indicate a homosexual *orientation*.)

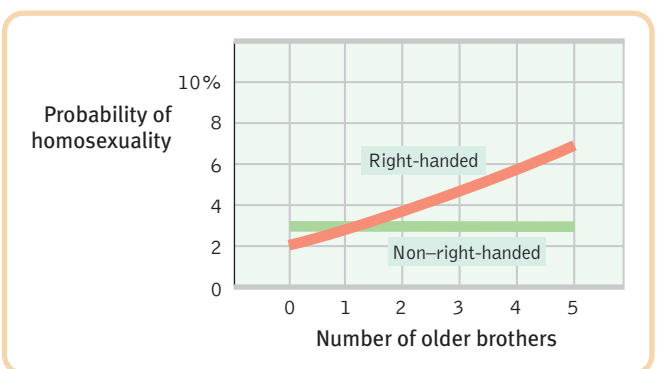


FIGURE 26.2 The fraternal birth-order effect Researcher Ray Blanchard (2008) offers these approximate curves depicting a man's likelihood of homosexuality as a function of his number of older brothers. This correlation has been found in several studies, but only among right-handed men.

The bottom line from a half-century's theory and research: If there are environmental factors that influence sexual orientation, we do not yet know what they are. This reality has motivated researchers to consider more carefully the possible biological influences on orientation, including evidence of homosexuality in the animal world, and the influences of differing brain centers, genetics, and prenatal hormone exposure.

Same-Sex Attraction in Animals

Biologist Bruce Bagemihl (1999) has identified several hundred species in which at least occasional same-sex relations have been observed. Grizzlies, gorillas, monkeys, flamingos, and owls are all on the long list. Among rams, for example, some 6 to 10 percent—to sheep-breeding ranchers, the "duds"—display same-sex attraction by shunning ewes and seeking to mount other males (Perkins & Fitzgerald, 1997). Some degree of homosexuality seems to be a natural part of the animal world.

The Brain and Sexual Orientation

Researcher Simon LeVay (1991) studied sections of the hypothalamus taken from deceased heterosexual and homosexual people. As a gay scientist, LeVay wanted to do "something connected with my gay identity." To avoid biasing the results, he did a *blind study,* not knowing which donors were gay. For nine months he peered through his microscope at a cell cluster he thought might be important. Then, one morning, he broke the codes: One cell cluster was reliably larger in heterosexual men than in women and homosexual men. "I was almost in a state of shock," LeVay said (1994). "I took a walk by myself on the cliffs over the ocean. I sat for half an hour just thinking what this might mean."

"Gay men simply don't have the brain cells to be attracted to women."
—Simon LeVay, *The Sexual Brain,* 1993

It should not surprise us that brains differ with sexual orientation. Remember our maxim: *Everything psychological is simultaneously biological.* But when do such brain differences begin? At conception? In the womb? During childhood or adolescence? Does experience produce these differences? Or is it genes or prenatal hormones (or genes via prenatal hormones)?

LeVay does not view the hypothalamic center as a sexual orientation center; rather, he sees it as an important part of the neural pathway engaged in sexual behavior. He acknowledges that sexual behavior patterns may influence the brain's anatomy. In fish, birds, rats, and humans, brain structures vary with experience—including sexual experience (Breedlove, 1997). But LeVay believes it more likely that brain anatomy influences sexual orientation. His hunch seems confirmed by the discovery of a similar hypothalamic difference between male sheep that display same-sex attraction and those attracted to females (Larkin et al., 2002; Roselli et al., 2002, 2004). Moreover, report University of London psychologists Qazi Rahman and Glenn Wilson (2003), "the neuroanatomical correlates of male homosexuality differentiate very early postnatally, if not prenatally."

Gay and lesbian humans also differ from their straight counterparts in brain responses to sex-related sweat odors and to pictures of male and female faces (Kranz & Ishai, 2006; Martins et al., 2005; Savic et al., 2005).

© *The Boston Globe*/John Tlumacki

Juliet and Juliet Boston's beloved swan couple, "Romeo and Juliet," were discovered actually to be, as are many other animal partners, a same-sex pair.

Genes and Sexual Orientation

Are these sexuality-related brain differences genetically influenced? Some evidence suggests they are. "First, homosexuality does appear to run in families," note Brian Mustanski and Michael Bailey (2003). "Second, twin studies have established that genes play a substantial role in explaining individual differences in sexual orientation." Identical twins are somewhat more likely than fraternal twins to share a homosexual orientation (Långström et al., 2008). (Because sexual orientations differ in many identical twin pairs, especially female twins, we know that other factors besides genes are at work.)

Experimenters have also, by genetic manipulations, created female fruit flies that during courtship act like males (pursuing other females) and males that act like females (Demir & Dickson, 2005). "We have shown that a single gene in the fruit fly is sufficient to determine all aspects of the flies' sexual orientation and behavior," explained Barry Dickson (2005). With humans, it's likely that multiple genes, possibly in interaction with other influences, shape sexual orientation. One study financed by the U.S. National Institutes of Health is analyzing the genes of more than 1000 gay brothers in search of such genetic markers.

Researchers have speculated about possible reasons why "gay genes" might exist. Given that same-sex couples cannot naturally reproduce, how could such genes have survived in the human gene pool? Evolutionary psychologists suggest two possible answers. The first is kin selection. Because many of our genes also reside in our biological relatives, gay people's genes could live on through their supporting the survival and reproductive success of relatives—nieces, nephews, and others—who carry many of those same genes.

Or second, and perhaps more likely, maternal genetics is at work (Bocklandt et al., 2006). Recent Italian studies (Camperio-Ciani et al., 2004, 2008) confirm what others have found—that homosexual men have more homosexual relatives on their mother's side than on their father's. And, compared with the maternal relatives of heterosexual men, the maternal relatives of homosexual men produce more offspring. Perhaps, surmise the researchers, the genes that make women more likely to have children (such as by strongly attracting them to men) also produce sons and nephews who are attracted to men.

"Studies indicate that male homosexuality is more likely to be transmitted from the mother's side of the family."

—Robert Plomin, John DeFries, Gerald McClearn, and Michael Rutter, *Behavioral Genetics,* 1997

Prenatal Hormones and Sexual Orientation

Elevated rates of homosexual orientation in identical *and* fraternal twins suggest that not just shared genetics but also a shared prenatal environment may be a factor. In animals and some exceptional human cases, abnormal prenatal hormone conditions have altered a fetus' sexual orientation. German researcher Gunter Dorner (1976, 1988) pioneered research on the influence of prenatal hormones by manipulating a fetal rat's exposure to male hormones, thereby "inverting" its sexual orientation. In other studies, when pregnant sheep were injected with testosterone during a critical period of fetal development, their female offspring later showed homosexual behavior (Money, 1987).

A critical period for the human brain's neural-hormonal control system may exist between the middle of the second and fifth months after conception (Ellis & Ames, 1987; Gladue, 1990; Meyer-Bahlburg, 1995). Exposure to the hormone levels typically experienced by female fetuses during this time appears to predispose the person (whether female or male) to be attracted to males in later life.

On several traits influenced by prenatal hormones, gays and lesbians appear to fall midway between straight females and males (**TABLE 26.1** on the next page). For example, lesbians' cochlea and hearing systems develop in a way that is intermediate between those of heterosexual females and heterosexual males (McFadden, 2002). Fingerprint ridges, which are complete by the sixteenth fetal week, may also differ. Although most people have more fingerprint ridges on their right hand than on their left, some studies find a greater right-left difference in heterosexual males than in females and gay males (Hall & Kimura, 1994; Mustanski et al., 2002; Sanders et al., 2002).

"Modern scientific research indicates that sexual orientation is . . . partly determined by genetics, but more specifically by hormonal activity in the womb."

—Glenn Wilson and Qazi Rahman, *Born Gay: The Psychobiology of Sex Orientation,* 2005

TABLE 26.1 Biological Correlates of Sexual Orientation

On average (the evidence is strongest for males), various biological and behavioral traits of gays and lesbians fall between those of straight men and straight women. Tentative findings—some in need of replication—include these:

Brain differences

- Brain asymmetry is greater in straight men and lesbian women.
- One hypothalamic cell cluster is larger in straight men than in women and gay men; same difference is found in male sheep displaying other-sex versus same-sex attraction.
- Gay men's hypothalamus reacts as does a straight woman's to the smell of sex-related hormones and pictures of male and female faces.

Genetic influences

- Shared sexual orientation is higher among identical twins than among fraternal twins.
- Sexual attraction in fruit flies can be genetically manipulated.

Prenatal hormonal influences

- Altered prenatal hormone exposure may lead to homosexuality in humans and other animals.
- Right-handed men with several older biological brothers are more likely to be gay.

These brain differences and genetic and prenatal influences may contribute to observed gay-straight differences in

- spatial abilities.
- fingerprint ridge counts.
- auditory system development.
- occupational preferences.
- relative finger lengths.
- male eating disorders.
- gender nonconformity.
- age of onset of puberty in males.
- male body size.
- sleep length.
- physical aggression.

Handedness also differs. Data from 20 studies reveals that "homosexual participants had 39 percent greater odds of being non–right-handed" (Lalumière et al., 2000).

Another you-never-would-have-guessed-it gay-straight difference appears in studies showing that gay men's spatial abilities resemble those typical of straight women (Cohen, 2002; Gladue, 1994; McCormick & Witelson, 1991; Sanders & Wright, 1997). On mental rotation tasks such as the one illustrated in **FIGURE 26.3**, straight men tend to outscore women. Studies by Qazi Rahman and colleagues (2003, 2008) find that, as on a number of other measures, the scores of gays and lesbians fall between those of heterosexual males and females. But straight women and gays both outperform straight men at remembering objects' spatial locations in tasks like those found in memory games (Hassan & Rahman, 2007).

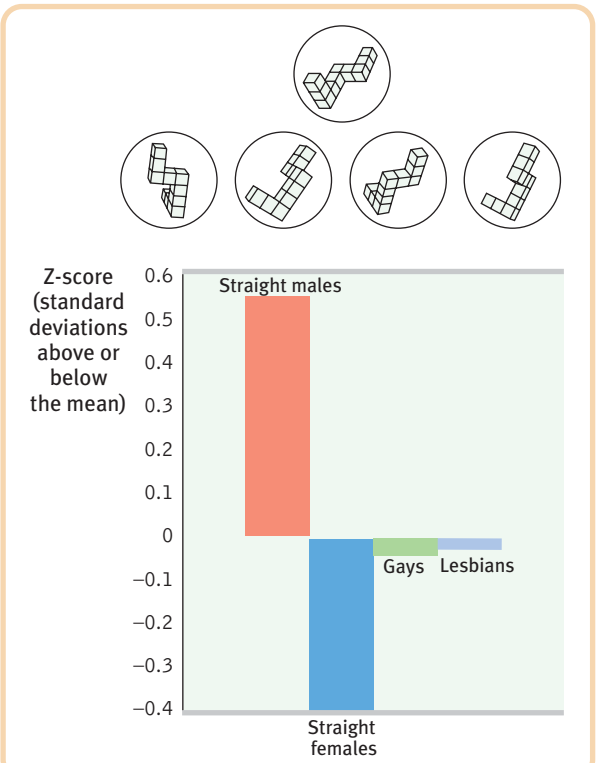


FIGURE 26.3 Spatial abilities and sexual orientation Which of the four figures can be rotated to match the target figure at the top? (Answer: The first and fourth.) Straight males tend to find this an easier task than do straight females, with gays and lesbians intermediate. (From Rahman et al., 2003, with 60 people tested in each group.)

Because the physiological evidence is preliminary and controversial, some scientists remain skeptical. Rather than specifying sexual orientation, they suggest, biological factors may predispose a *temperament* that influences sexuality "in the context of individual learning and experience" (Byne & Parsons, 1993). Daryl Bem (1996, 1998, 2000) has theorized that genes code for prenatal hormones and brain anatomy, which predispose temperaments that lead children to prefer gender-typical or gender-atypical activities and friends. These preferences may later lead children to feel attracted to whichever sex feels

different from their own. The dissimilar-seeming sex (whether or not it conforms to one's own anatomy) becomes associated with anxiety and other forms of arousal, which are eventually transformed into romantic arousal. The exotic becomes erotic.

Regardless of the process, the consistency of the brain, genetic, and prenatal findings has swung the pendulum toward a biological explanation of sexual orientation (Rahman & Wilson, 2003). This helps explain why sexual orientation is so difficult to change, and why a BBC Internet study of more than 200,000 people found the same gay-straight differences in personality and interests worldwide (Lippa, 2007a,b, 2008). Still, some people wonder: Should the cause of sexual orientation matter? Perhaps it shouldn't, but people's assumptions matter. Those who believe—as do 41 percent of Americans and most gays and lesbians—that sexual orientation is biologically disposed also tend to express more accepting attitudes toward homosexual people (Allen et al., 1996; Gallup polls; Haslam & Levy, 2006; Kaiser, 2001; Whitley, 1990).

To gay and lesbian activists, the new biological research is a double-edged sword (Diamond, 1993). If sexual orientation, like skin color and sex, is genetically influenced, that offers a further rationale for civil rights protection. Moreover, it may alleviate parents' concerns about their children being unduly influenced by gay teachers and role models. At the same time, this research raises the troubling possibility that genetic markers of sexual orientation could someday be identified through fetal testing, and a fetus could be aborted simply for being predisposed to an unwanted orientation.

Sex and Human Values

26-6: Is scientific research on sexual motivation value free?

Recognizing that values are both personal and cultural, most sex researchers and educators strive to keep their writings on sexual behavior and its motivation value free. But the very words we use to describe behavior can reflect our personal values. Whether we label certain sexual behaviors as "perversions" or as part of an "alternative sexual life-style" depends on our attitude toward the behaviors. Labels describe, but they also evaluate.

Sex education separated from the context of human values may also give some students the idea that sexual intercourse is simply a recreational activity. Child-rearing expert Diana Baumrind (1982) has observed that an implication that adults are neutral about adolescent sexual activity is unfortunate, because "promiscuous recreational sex poses certain psychological, social, health, and moral problems that must be faced realistically."

Perhaps we can agree that the knowledge provided by sex research is preferable to ignorance, and yet also agree that researchers' values should be stated openly, enabling us to debate them and to reflect on our own values. We should remember that scientific research on sexual motivation does not aim to define the personal meaning of sex in our own lives. You could know every available fact about sex—that the initial spasms of male and female orgasm come at 0.8-second intervals, that the female nipples expand 10 millimeters at the peak of sexual arousal, that systolic blood pressure rises some 60 points and the respiration rate to 40 breaths per minute—but fail to understand the human significance of sexual intimacy.

Surely one significance of sexual intimacy is its expression of our profoundly social nature. Sex is a socially significant act. Men and women can achieve orgasm alone, yet most people find greater satisfaction—and experience a much greater surge in the prolactin hormone associated with sexual satisfaction and satiety—after intercourse and orgasm with their loved one (Brody & Tillmann, 2005). With the satisfaction of intimacy and relationship surpassing the satisfaction of self-stimulation, there is a yearning for closeness in sexual motivation. Sex at its human best is life-uniting and love-renewing.

Andreanna Seymore/Getty Images

A sharing of love For most adults, a sexual relationship fulfills not only a biological motive but also a social need for intimacy.

The Need to Belong

26-7: What evidence points to our human need to belong?

Separated from friends or family—isolated in prison, alone at a new school, living in a foreign land—most people feel keenly their lost connections with important others. We are what Aristotle called the *social animal.* "Without friends," wrote Aristotle in his *Nichomachean Ethics,* "no one would choose to live, though he had all other goods." We have a need to affiliate with others, even to become strongly attached to certain others in enduring, close relationships. Human beings, contended the personality theorist Alfred Adler, have an "urge to community" (Ferguson, 1989, 2001). Roy Baumeister and Mark Leary (1995) have assembled evidence for this deep need to belong.

Aiding Survival

Social bonds boosted our ancestors' survival rate. By keeping children close to their caregivers, attachments served as a powerful survival impulse. As adults, those who formed attachments were more likely to reproduce and to co-nurture their offspring to maturity. To be "wretched" literally means, in its Middle English origin *(wrecche),* to be without kin nearby.

"We must love one another or die."
—W. H. Auden, "September 1, 1939"

Survival also was enhanced by cooperation. In solo combat, our ancestors were not the toughest predators. But as hunters, they learned that six hands were better than two. As foragers, they gained protection from predators and enemies by traveling in groups. Those who felt a need to belong survived and reproduced most successfully, and their genes now predominate. We are innately social creatures. People in every society on Earth belong to groups and prefer and favor "us" over "them."

Wanting to Belong

The need to belong colors our thoughts and emotions. We spend a great deal of time thinking about actual and hoped-for relationships. When relationships form, we often feel joy. Falling in mutual love, people have been known to feel their cheeks ache from their irrepressible grins. Asked, "What is necessary for your happiness?" or "What is it that makes your life meaningful?" most people mention—before anything else—close, satisfying relationships with family, friends, or romantic partners (Berscheid, 1985). Happiness hits close to home.

"The only thing that really matters in life are your relationships to other people."
—George Vaillant, 2009, when asked what he had learned from his study following 238 Harvard University men from the 1930s to the end of their lives.

Pause a moment to consider: What was your most satisfying moment in the past week? Kennon Sheldon and his colleagues (2001) asked that question of American and South Korean collegians, then asked them to rate how much this peak experience had satisfied various needs. In both countries, the satisfaction of self-esteem and relatedness-belonging needs were the top two contributors to the peak moment. Another study found that *very* happy university students are not distinguished by their money but by their "rich and satisfying close relationships" (Diener & Seligman, 2002). The need to belong runs deeper, it seems, than any need to be rich. When our need for relatedness is satisfied in balance with two other basic psychological needs—*autonomy* and *competence*—the result is a deep sense of well-being (Deci & Ryan, 2002; Patrick et al., 2007; Sheldon & Niemiec, 2006). To feel connected, free, and capable is to enjoy a good life.

South Africans have a word for the human bonds that define us all. *Ubuntu* (oo-BOON-too), explained Desmond Tutu (1999), expresses the fact that "my humanity is caught up, is inextricably bound up, in yours." A Zulu maxim captures the idea: *Umuntu ngumuntu ngabantu*—"a person is a person through other persons."

When we feel included, accepted, and loved by those important to us, our self-esteem rides high. Indeed, say Mark Leary and his colleagues (1998), self-esteem is a gauge of how valued and accepted we feel. Much of our social behavior therefore aims to increase our belonging—our social acceptance and inclusion. To avoid rejection, we

generally conform to group standards and seek to make favorable impressions. To win friendship and esteem, we monitor our behavior, hoping to create the right impressions. Seeking love and belonging, we spend billions on clothes, cosmetics, and diet and fitness aids—all motivated by our quest for acceptance.

Like sexual motivation, which feeds both love and exploitation, the need to belong feeds both deep attachments and menacing threats. Out of our need to define a "we" come loving families, faithful friendships, and team spirit, but also teen gangs, ethnic rivalries, and fanatic nationalism.

Sustaining Relationships

For most of us, familiarity breeds liking, not contempt. Thrown together in groups at school, at summer camp, on a vacation cruise, we later resist breaking those social bonds—we promise to call, to write, to come back for reunions. Parting, we feel distress. You don't need to look far to see people spending hours on smart phones and computers, sustaining their relationships with absent people by talking, text messaging, and e-mailing. Two-thirds of entering American collegians report spending one to five or more hours per week on social networking sites such as Facebook and MySpace (Pryor et al., 2007).

When the fear of being alone seems worse than the pain of emotional or physical abuse, attachments can keep people in abusive relationships. Even when bad relationships break, people suffer. After separations, feelings of loneliness and anger—and sometimes even a strange desire to be near the former partner—linger. In one 16-nation survey, and repeated in U.S. surveys, separated and divorced people have been half as likely as married people to say they were "very happy" (Inglehart, 1990; NORC, 2007).

Our fear of being alone has some basis in reality. Children who move through a series of foster homes, with repeated disruption of budding attachments, may come to have difficulty forming deep attachments. And children reared in institutions without a sense of belonging to anyone, or locked away at home under extreme neglect, become pathetic creatures—withdrawn, frightened, speechless.

When something threatens or dissolves our social ties, negative emotions—anxiety, loneliness, jealousy, guilt—overwhelm us. The bereaved often feel life is empty, pointless. Even the first weeks living on a college campus away from home can be distressing. For immigrants and refugees moving alone to new places, the stress and loneliness can be depressing. But if feelings of acceptance and connection build, so do self-esteem, positive feelings, and desires to help rather than hurt others (Buckley & Leary, 2001). After years of placing individual refugee and immigrant families in isolated communities, U.S. policies today encourage *chain migration* (Pipher, 2002). The second refugee Sudanese family settling in a town generally has an easier adjustment than the first.

20TH Century Fox/Dreamworks/The Kobal Collection

Separation amplifies the felt need to belong In the film *Cast Away,* Chuck Noland (played by Tom Hanks) combats social starvation by talking with his girlfriend's snapshot and a volleyball he has named Wilson.

AP/Wide World Photos

The need to connect Six days a week, women from the Philippines work as "domestic helpers" in 154,000 Hong Kong households. On Sundays, they throng to the central business district to picnic, dance, sing, talk, and laugh. "Humanity could stage no greater display of happiness," reported one observer (*Economist,* 2001).

AP/Wide World Photos

A violent response to social exclusion
Most socially excluded teens do not commit violence, but some do. Charles "Andy" Williams, described by a classmate as someone his peers derided as "freak, dork, nerd, stuff like that," went on a shooting spree at his suburban California high school, killing 2 and wounding 13 (Bowles & Kasindorf, 2001).

The Pain of Ostracism

Sometimes, though, the need to belong is denied. Perhaps you can recall such a time, when you felt excluded or ignored or shunned. Perhaps you received the silent treatment. Perhaps others avoided you, or averted their eyes in your presence, or even mocked you behind your back.

Social psychologist Kipling Williams (2007) and his colleagues have studied such experiences of *ostracism*—of social exclusion—in both natural and laboratory settings. Worldwide, humans control social behavior via the punishing effects of severe ostracism—of exile, imprisonment, and solitary confinement. For children, even a brief time-out in isolation can be punishing. Asked to describe personal episodes that made them feel especially good about themselves, people often think of some achievement. But asked what made them feel especially *bad* about themselves, they will—about four times in five—describe a relationship difficulty (Pillemer et al., 2007).

To be shunned—given the cold shoulder or the silent treatment, with others' eyes avoiding yours—is to have one's need to belong threatened (Williams & Zadro, 2001). "It's the meanest thing you can do to someone, especially if you know they can't fight back. I never should have been born," said Lea, a lifelong victim of the silent treatment by her mother and grandmother. Like Lea, people often respond to ostracism with depressed moods, initial efforts to restore their acceptance, and then withdrawal. After two years of silent treatment by his employer, Richard reported, "I came home every night and cried. I lost 25 pounds, had no self-esteem, and felt that I wasn't worthy."

Rejected and unable to remedy the situation, people may seek new friends—or they may turn nasty. In a series of experiments, Jean Twenge and her collaborators (2001, 2002, 2007; Baumeister et al., 2002; Maner et al., 2007) told some students (who had taken a personality test) that they were "the type likely to end up alone later in life," or that people they had met didn't want them in a group that was forming. They told other students that they would have "rewarding relationships throughout life," or that "everyone chose you as someone they'd like to work with." Those excluded became much more likely to engage in self-defeating behaviors and to underperform on aptitude tests. The rejection also interfered with their empathy for others and made them more likely to act in disparaging or aggressive ways against those who had excluded them (blasting them with noise, for example). "If intelligent, well-adjusted, successful university students can turn aggressive in response to a small laboratory experience of social exclusion," noted the research team, "it is disturbing to imagine the aggressive tendencies that might arise from a series of important rejections or chronic exclusion from desired groups in actual social life." Indeed, reports Williams (2007), ostracism "weaves through case after case of school violence."

Note: The researchers later debriefed and reassured the participants.

Sexual Motivation

Module Review

26-1: What stages mark the human sexual response cycle? Masters and Johnson described four stages in the human *sexual response cycle:* excitement, plateau, orgasm (which seems to involve similar feelings and brain activity in males and females), and resolution. In the resolution phase, males experience a *refractory period,* during which renewed arousal and orgasm are impossible. *Sexual disorders* (problems that consistently impair sexual arousal or functioning) can be successfully treated, often by behaviorally oriented therapy or drug therapy.

26-2: Do hormones influence human sexual motivation? Sex hormones direct sexual development and activate sexual behavior. The female *estrogen* and male *testosterone* hormones influence sexual behavior less directly in humans than in other animals. Unlike other mammalian females, women's sexuality is more responsive to testosterone level than to estrogen level. Short-term shifts in testosterone level are normal in men and have little effect on sexual drive.

26-3: How do internal and external stimuli influence sexual motivation? Erotic material and other external stimuli can trigger sexual arousal in both men and women. Sexually explicit material may lead people to perceive their partners as comparatively less appealing and to devalue their relationships. Sexually coercive material tends to increase viewers' acceptance of rape and violence toward women. Fantasies (imagined stimuli) also influence sexual arousal.

26-4: What factors influence teen pregnancy and risk of sexually transmitted infections? Factors contributing to teen pregnancy include ignorance; minimal communication about contraception with parents, partners, and peers; guilt related to sexual activity; alcohol use; and mass media norms of unprotected and impulsive sexuality. Attempts to protect teens from STIs—sexually transmitted infections—through comprehensive sex-education programs include contraceptive and abstinence education. High intelligence, religiosity, father presence, and participation in service learning programs are predictors of teen sexual restraint.

26-5: What has research taught us about sexual orientation? Surveys can tell us how many people (about 3 percent) are attracted to their own sex, but statistics cannot decide issues of human rights. There is no evidence that environmental influences determine *sexual orientation.* Evidence of biological influences comes from same-sex behaviors in many animal species, straight-gay differences in body and brain characteristics, higher rates of homosexuality in certain families, shared orientation in some identical twins, and the effects of prenatal exposure to certain hormones during critical periods of development.

26-6: Is scientific research on sexual motivation value free? Scientific research on sexual motivation does not attempt to define the personal meaning of sex in our lives, but sex research and education are not value free.

26-7: What evidence points to our human need to belong? The need to affiliate or belong had survival value for our ancestors. Humans in every society live in groups, and societies everywhere control behavior with the threat of ostracism—excluding or shunning others. When socially excluded, people may engage in self-defeating behaviors (performing below their ability) or in antisocial behaviors.

Rehearse It!

1. In describing the sexual response cycle, Masters and Johnson noted that
   a. a plateau phase followed orgasm.
   b. men experience a refractory period during which they cannot experience orgasm.
   c. the feeling that accompanies orgasm is stronger in men than in women.
   d. testosterone is released in the female as well as in the male.

2. One striking effect of hormonal changes on human sexual behavior is the
   a. arousing influence of erotic materials.
   b. sharp rise in sexual interest at puberty.
   c. decrease in women's sexual desire at the time of ovulation.
   d. increase in testosterone levels in castrated males.

3. Sexual behavior is motivated by internal biological factors, by external stimuli, and by imagined stimuli. An example of an external stimulus that might influence sexual behavior is
   a. blood level of testosterone.
   b. the onset of puberty.
   c. a sexually explicit film.
   d. an erotic fantasy or dream.

4. Factors contributing to teen pregnancies include ignorance about reproduction and contraception, guilt about sexual behavior, mass media norms of promiscuity, insufficient communication about contraception, and
   a. the "just say no" attitude.
   b. the unavailability of abortion.
   c. the decreased rates of sexually transmitted diseases.
   d. alcohol use.

5. Current research suggests several possible contributors to sexual orientation. Which of the following is NOT one of those contributors?
   a. Certain cell clusters in the hypothalamus
   b. A domineering mother and ineffectual father
   c. Multiple genes interacting with other influences
   d. Exposure to hormone levels typically experienced by female fetuses

6. Which of the following is NOT part of the evidence presented to support the view that humans are strongly motivated by a need to belong?
   a. Students who rated themselves as "very happy" also tended to have satisfying close relationships.

b. Social exclusion—such as exile or solitary confinement—is considered a severe form of punishment.

c. As adults, adopted children tend to resemble their biological parents and to yearn for an affiliation with them.

d. Children who are extremely neglected become withdrawn, frightened, and speechless.

Answers: 1. b, 2. b, 3. c, 4. d, 5. b, 6. c.

Terms and Concepts to Remember

sexual response cycle, p. 373
refractory period, p. 374
sexual disorder, p. 374
estrogens, p. 374
testosterone, p. 374
sexual orientation, p. 379

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Everything psychological is simultaneously biological. How is this true of sexual orientation?
2. To what extent might social networking Web sites like Facebook satisfy or thwart our need to belong?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Emotions, Stress, and Health

Emotions, Stress, and Health

No one needs to tell you that feelings add color to your life, or that in times of stress they can disrupt your life or save it. Of all the species, we seem the most emotional (Hebb, 1980). More often than any other creature, we express fear, anger, sadness, joy, and love, and these psychological states often entail physical reactions. Nervous about an important encounter, we feel butterflies in our stomach. Anxious over speaking in public, we frequent the bathroom. Smoldering over a conflict with a family member, we get a splitting headache.

You can surely recall a time when you were overcome with emotion. I retain a flashbulb memory for the day I went to a huge store to drop off film and brought along Peter, my toddler first-born child. As I set Peter down on his feet and prepared to complete the paperwork, a passerby warned, "You'd better be careful or you'll lose that boy!" Not more than a few breaths later, after dropping the film in the slot, I turned and found no Peter beside me.

With mild anxiety, I peered around one end of the counter. No Peter in sight. With slightly more anxiety, I peered around the other end. No Peter there, either. Now, heart accelerating, I circled the neighboring counters. Still no Peter anywhere. As anxiety turned to panic, I began racing up and down the store aisles. He was nowhere to be found. Apprised of my alarm, the store manager used the public-address system to ask customers to assist in looking for a missing child. Soon after, I passed the customer who had warned me. "I told you that you were going to lose him!" he scorned. With visions of kidnapping (strangers routinely adored that beautiful child), I braced for the possibility that my negligence had caused me to lose what I loved above all else, and that I might have to return home and face my wife without our only child.

But then, as I passed the customer service counter yet again, there he was, having been found and returned by some obliging customer! In an instant, the arousal of terror spilled into ecstasy. Clutching my son, with tears suddenly flowing, I found myself unable to speak my thanks and stumbled out of the store awash in grateful joy.

Where do such emotions come from? Why do we have them? What are they made of? Emotions are our body's adaptive response. They exist not to give us interesting experiences but to enhance our survival. When we face challenges, emotions focus our attention and energize our action. Our heart races. Our pace quickens. All our senses go on high alert. Receiving unexpected good news, we may find our eyes tearing. We raise our hands triumphantly. We feel exuberance and a newfound confidence. Yet, when prolonged and experienced as stress, emotions can also have a damaging effect on our health.

So, how do psychologists think about and study emotions, stress, and health? In Module 27, we examine three classic theories of emotion that explore the interplay of physiological activation, expressive behavior, and conscious experience. Module 28 then turns to the topics of how we express and experience our emotions, with an in-depth look at anger and happiness. Module 29 looks at two key questions health psychologists ask: How do our emotions and personality influence our risk of disease, and what attitudes and behaviors may help prevent illness and promote health and well-being?

MODULE 27

Theories and Physiology of Emotions

Theories of Emotion

27-1: What are the components of an emotion?

Not only emotion, but most psychological phenomena (vision, sleep, memory, sex, and so forth) can be approached these three ways—physiologically, behaviorally, and cognitively.

As my anguished search for Peter illustrates, **emotions** are a mix of (1) physiological arousal (heart pounding), (2) expressive behaviors (quickened pace), and (3) consciously experienced thoughts *(Is this a kidnapping?)* and feelings (a sense of fear, and later joy). The puzzle for psychologists has been figuring out how these three pieces fit together.

There are two controversies over the interplay of physiology, expressions, and thoughts in emotions:

- Does our physiological arousal precede or follow our emotional experience? (Did I first notice my heart racing and my faster step, and then feel anxious dread about losing Peter? Or did my sense of fear come first, stirring my heart and legs to respond?)
- Does cognition always precede emotion? Or can we experience emotion apart from or after thinking? (Did I *think* about the kidnapping threat before reacting emotionally? Or did I react first and then interpret my reaction?)

emotion a response of the whole organism, involving (1) physiological arousal, (2) expressive behaviors, and (3) consciously experienced thoughts and feelings.

Common sense tells most of us that we cry because we are sad, lash out because we are angry, tremble because we are afraid. First comes conscious awareness, then the physiological trimmings. But to pioneering psychologist William James, this commonsense view of emotion was backward. According to James, "We feel sorry because we cry, angry because we strike, afraid because we tremble" (1890, p. 1066). James' idea, also proposed by Danish physiologist Carl Lange, is called the **James-Lange theory.** First comes a distinct physiological response, then (as we observe that response) comes our experienced emotion.

James-Lange theory the theory that our experience of emotion is our awareness of our physiological responses to emotion-arousing stimuli.

This James-Lange theory struck U.S. physiologist Walter Cannon as implausible, in part because he thought the body's responses are not distinct enough to evoke the different emotions. Does a racing heart signal fear, anger, or love? Also, changes in heart rate, perspiration, and body temperature seemed too slow to trigger sudden emotion. Cannon, and later another physiologist, Philip Bard, concluded that our physiological arousal and our emotional experience occur *simultaneously.* According to this **Cannon-Bard theory,** the emotion-triggering stimulus is routed separately but simultaneously to the brain's cortex, causing the *subjective awareness* of emotion, and to the sympathetic nervous system, causing the body's arousal. Thus, your heart begins pounding *as* you experience fear; one does not cause the other.

Cannon-Bard theory the theory that an emotion-arousing stimulus simultaneously triggers (1) physiological responses and (2) the subjective experience of emotion.

Let's check your understanding of the James-Lange and Cannon-Bard theories. Imagine that your brain could not sense your heart pounding or your stomach churning. According to each theory, how would this affect your experienced emotions?

Cannon and Bard would have expected you to experience emotions normally because they believed emotions occur separately from (though simultaneously with) the body's arousal. James and Lange would have expected greatly diminished emotions because they believed that to experience emotion you must first perceive your body's arousal.

The James-Lange theory finds support in studies of people with severed spinal cords, including a survey of 25 soldiers who suffered such injuries in World War II (Hohmann, 1966). Those with lower-spine injuries, who had lost sensation only in their legs, reported little change in the intensity of their emotions before and after their spinal injuries. Those with high spinal-cord injury, who could feel nothing below the neck, reported a difference, however. After their injury, the intensity of some reactions had decreased considerably, as James and Lange would have expected. Anger, one man confessed, "just doesn't have the heat to it that it used to.

Joy expressed According to the James-Lange theory, we don't just smile because we share our teammates' joy. We also share the joy because we are smiling with them.

AP Photo/Charlie Neibergall

two-factor theory the Schachter-Singer theory that to experience emotion one must (1) be physically aroused and (2) cognitively label the arousal.

It's a mental kind of anger." But other emotions, those expressed mostly in body areas above the neck—such as weeping while watching a touching film—were felt more intensely by the men with high spinal-cord injury.

So, with James and Lange we can say that our body's reactions are an important ingredient of emotion. Some researchers now view feelings as "mostly shadows" of our bodily responses and behaviors (Damasio, 2003).

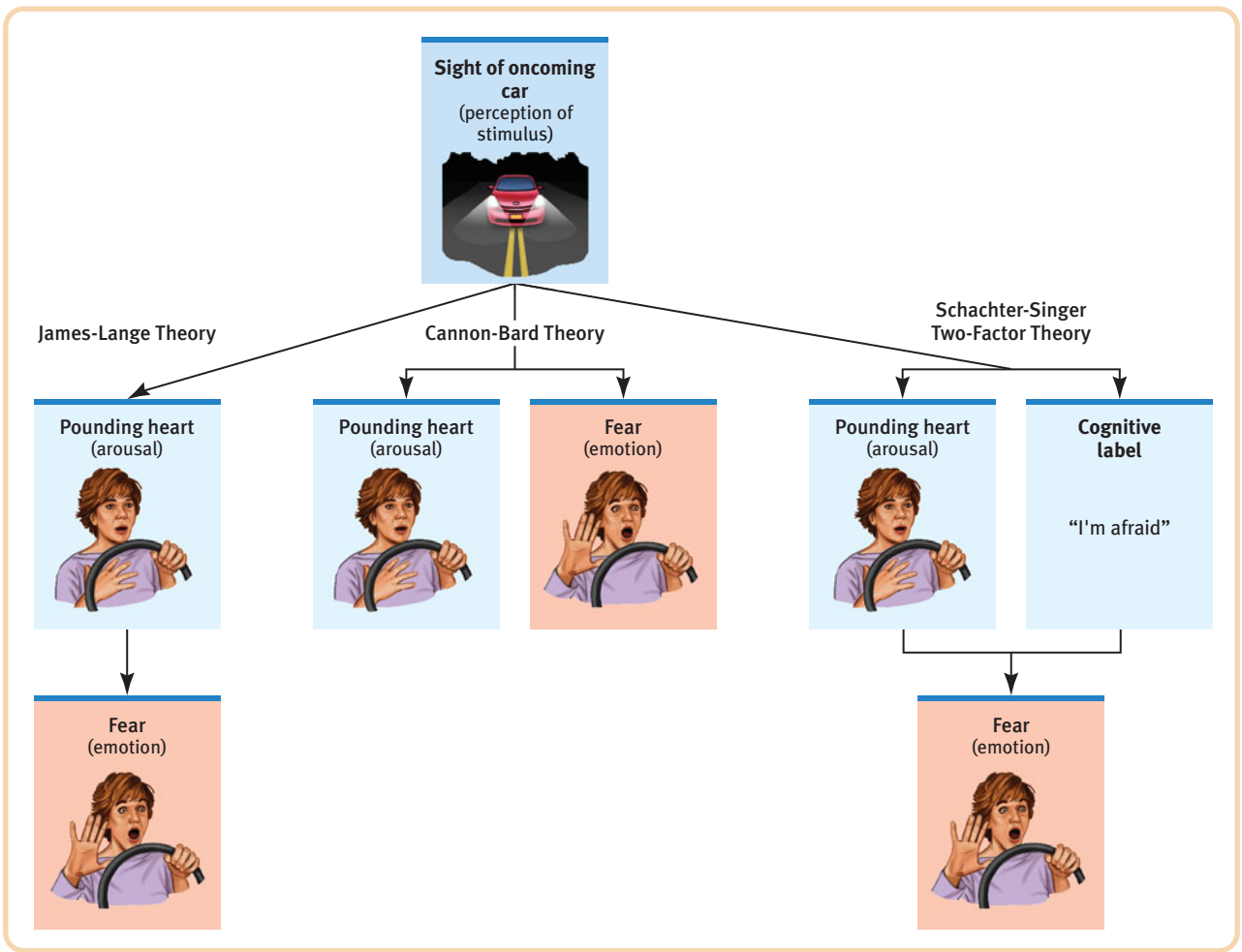
But most researchers agree with Cannon and Bard on another point: There is more to the experience of emotion than reading our body's responses. Our experienced emotions also involve cognition (Averill, 1993). Whether we fear the man behind us on the dark street depends entirely on whether we interpret his actions as threatening or friendly.

Stanley Schachter and Jerome Singer (1962) proposed a third theory: Our physiology and our cognitions—perceptions, memories, and interpretations—together create emotion. In their **two-factor theory,** emotions therefore have two ingredients: physical arousal and a cognitive label (**FIGURE 27.1**). Like James and Lange, Schachter and Singer presumed that our experience of emotion grows from our awareness of our body's arousal. Yet like Cannon and Bard, Schachter and Singer also believed that emotions are physiologically similar. Thus, in their view, an emotional experience requires a conscious interpretation of the arousal.

To assess the James-Lange, Cannon-Bard, and two-factor theories, we'll consider in the next section some answers contemporary researchers have gleaned to two questions:

- Are different emotions marked by distinct physiological responses?
- What is the connection between what we *think* and how we *feel*?

FIGURE 27.1 Theories of emotion



Embodied Emotion

Whether you are eagerly anticipating a long-awaited vacation, falling in love, or grieving a death, you need little convincing that emotions involve the body. Feeling without a body is like breathing without lungs. Some physical responses are easy to notice, others—many taking place at the level of brain neurons—happen without your awareness.

Emotions and the Autonomic Nervous System

27-2: What is the link between emotional arousal and the autonomic nervous system?

In a crisis, it is your autonomic nervous system (ANS) that mobilizes your body for action and calms it when the crisis passes (**FIGURE 27.2**). Without any conscious effort, your body's response to danger is wonderfully coordinated and adaptive—preparing you to fight or flee.

"Fear lends wings to his feet."
—Virgil, *Aeneid,* 19 B.C.E.

The *sympathetic division* of your ANS directs your adrenal glands to release the stress hormones epinephrine (adrenaline) and norepinephrine (noradrenaline). To provide energy, your liver, influenced by this hormonal surge, pours extra sugar into your bloodstream. To help burn the sugar, your respiration increases to supply needed oxygen. Your heart rate and blood pressure increase. Your digestion slows, diverting blood from your internal organs to your muscles. With blood sugar driven into the large muscles, running becomes easier. Your pupils dilate, letting in more light. To cool your stirred-up body, you perspire. If wounded, your blood would clot more quickly.

When the crisis passes, the *parasympathetic division* of your ANS takes over, calming your body. Its neural centers inhibit further release of stress hormones, but those already in your bloodstream will linger a while, so arousal diminishes gradually.

In many situations, arousal is adaptive. Performance peaks at higher levels of arousal for easy or well-learned tasks. Thus, runners excel when aroused by competition. But when we are facing difficult tasks, high anxiety can disrupt performance. When you're taking an exam, for example, it pays to be moderately aroused—alert but not trembling with nervousness. Learning to relax before an exam may help you to perform better (Hembree, 1988). But too little arousal (think sleepiness) and prolonged high arousal can tax the body.

FIGURE 27.2 Emotional arousal Like a crisis control center, the autonomic nervous system arouses the body in a crisis and calms it when danger passes.

Autonomic Nervous System Controls Physiological Arousal

Sympathetic division (arousing)		Parasympathetic division (calming)
Pupils dilate	EYES	Pupils contract
Decreases	SALIVATION	Increases
Perspires	SKIN	Dries
Increases	RESPIRATION	Decreases
Accelerates	HEART	Slows
Inhibits	DIGESTION	Activates
Secrete stress hormones	ADRENAL GLANDS	Decrease secretion of stress hormones

Brain and Other Physiological Indicators of Emotions

27-3: Do different emotions activate different physiological or brain responses?

Imagine conducting this experiment: In each of four rooms, you have someone watching a movie: In the first, the person is viewing a horror show; in the second, an anger-provoking film; in the third, a sexually arousing film; in the fourth, an utterly boring movie. From the control center, you are monitoring each person's physiological responses, measuring heart rate, breathing, and perspiration. Do you think you could tell who is frightened? Who is angry? Who is sexually aroused? Who is bored?

With training, you could probably pick out the bored viewer. But discerning physiological differences among fear, anger, and sexual arousal would be much more difficult (Barrett, 2006). Different emotions do not have sharply distinct biological signatures. Nevertheless, to you and me, sexual arousal, fear, and anger *feel* different. And, despite similar arousal, emotions often *look* different. People may appear "paralyzed with fear" or "ready to explode."

"No one ever told me that grief felt so much like fear. I am not afraid, but the sensation is like being afraid. The same fluttering in the stomach, the same restlessness, the yawning. I keep on swallowing."

—C. S. Lewis, *A Grief Observed,* 1961

Although we can't easily see differences in emotions from tracking heart rate, breathing, and perspiration, researchers have found some real, though subtle, physiological distinctions among the emotions. For example, the finger temperatures and hormone secretions that accompany fear and rage sometimes differ (Ax, 1953; Levenson, 1992). And, though fear and joy can prompt similar increased heart rate, they stimulate different facial muscles. During fear, brow muscles tense. During joy, muscles in the cheeks and under the eyes pull into a smile (Witvliet & Vrana, 1995).

Emotions differ much more in the brain circuits they use (Panksepp, 2007). Compared with observers watching angry faces, those watching (and subtly mimicking) fearful faces show more activity in their amygdala, the emotional control center in the brain's limbic system (Whalen et al., 2001). (The amygdala also offers a shortcut for some of our emotional responses, as you'll see later in this module.) Brain scans and EEG recordings show that emotions also activate different areas of the brain's cortex, with some tendency for negative emotions to be linked to the right hemisphere and positive emotions to the left. Disgust, for example, triggers more activity in the right prefrontal cortex than in the left. Depression-prone people, and those with generally negative personalities, also show more right frontal lobe activity (Harmon-Jones et al., 2002).

In 1966, a young man named Charles Whitman killed his wife and mother and then climbed to the top of a tower at the University of Texas and shot 38 people. An autopsy later revealed a tumor pressing against his amygdala, which may have contributed to his violence.

Positive moods tend to trigger more left frontal lobe activity. (When you're happy and you know it, your brain will surely show it.) People with positive personalities—exuberant infants and alert, enthusiastic, energized, and persistently goal-directed adults—also show more activity in the left frontal lobe than in the right (Davidson, 2000, 2003; Urry et al., 2004). Indeed, the more a person's baseline frontal lobe activity tilts left—or is made to tilt left by perceptual activity—the more upbeat the person typically is (Drake & Myers, 2006).

Given the physical indicators of emotion, might we, like Pinocchio, give some telltale signs when we lie? See Thinking Critically About: Lie Detection.

AP Photo/HO

Emotional arousal Elated excitement and panicky fear involve similar physiological arousal. That allows us to flip rapidly between the two emotions.

Thinking Critically About:

Lie Detection

Dream Pictures/Getty Images

Can polygraph tests like this identify liars? To learn more, read on.

For those who believe in them, *lie detectors,* or **polygraphs,** have offered a way to eavesdrop on the brain and detect lies as they are told. But as our understanding of physiological measures of emotion has grown, the reputation of lie detectors has shrunk.

Polygraphs measure the changes in breathing, cardiovascular activity, and perspiration that accompany emotion. An examiner monitors these responses as you answer questions. Some items, called *control questions,* aim to make anyone a little nervous. If asked, "In the last 20 years, have you ever taken something that didn't belong to you?" many people will tell a white lie and say *no,* and the polygraph will detect arousal. If your physiological reactions to *critical questions* ("Did you ever steal anything from your previous employer?") are weaker than to control questions, the examiner infers you are telling the truth.

But there are two problems: First, our physiological arousal is much the same from one emotion to another—anxiety, irritation, and guilt all prompt similar physiological reactivity. Second, these tests have erred about one-third of the time, especially when innocent people were responding with heightened tension to the accusations implied by the critical questions (**FIGURE 27.3**). Many rape victims, for example, have "failed" lie detector tests when reacting emotionally while telling the truth about their assailant (Lykken, 1991).

A 2002 U.S. National Academy of Sciences report noted that "no spy has ever been caught [by] using the polygraph." It was not for lack of trying. The FBI, CIA, and Departments of Defense and Energy in the United States have spent millions of dollars testing tens of thousands of employees. Meanwhile Aldrich Ames, who enjoyed an unexplained lavish life-style as a Russian spy within the CIA, went undetected. Ames "took scores of polygraph tests and passed them all," noted Robert Park (1999). "Nobody thought to investigate the source of his sudden wealth—after all, he was passing the lie detector tests." The truth is, lie detectors can lie.

A more effective approach to lie detection uses the *guilty knowledge test,* which assesses a suspect's physiological responses to crime-scene details known only to the police and the guilty person (Ben-Shakhar & Elaad, 2003). If a camera and computer had been stolen, for example, presumably only a guilty person would react strongly to the specific brand names of these items. Given enough such specific probes, an innocent person will seldom be wrongly accused.

polygraph a machine, commonly used in attempts to detect lies, that measures several of the physiological responses accompanying emotion (such as perspiration and cardiovascular and breathing changes).

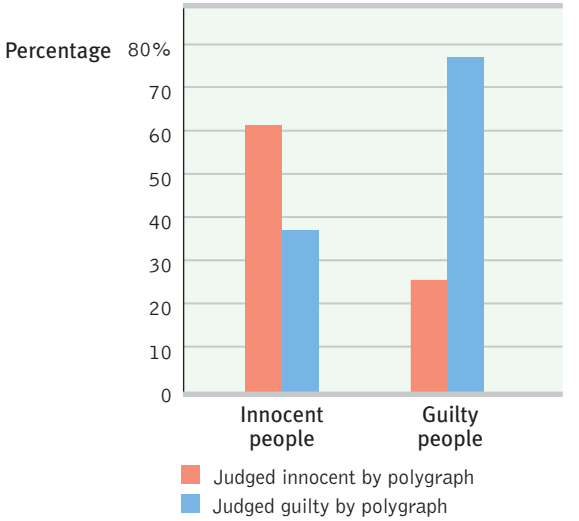


FIGURE 27.3 How often do lie detectors lie? Benjamin Kleinmuntz and Julian Szucko (1984) had polygraph experts study the polygraph data of 50 theft suspects who later confessed to being guilty and 50 suspects whose innocence was later established by someone's confession. Had the polygraph experts been the judges, more than one-third of the innocent would have been declared guilty, and almost one-fourth of the guilty would have been declared innocent.

Cognition and Emotion

27-4: To experience emotions, must we consciously interpret and label them?

Do our thoughts define our feelings? It sometimes seems that way when our arousal response to one event spills over into our response to the next event. Imagine arriving home after an invigorating run and finding a message that you got a longed-for job. With arousal lingering from the run, would you feel more elated than if you received this news after awakening from a nap?

The spillover effect Arousal from a soccer match can fuel anger, which can descend into rioting or other violent confrontations.

To find out whether this *spillover effect* exists, Stanley Schachter and Jerome Singer (1962) aroused college men with injections of the hormone epinephrine. Picture yourself as one of their participants: After receiving the injection, you go to a waiting room, where you find yourself with another person (actually an accomplice of the experimenters) who is acting either euphoric or irritated. As you observe this person, you begin to feel your heart race, your body flush, and your breathing become more rapid. If told to expect these effects from the injection, what would you feel? Schachter and Singer's volunteers felt little emotion—because they attributed their arousal to the drug. But if told the injection would produce no effects, what would you feel? Perhaps you would react, as another group of participants did, by "catching" the apparent emotion of the person you are with—becoming happy if the accomplice is acting euphoric, and testy if the accomplice is acting irritated.

This discovery—that a stirred-up state can be experienced as one emotion or another very different one, depending on how we interpret and label it—has been replicated in dozens of experiments. Insult people who have just been aroused by pedaling an exercise bike or watching rock videos and they will find it easy to misattribute their arousal to the provocation. Their anger will exceed that of people similarly provoked but not previously aroused. Likewise, sexually aroused people react with more hostility in anger-provoking situations. And, vice versa—the arousal that lingers after an intense argument or a frightening experience may intensify sexual passion (Palace, 1995). Just as the Schachter-Singer two-factor theory predicts, arousal + label = emotion. Emotional arousal may not be as undifferentiated as Schachter and Singer believed, but arousal from emotions as diverse as anger, fear, and sexual excitement can indeed spill from one emotion to another (Reisenzein, 1983; Sinclair et al., 1994; Zillmann, 1986). *The point to remember:* Arousal fuels emotion; cognition channels it.

"Feelings that one interprets as fear in the presence of a sheer drop may be interpreted as lust in the presence of a sheer blouse."

—Daniel Gilbert, *Stumbling on Happiness*, 2006

Emotion and the Two-Track Brain

Is the heart *always* subject to the mind? Robert Zajonc (pronounced ZI-yence; 1980, 1984a) has contended that we actually have many emotional reactions apart from, or even before, our interpretations of a situation. Imagine receiving some unsettling news. You discover that you've forgotten an important deadline, or that you've hurt someone's feelings. As the ongoing conversation distracts your attention, you lose awareness of the bad news. Yet the feeling still churns. You feel a little bad. You know there's a reason, but for the moment you can't put your finger on it.

Can you recall liking something or someone immediately, without knowing why?

Arousal can linger without a label. Without being consciously aware of having seen it, we can be influenced by a stimulus flashed too briefly to interpret, much less label. A subliminally flashed stimulus, such as a smiling or angry face or a disgusting scene, can prime a mood or specific emotion and lead us to feel better or worse

about a follow-up stimulus (Murphy et al., 1995; Ruys & Stapel, 2008). In one set of experiments, thirsty people were given a fruit-flavored drink after viewing a subliminally flashed (thus unperceived) face. Those exposed to a happy face drank about 50 percent more than those exposed to a neutral face (Berridge & Winkielman, 2003). Those flashed an angry face drank substantially less.

Neuroscience research helps us understand these surprising findings. Like speedy reflexes that operate apart from the brain's thinking cortex, some emotions take what Joseph LeDoux (2002) calls the "low road," via neural pathways that bypass the cortex (which offers the alternative "high road" pathway). One low-road pathway runs from the eye or ear via the thalamus to the amygdala, bypassing the cortex (**FIGURE 27.4**). This shortcut enables our greased-lightning emotional response before our intellect intervenes. So speedy is the amygdala reaction that we may be unaware of what's transpired (Dimberg et al., 2000). In one fascinating experiment, Paul Whalen and his colleagues (2004) used fMRI scans to observe the amygdala's response to subliminally presented fearful eyes (**FIGURE 27.5**). Compared with a control condition that presented the whites of happy eyes, the fearful eyes triggered increased amygdala activity (despite no one's being aware of seeing them).

"Oh! ye'll tak' the high road and I'll tak' the low road, An' I'll be in Scotland afore ye."

—Traditional Scottish song, "Bonnie Banks o' Loch Lomond"

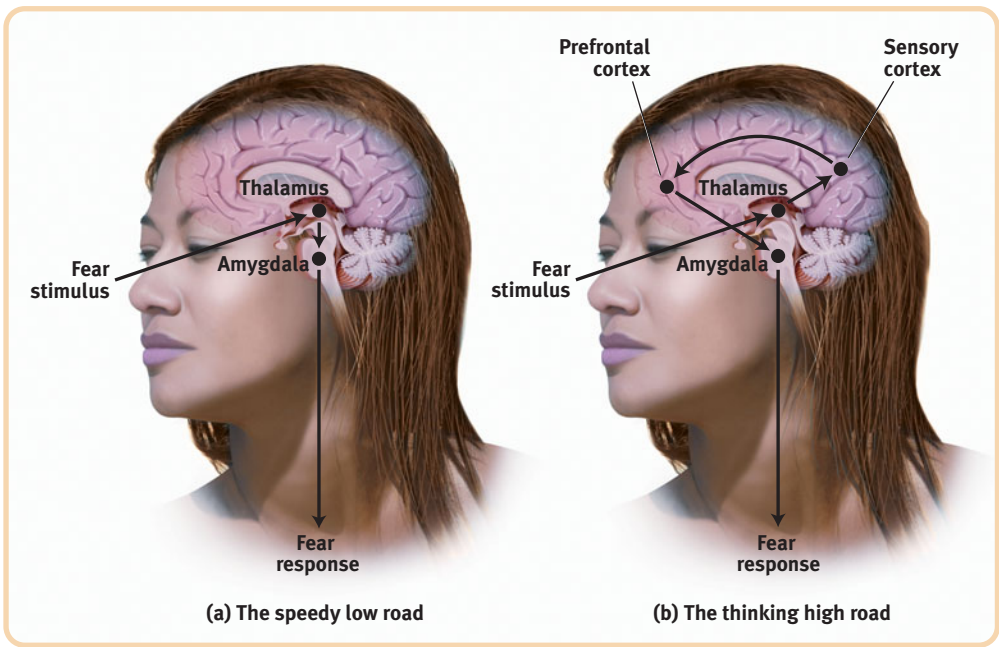


FIGURE 27.4 The brain's shortcut for emotions In the two-track brain, sensory input may be routed (a) directly to the amygdala (via the thalamus) for an instant emotional reaction, or (b) to the cortex for analysis.

The amygdala sends more neural projections up to the cortex than it receives back. This makes it easier for our feelings to hijack our thinking than for our thinking to rule our feelings, noted LeDoux and Jorge Armony (1999). In the forest, we jump at the sound of rustling bushes nearby, leaving the cortex to decide later whether the sound was made by a predator or just the wind. Such an experience supports Zajonc's belief that *some* of our emotional reactions involve no deliberate thinking.

Emotion researcher Richard Lazarus (1991, 1998) has conceded that our brains process and react to vast amounts of information without our conscious awareness, and he willingly granted that some emotional responses do not require *conscious* thinking. Much of our emotional

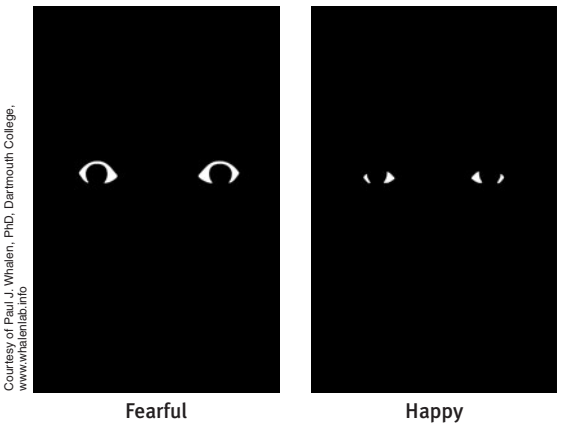


FIGURE 27.5 The brain's sensitivity to threats Even when fearful eyes (left) were flashed too briefly for people to consciously perceive them, fMRI scans revealed that their hypervigilant amygdala was alerted (Whalen et al., 2004). The happy eyes on the right did not have this effect.

life operates via the automatic, effortless, speedy low road. But, without some sort of cognitive appraisal, how would we *know* what we are reacting to? The appraisal may be effortless and we may not be conscious of it, but it is still a mental function. To know whether something is good or bad, the brain must have some idea of what it is (Storbeck et al., 2006). Thus, emotions arise when we *appraise* an event as beneficial or harmful to our well-being, whether we truly know it is or not. We appraise the sound of the rustling bushes as the presence of a threat. Later, we realize that it was "just the wind."

To sum up, as Zajonc and LeDoux have demonstrated, some emotional responses—especially simple likes, dislikes, and fears (imagine a large spider falling on you)—involve no conscious thinking (**FIGURE 27.6**). Such responses are difficult to alter by changing our thinking. The emotional brain even influences people's political decisions, leading many to vote for candidates they automatically *like* over a candidate expressing positions closer to their own (Westen, 2007).

But like other emotions—including moods such as depression and complex feelings such as hatred, guilt, happiness, and love—our feelings about politics are, as Lazarus, Schachter, and Singer predicted, greatly influenced by our memories, expectations, and interpretations. Highly emotional people are intense partly because of their interpretations. They may *personalize* events as being somehow directed at them, and they may *generalize* their experiences by blowing single incidents out of proportion (Larsen et al., 1987). In dealing with complex emotions, learning to *think* more positively can help people *feel* better. Even though the emotional low road functions automatically, the thinking high road allows us to retake some control over our emotional life.

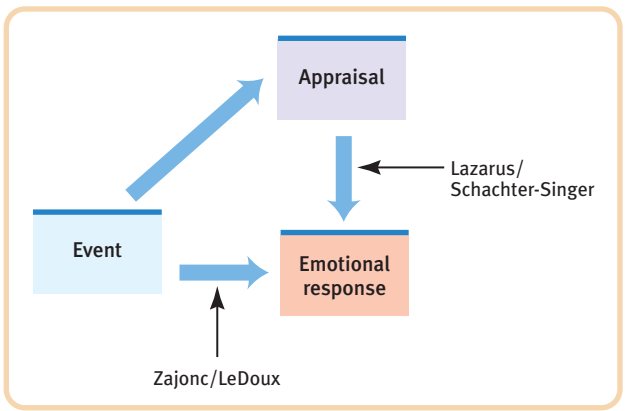


FIGURE 27.6 Another example of dual processing: two routes to emotion
Zajonc and LeDoux have emphasized that some emotional responses are immediate, before any conscious appraisal. Lazarus, Schachter, and Singer emphasized that our appraisal and labeling of events also determine our emotional responses.

REVIEWING

Theories and Physiology of Emotions

Module Review

27-1: What are the components of an emotion? *Emotions* are psychological responses of the whole organism involving an interplay among (1) physiological arousal, (2) expressive behaviors, and (3) conscious experience.

The *James-Lange theory* maintains that our emotional feelings follow our body's response to the emotion-inducing stimuli. The *Cannon-Bard theory* proposes that our body responds to emotion at the same time that we experience the emotion (one does not cause the other). The Schachter-Singer *two-factor theory* holds that our emotions have two ingredients: physical arousal and a cognitive label.

27-2: What is the link between emotional arousal and the autonomic nervous system? Emotions are both psychological and physiological. The autonomic nervous system controls physiological arousal through its sympathetic (arousing) and parasympathetic (calming) divisions. Performance peaks at lower levels of arousal for difficult tasks, and at higher levels for easy or well-learned tasks.

27-3: Do different emotions activate different physiological or brain responses? Emotions may be similarly arousing, but subtle differences in physiological responses and brain activity are associated with different emotions. *Polygraphs* measure several physiological indicators of emotion, but they are not accurate enough to justify their widespread use. The use of guilty knowledge questions may produce better results.

27-4: To experience emotions, must we consciously interpret and label them? Schachter and Singer's two-factor theory of emotion contended that the cognitive labels we put on our states of arousal are an essential ingredient of emotion. Lazarus agreed that cognition is essential: Many important emotions arise from our interpretations or inferences. Zajonc and LeDoux, however, believe that some simple emotional responses occur instantly, outside our conscious awareness and before any cognitive processing occurs. The interplay between emotion and cognition illustrates our dual-track mind.

Rehearse It!

1. The Cannon-Bard theory of emotion proposes that the physiological response (like heart pounding) and the subjective experience of, say, fear
   a. are unrelated.
   b. occur simultaneously.
   c. occur in the opposite order (with feelings of fear first).
   d. are regulated by the thalamus.
2. With a challenging task, such as taking a difficult exam, performance is likely to peak when arousal is
   a. very high.
   b. moderate.
   c. low.
   d. absent.
3. Assume that after spending an hour on a treadmill, you receive a letter saying that your scholarship request has been approved. The two-factor theory of emotion would predict that your physical arousal will
   a. weaken your happiness.
   b. intensify your happiness.
   c. transform your happiness into relief.
   d. have no particular effect on your happiness.
4. If physically aroused by swimming, then heckled by an onlooker, we may interpret our arousal as anger and
   a. become less physically aroused.
   b. feel angrier than usual.
   c. feel less angry than usual.
   d. act euphoric.
5. Zajonc and LeDoux maintain that some emotional reactions occur before we have had the chance to label or interpret them. Lazarus disagreed. These psychologists differ about whether emotional responses occur in the absence of
   a. physical arousal.
   b. the hormone epinephrine.
   c. cognitive processing.
   d. learning.

Answers: 1. b, 2. b, 3. b, 4. b, 5. c.

Terms and Concepts to Remember

emotion, p. 393
James-Lange theory, p. 393
Cannon-Bard theory, p. 393
two-factor theory, p. 394
polygraph, p. 397

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Christine is holding her 8-month-old baby when a fierce dog appears out of nowhere and, with teeth bared, leaps for the baby's face. Christine immediately ducks for cover to protect the baby, screams at the dog, then notices that her heart is banging in her chest and she's broken out in a cold sweat. How would the James-Lange, Cannon-Bard, and two-factor theories explain Christine's emotional reaction?
2. How might mountain climbing on a first date influence your emotional reaction to the person?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

28

"Your face, my thane, is a book where men may read strange matters."

—Lady Macbeth to her husband, in William Shakespeare's *Macbeth*

Expressing and Experiencing Emotion

Expressed Emotion

28-1: How do we communicate nonverbally?

There is a simple method of deciphering people's emotions: We read their bodies, listen to their tone of voice, and study their faces. People's expressive behavior reveals their emotion. Does this nonverbal language vary with culture, or is it universal? And do our expressions influence our experienced emotions?

Detecting Emotion

All of us communicate nonverbally as well as verbally. To Westerners, a firm handshake immediately conveys an outgoing, expressive personality (Chaplin et al., 2000). With a gaze, an averted glance, or a stare we can communicate intimacy, submission, or dominance (Kleinke, 1986). Among those passionately in love, gazing into each other's eyes is typically prolonged and mutual (Rubin, 1970). Joan Kellerman, James Lewis, and James Laird (1989) wondered if intimate gazes would stir such feelings between strangers. To find out, they asked unacquainted male-female pairs to gaze intently for two minutes either at each other's hands or into each other's eyes. After separating, the eye gazers reported feeling a tingle of attraction and affection.

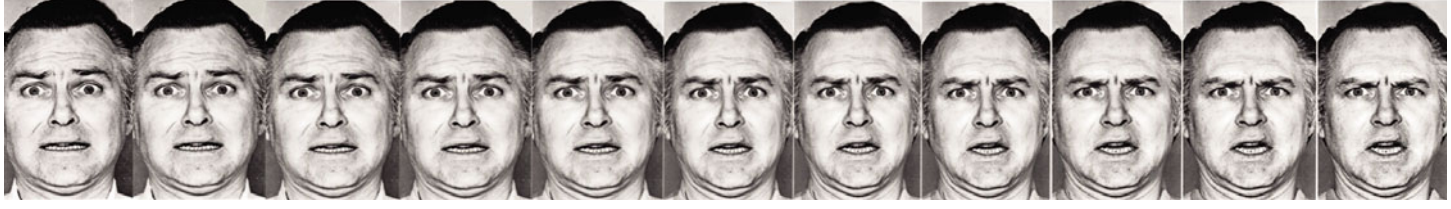
Network Photographers/Alamy

A silent language of emotion Hindu classic dance uses the face and body to effectively convey 10 different emotions (Hejmadi et al., 2000).

Most of us are good enough at reading nonverbal cues to decipher the emotions in an old silent film. We are especially good at detecting threats. Even when hearing emotions conveyed in another language, people most readily detect anger (Scherer et al., 2001). When viewing subliminally flashed words, we more often sense the presence of a negative word, such as *snake* or *bomb* (Dijksterhuis & Aarts, 2003). And in a crowd of faces, a single angry face will "pop out" faster than a single happy one (Fox et al., 2000; Hansen & Hansen, 1988; Öhman et al., 2001).

Experience can sensitize us to particular emotions, as shown by experiments using a series of faces (like those in **FIGURE 28.1**) that morphed from fear (or sadness) to anger. Viewing such faces, physically abused children are much quicker than other children to spot the signals of anger. Shown a face that is 60 percent fear and 40 percent anger, they are as likely to perceive anger as fear. Their perceptions become sensitively attuned to glimmers of danger that nonabused children miss.

Hard-to-control facial muscles reveal signs of emotions you may be trying to conceal. Lifting just the inner part of your eyebrows, which few people do consciously, reveals distress or worry. Eyebrows raised and pulled together signal fear. Activated muscles under the eyes and raised cheeks suggest a natural smile. A feigned smile, such as one we make for a photographer, often continues for more than 4 or 5 seconds. Most authentic expressions have faded by that time. Feigned smiles are also switched on and off more abruptly than is a genuine happy smile (Bugental, 1986).

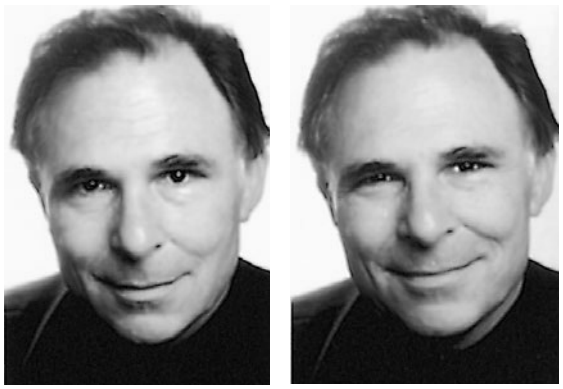


Used by permission of S. D. Pollack, D. J. Kistler, and the National Academy of Sciences

FIGURE 28.1 Experience influences how we perceive emotions Viewing the morphed middle face, evenly mixing fear with anger, physically abused children were more likely than nonabused children to perceive the face as angry (Pollak & Kistler, 2002; Pollak & Tolley-Schell, 2003).

Our brains are rather amazing detectors of subtle expressions. Elisha Babad, Frank Bernieri, and Robert Rosenthal (1991) discovered just *how* amazing after filming teachers talking to unseen schoolchildren. A mere 10-second clip of either the teacher's voice or face provided enough clues for both young and old viewers to determine whether the teacher liked and admired the child he or she was addressing. In another experiment, a glimpse of a face for even one-tenth of a second was enough for people to judge someone's trustworthiness (Willis & Todorov, 2006).

Despite our brain's emotion-detecting skill, we find it difficult to detect deceiving expressions (Porter & ten Brinke, 2008). In one digest of 206 studies of discerning truth from lies, people were just 54 percent accurate—barely better than a coin toss (Bond & DePaulo, 2006). Moreover, contrary to claims that some experts can spot lies, the available research indicates that virtually no one beats chance by much (Bond & DePaulo, 2008).



Dr. Paul Ekman, University of California at San Francisco

Which of researcher Paul Ekman's smiles is feigned, which natural? The smile on the right engages the facial muscles of a natural smile.

Some of us are, however, more sensitive than others to physical cues. In one study (Rosenthal et al., 1979), hundreds of people viewed brief film clips of an emotionally expressive face or body, sometimes accompanied by a garbled voice, and reported on the emotions they had observed. For example, after a 2-second scene revealing only the face of an upset woman, the viewers would decide whether the woman was criticizing someone for being late or was talking about her divorce. Given such *thin slices,* some people were much better than others at detecting emotion. Introverts tend to excel at reading others' emotions, and extraverts' emotions are generally easier to read (Ambady et al., 1995).

Nonverbal cues—gestures, facial expressions, tones of voice—are absent in computer-based communication, except for occasional sideways *emoticons,* such as ;-) for a knowing wink and :-(for a frown. In e-mails and Internet discussions, nobody knows what you look or sound like, or anything about your status, personality, age, or background; you are judged solely on your words. When first meeting face to face, e-mail pen pals are often surprised at the person they encounter.

It's also easy to misread computer-based communications. The absence of expressive e-motion, including the vocal nuances by which we signal that a statement is serious, kidding, or sarcastic, can make for ambiguous emotion. Communicators may think their "just kidding" intent is equally clear, whether e-mailed or spoken, but they commonly exhibit egocentrism by not foreseeing misinterpretations (Krueger et al., 2005).

Botox injections paralyze facial muscles that create wrinkles, allowing the overlying skin to relax and smooth. By erasing the subtle expressions of frown lines or smiling eyes, might this cosmetic procedure hide subtle emotions?

Gender, Emotion, and Nonverbal Behavior

Is women's intuition, as so many believe, superior to men's? Consider: As Jackie Larsen left her Grand Marais, Minnesota, church prayer group one April 2001 morning, she encountered Christopher Bono, a clean-cut, well-mannered youth. Bono's car had broken down, and he said he was looking for a ride to meet friends in Thunder Bay. When Bono later appeared in Larsen's shop, where she had promised to help him phone his friends, she felt a pain in her stomach. Sensing that something was very wrong with this young man, she insisted they talk outside on the sidewalk. "I said, 'I am a mother and I have to talk to you like a mother. . . . I can tell by your manners that you have a nice mother.'" At the mention of his mother, Bono's eyes fixed on her. "I don't know where my mother is," he said.

As the conversation ended, Larsen directed Bono back to the church to meet the pastor. She also called the police and suggested that they trace his license plates. The car was registered to his mother in southern Illinois. When police went to her apartment, they found blood all over and Lucia Bono dead in the bathtub. Christopher Bono, 16, was charged with first-degree murder (Biggs, 2001).

Was it a coincidence that Larsen, who had seen through Bono's calm exterior, was a woman? Some psychologists would say *no.* In her analysis of 125 studies of

sensitivity to nonverbal cues, Judith Hall (1984, 1987) discerned that women generally surpass men at reading people's emotional cues in thin slices of behavior. And women have surpassed men in discerning whether a male-female couple is a genuine romantic couple or a posed phony couple, and in discerning which of two people in a photo is the other's supervisor (Barnes & Sternberg, 1989).

Women's nonverbal sensitivity helps explain their greater emotional literacy. Invited by Lisa Feldman Barrett and her colleagues (2000) to describe how they would feel in certain situations, men described simpler emotional reactions. You might like to try this yourself: Ask some people how they might feel when saying good-bye to friends after graduation. Barrett's work suggests you are more likely to hear men say, simply, "I'll feel bad," and to hear women express more complex emotions: "It will be bittersweet; I'll feel both happy and sad."

In both positive and negative situations, women tend to display greater emotional responsiveness (Grossman & Wood, 1993; Sprecher & Sedikides, 1993; Stoppard & Gruchy, 1993). Studies of 23,000 people from 26 cultures around the world have found that women more than men report themselves open to feelings (Costa et al., 2001). That helps explain the extremely strong perception that emotionality is "more true of women"—a perception expressed by nearly 100 percent of 18- to 29-year-old Americans (Newport, 2001).

One exception: Anger strikes most people as a more masculine emotion. Ask someone to imagine an angry face, then ask them: What gender is the person? For three in four Arizona State University students, the imagined angry person was male (Becker et al., 2007). The researchers also found that if a gender-neutral face is made to look angry, most people will perceive it as male. If the face is smiling, they will more likely perceive it as female (**FIGURE 28.2**).

Women and men also differ in whether they describe themselves as empathic. If you have *empathy,* you identify with others and imagine what it must be like to walk in their shoes. You rejoice with those who rejoice and weep with those who weep. Physiological measures of empathy, such as heart rate while seeing another's distress, reveal a much smaller gender gap than is found in self-reports in surveys (Eisenberg & Lennon, 1983).

Nevertheless, females are more likely to *express* empathy—to cry and to report distress when observing someone in distress. Ann Kring and Albert Gordon (1998) observed this gender difference in videotapes of men and women students watching film clips that were sad (children with a dying parent), happy (slapstick comedy), or frightening (a man nearly falling off the ledge of a tall building). As **FIGURE 28.3** shows, the women reacted more visibly to each film type. Women also tend to experience emotional events (such as viewing pictures of mutilation) more deeply—with more brain activation in areas sensitive to emotion—and then to remember the scenes better three weeks later (Canli et al., 2002).

In another exploration of gender and facial expression, Harold Hill and Alan Johnston (2001) animated an image of an average head with expressions (smirks,

FIGURE 28.2 Male or female? When Vaughn Becker and his colleagues (2007) manipulated a gender-neutral face, people were more likely to see it as a male when it wore an angry expression, and as a female when it wore a smile.

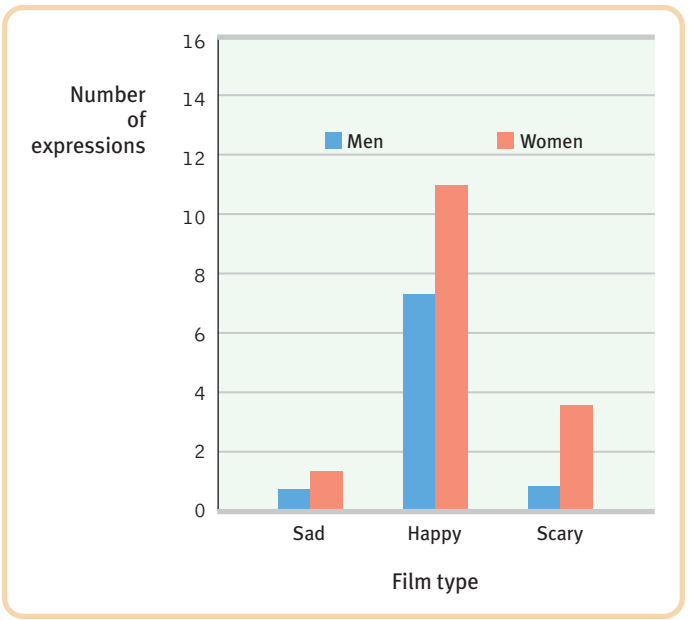


FIGURE 28.3 Gender and expressiveness Although male and female students did not differ dramatically in self-reported emotions or physiological responses while viewing emotional films, the women's faces *showed* much more emotion. (From Kring & Gordon, 1998.)

head tosses, raised eyebrows) that had been digitally captured from the faces of London University students as they read a joke. Despite having no anatomical clues to gender, observers could usually detect gender in the telltale expressions.

Culture and Emotional Expression

28-2: Are nonverbal expressions of emotion universally understood?

The meaning of gestures varies with the culture. Some years ago, psychologist Otto Klineberg (1938) observed that in Chinese literature people clapped their hands to express worry or disappointment, laughed a great "Ho-Ho" to express anger, and stuck out their tongues to show surprise. Similarly, the North American "thumbs up" and "A-OK" signs are considered insults in certain other cultures. (When former U.S. President Richard Nixon made the latter sign in Brazil, he didn't realize he was delivering a crude insult.) Just how important cultural definitions of gestures can be was demonstrated in 1968, when North Korea publicized photos of supposedly happy officers from a captured U.S. Navy spy ship. In the photo, three of the men raised their middle fingers; they had told captors it was a "Hawaiian good luck sign" (Fleming & Scott, 1991).

Do facial expressions also have different meanings in different cultures? To find out, two investigative teams—one led by Paul Ekman, Wallace Friesen, and others (1975, 1987, 1994), the other by Carroll Izard (1977, 1994)—showed photographs of various facial expressions to people in different parts of the world and asked them to guess the emotion. You can try this matching task yourself by pairing the six emotions with the six faces of **FIGURE 28.4**.

Regardless of your cultural background, you probably did pretty well. A smile's a smile the world around. Ditto for anger, and to a lesser extent the other basic expressions (Elfenbein & Ambady, 1999). (There is no culture where people frown when they are happy.) Thus, a glimpse at competitors' spontaneous expressions following an Olympic judo competition gives a very good clue to who won, no matter their country (Matsumoto & Willingham, 2006).

FIGURE 28.4 Culture-specific or culturally universal expressions? As people of differing cultures and races, do our faces speak differing languages? Which face expresses disgust? Anger? Fear? Happiness? Sadness? Surprise? (From Matsumoto & Ekman, 1989.) See inverted answers below.

From left to right, top to bottom: happiness, surprise, fear, sadness, anger, disgust.

Ekman & Matsumoto, Japanese and Caucasian Facial Expression of Emotion

"For news of the heart, ask the face."
—Guinean proverb

Do people from different cultures share these similarities because they share experiences, such as American movies or the BBC and CNN broadcasts? Apparently not. Ekman and his team asked people in isolated parts of New Guinea to display various emotions in response to such statements as, "Pretend your child has died." When the researchers showed tapes of the New Guineans' facial reactions to North American collegians, the students read them easily.

Facial expressions do contain some nonverbal accents that provide clues to one's culture (Marsh et al., 2003). So it's not surprising that data from 182 studies show slightly enhanced accuracy when people judge emotions from their own culture (Elfenbein & Ambady, 2002, 2003a,b). Still, the telltale signs of emotion generally cross cultural boundaries.

People blind from birth spontaneously exhibit the common facial expressions associated with such emotions as joy, sadness, fear, and anger (Galati et al., 1997). Even blind children who have never seen a face display these facial expressions (Eibl-Eibesfeldt, 1971). The world over, children cry when distressed, shake their heads when defiant, and smile when they are happy.

The discovery that facial muscles speak a fairly universal language would not have surprised pioneering emotion researcher Charles Darwin (1809–1882). He speculated that before our prehistoric ancestors communicated in words, their ability to convey threats, greetings, and submission with facial expressions helped them survive. That shared heritage, he believed, is why all humans express the basic emotions with similar facial expressions. A sneer, for example, retains elements of an animal baring its teeth in a snarl. Emotional expressions may enhance our survival in other ways, too. Surprise raises the eyebrows and widens the eyes, enabling us to take in more information. Disgust wrinkles the nose, closing it from foul odors.

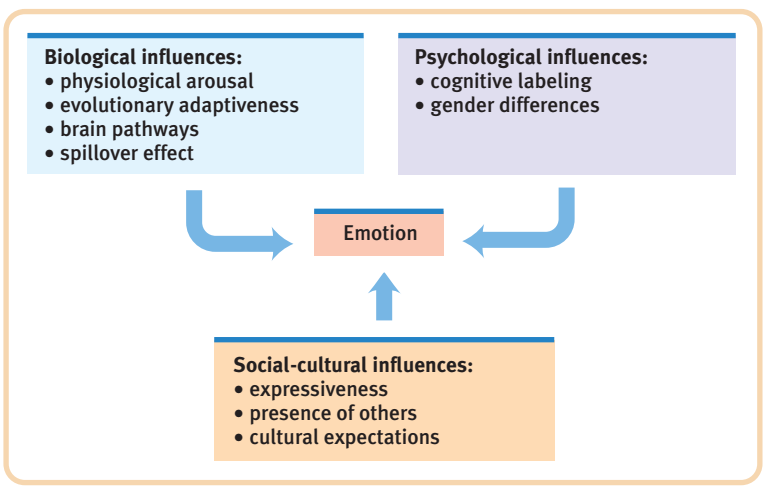
While weightless, astronauts' internal bodily fluids move toward their upper body and their faces become puffy. This makes nonverbal communication more difficult, increasing the risks of misunderstanding, especially among multinational crews (Gelman, 1989).

Smiles, too, are social phenomena as well as emotional reflexes. Bowlers seldom smile when they score a strike—they smile when they turn to face their companions (Jones et al., 1991; Kraut & Johnston, 1979). Even euphoric winners of Olympic gold medals typically don't smile when they are awaiting their ceremony but do when interacting with officials and facing the crowd and cameras (Fernández-Dols & Ruiz-Belda, 1995).

It has been adaptive for us to interpret faces in particular contexts. People judge an angry face set in a frightening situation as afraid. They judge a fearful face set in a painful situation as pained (Carroll & Russell, 1996). Movie directors harness this phenomenon by creating contexts and soundtracks that amplify our perceptions of particular emotions.

Although cultures share a universal facial language for basic emotions, they differ in how *much* emotion they express. Cultures that encourage individuality, as in Western Europe, Australia, New Zealand, and North America, display mostly visible emotions (van Hemert et al., 2007). In Chinese culture, which encourages people to adjust to others, personal emotions are less visibly displayed (Tsai et al., 2007). Ditto Japan, where people infer emotion more from the surrounding context, and where the difficult-to-control eyes convey more emotion than the mouth, which is so expressive in North America (Masuda et al., 2008; Yuki et al., 2007).

FIGURE 28.5 Levels of analysis for the study of emotion As with other psychological phenomena, researchers explore emotion at biological, psychological, and social-cultural levels.



Cultural differences also exist within nations. The Irish and their Irish-American descendants tend to be more expressive than Scandinavians and their Scandinavian-American descendants (Tsai & Chentsova-Dutton, 2003). And that reminds us of a familiar lesson: Like most psychological events, emotion is best understood not only as a biological and cognitive phenomenon, but also as a social-cultural phenomenon (FIGURE 28.5).

The Effects of Facial Expressions

28-3: Do our facial expressions influence our feelings?

As William James struggled with feelings of depression and grief, he came to believe that we can control emotions by going "through the outward movements" of any emotion we want to experience. "To feel cheerful," he advised, "sit up cheerfully, look around cheerfully, and act as if cheerfulness were already there."

"Whenever I feel afraid
I hold my head erect
And whistle a happy tune."

—Richard Rodgers and Oscar Hammerstein, *The King and I,* 1958

Studies of emotional effects of facial expressions reveal precisely what James might have predicted. Expressions not only communicate emotion, they also amplify and regulate it. In his 1872 book, *The Expression of the Emotions in Man and Animals,* Darwin contended that "the free expression by outward signs of an emotion intensifies it. . . . He who gives way to violent gestures will increase his rage."

Was Darwin right? Let's test Darwin's hypothesis: Fake a big grin. Now scowl. Can you feel the "smile therapy" difference? Participants in dozens of experiments have felt a difference. For example, James Laird and his colleagues (1974, 1984, 1989) subtly induced students to make a frowning expression by asking them to "contract these muscles" and "pull your brows together" (supposedly to help the researchers attach facial electrodes). The results? The students reported feeling a little angry. People instructed to mold their faces in ways that express other basic emotions also experienced those emotions (**FIGURE 28.6**). For example, they reported feeling more fear than anger, disgust, or sadness when made to construct a fearful expression: "Raise your eyebrows. And open your eyes wide. Move your whole head back, so that your chin is tucked in a little bit, and let your mouth relax and hang open a little" (Duclos et al., 1989). The face is more than a billboard that displays our feelings; *it also feeds our feelings.*

Courtesy of Louis Schakel/Michael Kausman/The New York Times Pictures

FIGURE 28.6 How to make people frown without telling them to frown Randy Larsen, Margaret Kasimatis, and Kurt Frey's (1992) solution: Attach two golf tees above people's eyebrows and ask them to make the tee tips touch. Participants felt sad while viewing scenes of war, sickness, and starvation, and even sadder with their "sad face" muscles activated.

In the absence of competing emotions, this *facial feedback* effect is subtle yet detectable. Students induced to smile have felt happier and recalled happier memories than did frowners. Just activating one of the smiling muscles by holding a pen in the teeth (rather than with the lips, which activates a frowning muscle) is enough to make cartoons seem more amusing (Strack et al., 1988). A heartier smile—made not just with the mouth but with raised cheeks that crinkle the eyes—enhances positive feelings even more when you are reacting to something pleasant or funny (Soussignan, 2001). Smile warmly on the outside and you feel better on the inside. Scowl and the whole world seems to scowl back.

A request from your author: Smile often as you read this book.

Sara Snodgrass and her associates (1986) observed the *behavior feedback* phenomenon with walking. You can duplicate the participants' experience: Walk for a few minutes with short, shuffling steps, keeping your eyes downcast. Now walk around taking long strides, with your arms swinging and your eyes looking straight ahead. Can you feel your mood shift? Going through the motions awakens the emotions.

One small way to become more empathic is to let your own face mimic another person's expression (Vaughn & Lanzetta, 1981). Acting as another acts helps us feel what another feels. Indeed, natural mimicry of others' emotions helps explain why emotions are contagious (Dimberg et al., 2000; Neumann & Strack, 2000).

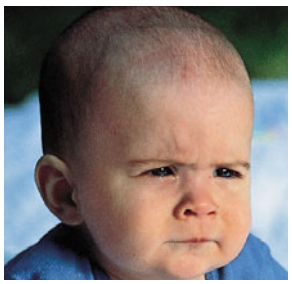
Experienced Emotion

How many distinct emotions are there? Carroll Izard (1977) isolated 10 basic emotions (joy, interest-excitement, surprise, sadness, anger, disgust, contempt, fear, shame, and guilt), most of which are present in infancy (**FIGURE 28.7**). Jessica Tracey and Richard Robins (2004) believe that pride is also a distinct emotion, signaled by a small smile, head slightly tilted back, and an open posture. And Phillip Shaver and his colleagues (1996) believe that love, too, may be a basic emotion. But Izard has argued that other emotions are combinations of these 10, with love, for example, being a mixture of joy and interest-excitement.

Let's take a closer look at two of these emotions: anger and happiness. What influences our experience of each? What functions do they serve?


Tom McCarthy/Rainbow

(a) Joy (mouth forming smile, cheeks lifted, twinkle in eye)


Patrick Donehue/Photo Researchers, Inc.

(b) Anger (brows drawn together and downward, eyes fixed, mouth squarish)


Bob Daemmrich/The Image Works

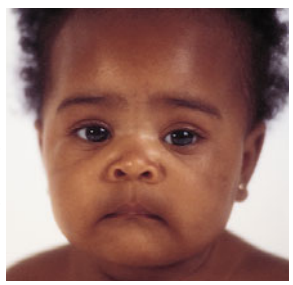
(c) Interest (brows raised or knitted, mouth softly rounded, lips may be pursed)


Lew Merrim/Photo Researchers, Inc.

(d) Disgust (nose wrinkled, upper lip raised, tongue pushed outward)


Nancy Brown/The Image Bank

(e) Surprise (brows raised, eyes widened, mouth rounded in oval shape)


Marc Grimberg/The Image Bank

(f) Sadness (brow's inner corners raised, mouth corners drawn down)


Michael Newman/PhotoEdit

(g) Fear (brows level, drawn in and up, eyelids lifted, mouth corners retracted)

FIGURE 28.7 Infants' naturally occurring emotions To identify the emotions present from birth, Carroll Izard analyzed infants' facial expressions.

Anger

28-4: What are the causes and consequences of anger?

Anger, the sages have said, is "a short madness" (Horace, 65–8 B.C.E.) that "carries the mind away" (Virgil, 70–19 B.C.E.) and can be "many times more hurtful than the injury that caused it" (Thomas Fuller, 1654–1734). But they have also said that "noble anger" (William Shakespeare, 1564–1616) "makes any coward brave" (Cato, 234–149 B.C.E.) and "brings back . . . strength" (Virgil).

What makes us angry? Sometimes anger is a response to a friend or loved one's perceived misdeed, especially when the act seems willful, unjustified, and avoidable (Averill, 1983). But small hassles and blameless annoyances—foul odors, high temperatures, a traffic jam, aches and pains—also have the power to make us angry (Berkowitz, 1990).

Anger, especially chronic hostility, can harm us. How, then, can we rid ourselves of our anger? When irritated, should we lash out at the offender rather than internalizing our angry feelings? Are advice columnists right in urging us to teach children to vent their anger? Are "recovery" therapists right in encouraging us to rage at our dead parents, imaginatively curse the boss, or confront our childhood abuser?

Wolfgang Kaehler

A cool culture Domestic violence is rare in Micronesia. This photo of community life on Pulap Island suggests one possible reason: Family life takes place in the open. Relatives and neighbors who witness angry outbursts can step in before the emotion escalates into child, spouse, or elder abuse.

Although common in individualized cultures, such advice would seldom be heard in cultures where people's identity is centered more on the group. People who keenly sense their *inter*dependence see anger as a threat to group harmony (Markus & Kitayama, 1991). In Tahiti, for instance, people learn to be considerate and gentle. In Japan, from infancy on, angry expressions are less frequent than in Western cultures.

The idea of "venting your anger" presumes that through aggressive action or fantasy you can achieve emotional release, or **catharsis.** Experimenters report that *sometimes* when people retaliate against a provoker, they may indeed calm down. But this tends to be true only *if* their counterattack is directed against the provoker, *if* their retaliation seems justifiable, and *if* their target is not intimidating (Geen & Quanty, 1977; Hokanson & Edelman, 1966). In short, expressing anger can be *temporarily* calming *if* it does not leave you feeling guilty or anxious.

More often, however, catharsis fails to cleanse rage and instead breeds more anger. For one thing, expressing anger may provoke further retaliation, escalating minor conflicts into major confrontations. For another, expressing anger can magnify anger. (Recall the *behavior feedback* research: Acting angry can make us feel angrier.) In a now-classic study (Ebbesen et al., 1975), researchers interviewed 100 people recently laid off by an aerospace company during an economic downturn, and they asked them to fill out a questionnaire assessing their attitudes toward the company. First, however, they asked some workers questions that released hostility, such as, "What instances can you think of where the company has not been fair with you?" Did this opportunity to "drain off" hostility reduce it? Quite the contrary. Those who had vented their anger exhibited *more* hostility.

Even when provoked people hit a punching bag *believing* it will be cathartic, the effect is the opposite—leading them to exhibit *more* cruelty (Bushman et al., 1999). And when they wallop a punching bag while ruminating about the person who angered them, they become even more aggressive when given a chance for revenge. "Venting to reduce anger is like using gasoline to put out a fire," concluded researcher Brad Bushman (2002). When anger fuels physically or verbally aggressive acts we later regret, it becomes maladaptive. Anger primes prejudice. After 9/11, Americans who responded with anger more than fear displayed intolerance for immigrants and Muslims (DeSteno et al., 2004; Skitka et al., 2004).

Angry outbursts that temporarily calm us are dangerous in another way: They may be reinforcing and therefore habit forming. If stressed managers find they can drain off some of their tension by berating an employee, then the next time they feel irritated and tense they may be more likely to explode again. Think about it: The next time you are angry you are likely to do whatever has relieved your anger in the past.

What, then, is the best way to handle our anger? Experts offer two suggestions. First, wait. You can bring down the level of physiological arousal of anger by waiting. "It is true of the body as of arrows," noted Carol Tavris (1982), "what goes up must come down. Any emotional arousal will simmer down if you just wait long

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The catharsis myth: Is it true?

catharsis emotional release. The catharsis hypothesis maintains that "releasing" aggressive energy (through action or fantasy) relieves aggressive urges.

"Anger will never disappear so long as thoughts of resentment are cherished in the mind."

—The Buddha, 500 B.C.E.

enough." Second, deal with anger in a constructive way. Being chronically angry over every little annoyance or ruminating inwardly about the causes of your anger serves only to increase it (Rusting & Nolen-Hoeksema, 1998). Instead, calm yourself by exercising, playing an instrument, or talking it through with a friend. One Gallup survey indicated that teens found these tactics successful. Boys more than girls reported walking away from the situation or working it off with exercise. Girls more often reported talking with a friend, listening to music, or writing (Ray, 2005).

Civility means not only keeping silent about trivial irritations but also communicating important ones clearly and assertively. Anger can communicate strength and competence (Tiedens, 2001). Controlled expressions of anger are more adaptive than either hostile outbursts or pent-up angry feelings. When James Averill (1983) asked people to recall or keep careful records of their experiences with anger, they often recalled reacting assertively rather than hurtfully. Their anger frequently led them to discuss the conflicts with the offender, thereby lessening the aggravation. A nonaccusing statement of feeling—perhaps letting one's housemate know that "I get irritated when the dirty dishes are left for me to clean up"—can help resolve the conflicts that cause anger. Grievances expressed in ways that promote reconciliation rather than retaliation can benefit a relationship.

What if such tactics fail, but someone else's behavior has really hurt you? Research recommends the age-old response of forgiveness. Without letting the offender off the hook or inviting further harm, forgiveness releases anger and calms the body. To explore the bodily effects of forgiveness, Charlotte Witvliet and her coresearchers (2001) invited college students to recall an incident in which someone had hurt them. As the students mentally rehearsed forgiveness, their negative feelings—and their perspiration, blood pressure, heart rate, and facial tension—all were lower than when they rehearsed their grudges.

Happiness

28-5: What are the causes and consequences of happiness?

"How to gain, how to keep, how to recover happiness is in fact for most men at all times the secret motive for all they do," observed William James (1902, p. 76). Understandably so, for one's state of happiness or unhappiness colors everything. People who are happy perceive the world as safer, feel more confident, make decisions more easily, rate job applicants more favorably, are more cooperative and tolerant, and live healthier and more energized and satisfied lives (Briñol et al., 2007; Lyubomirsky et al., 2005; Pressman & Cohen, 2005). When your mood is gloomy and your thinking preoccupied, life as a whole seems depressing and meaningless. Let your mood brighten, and your thinking broadens and becomes more playful and creative (Amabile et al., 2005; Fredrickson, 2006; King et al., 2006). Your relationships, your self-image, and your hopes for the future also seem more promising. Positive emotions fuel upward spirals.

This helps explain why college students' happiness helps predict their life course. In one study, women who smiled happily in 1950s college yearbook photos were more likely to be married, and happily so, in middle age (Harker & Keltner, 2001). In another study, which surveyed thousands of U.S. college students in 1976 and restudied them at age 37, happy students had gone on to earn significantly more money than their less-happy-than-average peers (Diener et al., 2002).

Moreover—and this is one of psychology's most consistent findings—happiness doesn't just feel good, it does good. In study after study, a mood-boosting experience (finding money, succeeding on a challenging task, recalling a happy event) has made people more likely to give money, pick up someone's dropped papers, volunteer time, and do other good deeds. Psychologists call it the **feel-good, do-good phenomenon** (Salovey, 1990). (Doing good also promotes good feeling, a phenomenon harnessed by some happiness coaches as they assign people to perform a daily "random act of kindness" and to record the results.)

feel-good, do-good phenomenon people's tendency to be helpful when already in a good mood.

Despite the significance of happiness, psychology throughout its history has more often focused on negative emotions. Since 1887, *Psychological Abstracts* (a guide to psychology's literature) has included, as of this writing, 16,150 articles mentioning anger and 130,520 mentioning depression, but only 6895 on happiness. There is, of course, good reason to focus on negative emotions; they can make our lives miserable and drive us to seek help. But researchers are becoming increasingly interested in **subjective well-being,** assessed either as feelings of happiness (sometimes defined as a high ratio of positive to negative feelings) or as a sense of satisfaction with life. A new *positive psychology* is on the rise.

subjective well-being self-perceived happiness or satisfaction with life. Used along with measures of objective well-being (for example, physical and economic indicators) to evaluate people's quality of life.

The Short Life of Emotional Ups and Downs

Happiness research has focused on both our temporary moods and our long-term life satisfaction. Even over the course of an average day, our emotions vary (**FIGURE 28.8**), with positive emotion rising over the early to middle hours (Kahneman et al., 2004; Watson, 2000). Stressful events—an argument, a sick child, a car problem—can trigger a bad day. No surprise there. But by the next day, the gloom nearly always lifts (Affleck et al., 1994; Bolger et al., 1989; Stone & Neale, 1984). If anything, people tend to rebound from a bad day to a *better*-than-usual good mood the following day. (When in a bad mood, can you usually depend on rebounding within a day or two? Are your times of elation similarly hard to sustain?)

Over the long run, our emotional ups and downs tend to balance. After being struck by a severe disability, we may not rebound all the way back to our former emotions (Diener et al., 2006). But consider our remarkable adaptiveness and resilience:

- Learning that one is HIV-positive is devastating. But after five weeks of adapting to the grim news, those who have tested positive have reported feeling less emotionally distraught than they had expected (Sieff et al., 1999).
- Kidney dialysis patients recognize that their health is relatively poor, yet in their moment-to-moment experiences they report being just as happy as healthy nonpatients (Riis et al., 2005).
- European 8- to 12-year-olds with cerebral palsy experience normal psychological well-being (Dickinson et al., 2007).

A major disability often leaves people less happy than average, yet happier than able-bodied people with depression (Kübler et al., 2005; Lucas, 2007a,b; Oswald & Powdthavee, 2006; Schwartz & Estrin, 2004). "If you are a paraplegic," explains Daniel Kahneman (2005), "you will gradually start thinking of other things, and the more time you spend thinking of other things the less miserable you are going to be." Even patients "locked in" a motionless body "rarely want to die," report Eimar Smith and Mark Delargy (2005), which "counters a popular misconception that such patients would have been better off dead."

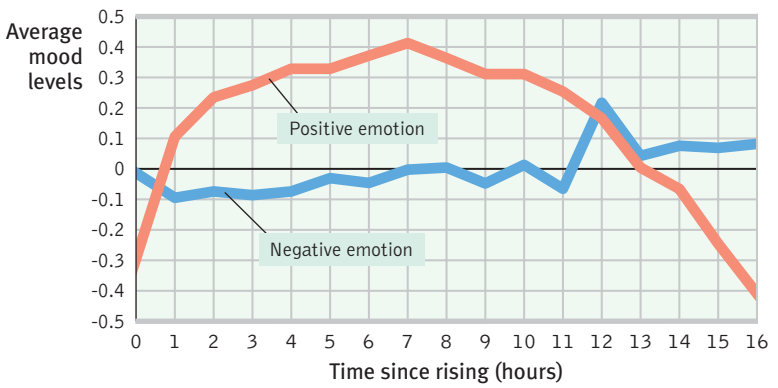

FIGURE 28.8 Moods across the day
When psychologist David Watson (2000) sampled nearly 4500 mood reports from 150 people, he found this pattern of variation from the average levels of positive and negative emotions.

adaptation-level phenomenon our tendency to form judgments (of sounds, of lights, of income) relative to a neutral level defined by our prior experience.

"Weeping may tarry for the night, but joy comes with the morning."
—Psalm 30:5

In less life-threatening contexts, the pattern continues. Faculty members up for tenure expect their lives would be deflated by a negative decision. Actually, 5 to 10 years later, those denied were not noticeably less happy than those who were awarded tenure (Gilbert et al., 1998). The same is true of romantic breakups, which feel devastating. The surprising reality: *We overestimate the duration of our emotions and underestimate our capacity to adapt.*

Wealth and Well-Being

"Do you think you would be happier if you made more money?" *Yes,* replied 73 percent of Americans in a 2006 Gallup poll. How important is "Being very well off financially"? *Very,* say many entering U.S. collegians (**FIGURE 28.9**). Some 3 in 4 students rate their top two objectives (among 21 possible) as being "very well off" and "raising a family," and they grade them "extremely important" or "essential."

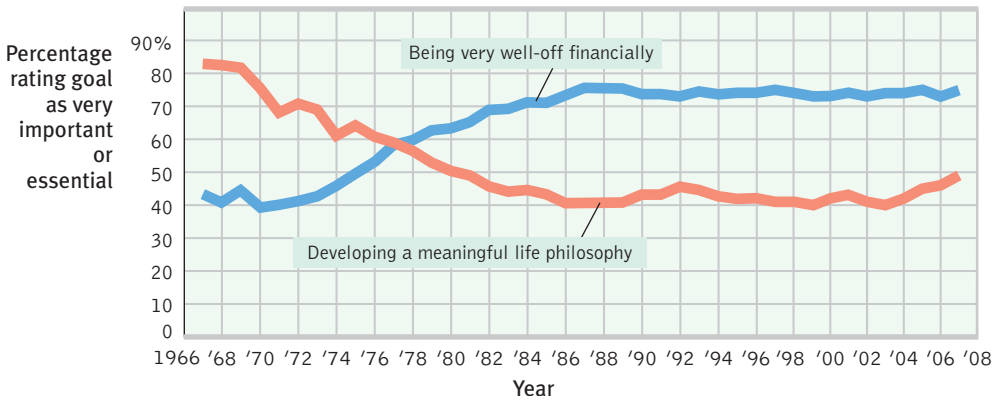

FIGURE 28.9 The changing materialism of entering collegians Surveys of more than 200,000 entering U.S. collegians per year have revealed an increasing desire for wealth after 1970. (From *The American Freshman* surveys, UCLA, 1966 to 2007.)

And, to a point, wealth does correlate with well-being. Consider:

- Within most countries, though especially in poor countries, individuals with lots of money are typically happier than those who struggle to afford life's basic needs (Diener & Biswas-Diener, 2009; Howell & Howell, 2008). They also often enjoy better health than those stressed by poverty and lack of control over their lives.
- People in rich countries are also somewhat happier than those in poor countries (Inglehart, 2009).
- Those who have experienced a recent windfall from a lottery, an inheritance, or a surging economy typically feel some elation (Diener & Oishi, 2000; Gardner & Oswald, 2007).

In World Values Surveys in 97 countries (Inglehart, 2008) and in Gallup (2008) surveys in 130 countries, the highest self-reported happiness was found in Denmark.

So, it seems that money enough to buy your way out of hunger and hopelessness also buys some happiness. But once one has enough money for comfort and security, piling up more and more affects happiness less and less.

C. Harley Schwadron/www.cartoonstock.com

"Money won't make you happy, Waldron. So instead of a raise, I'm giving a Prozac."

And consider this: During the last four decades, the average U.S. citizen's buying power almost tripled. Did this greater wealth—enabling twice as many cars per person, not to mention iPods, laptops, and smart phones—also buy more happiness? As **FIGURE 28.10** shows, the average American, though certainly richer, is not a bit happier. In 1957, some 35 percent said they were "very happy," as did slightly fewer—32 percent—in 2008. Much the same has been true of Europe, Australia, and Japan, where people enjoy better nutrition, health care, education, and science, and they are somewhat happier than those in very poor countries (Diener & Biswas-Diener, 2002, 2009; Speth, 2008). Yet their increasing real incomes have *not* produced increasing happiness. This finding lobs a bombshell at modern materialism: *Economic growth in affluent countries has provided no apparent boost to morale or social well-being.*

"Australians are three times richer than their parents and grandparents were in the 1950s, but they are not happier."
—The Australia Institute, *A Well-Being Manifesto,* 2005

Ironically, in every culture, those who strive hardest for wealth tend to live with lower well-being (Ryan, 1999), especially when those hard-driving people are seeking money to prove themselves, gain power, or show off rather than support their

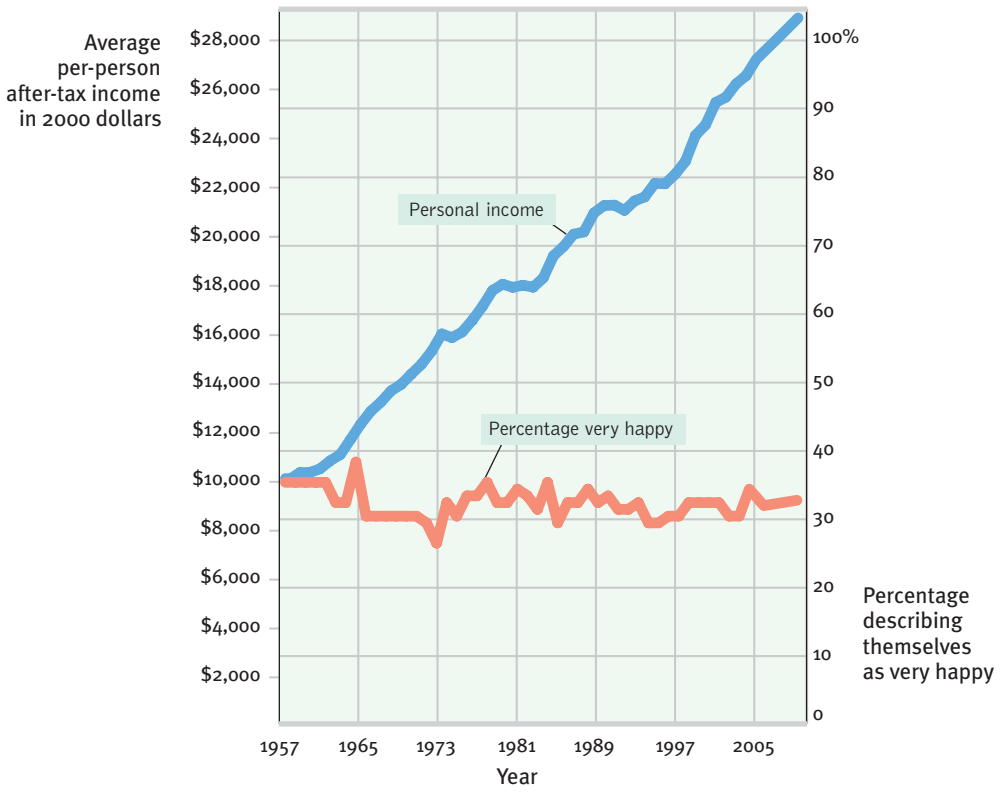

FIGURE 28.10 Does money buy happiness? It surely helps us to avoid certain types of pain. Yet, though buying power has almost tripled since the 1950s, the average American's reported happiness has remained almost unchanged. (Happiness data from National Opinion Research Center surveys; income data from *Historical Statistics of the United States* and *Economic Indicators*.)

families (Srivastava et al., 2001). Those who instead strive for intimacy, personal growth, and contribution to the community experience a higher quality of life (Kasser, 2000, 2002).

Two Psychological Phenomena: Adaptation and Comparison

Two psychological principles explain why, for those who are not poor, more money buys little more than a temporary surge of happiness and why our emotions seem attached to elastic bands that pull us back from highs or lows. In its own way, each principle suggests that happiness is relative.

Happiness and Prior Experience The **adaptation-level phenomenon** describes our tendency to judge various stimuli relative to those we have previously experienced. As psychologist Harry Helson (1898–1977) explained, we adjust our *neutral levels*—the points at which sounds seem neither loud nor soft, temperatures neither hot nor cold, events neither pleasant nor unpleasant—based on our prior experience. We then notice and react to variations up or down from these levels.

So, could we ever create a permanent social paradise? Social psychologist Donald Campbell (1975) answered *no:* If you woke up tomorrow to your utopia—perhaps a world with no bills, no ills, perfect scores, someone who loves you unreservedly—you would feel euphoric, for a time. But then you would gradually recalibrate your adaptation level. Before long, you would again sometimes feel gratified (when achievements

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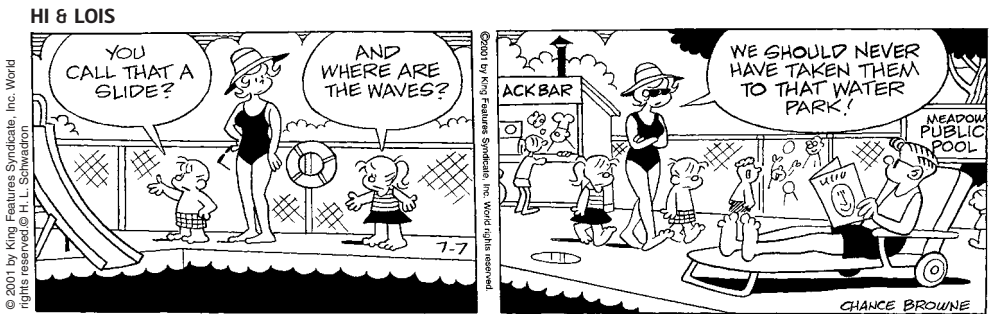
"But on the positive side, money can't buy happiness—so who cares?"

"No happiness lasts for long."
—Seneca, *Agamemnon,* C.E. 60

"Continued pleasures wear off. . . . Pleasure is always contingent upon change and disappears with continuous satisfaction."
—Dutch psychologist Nico Frijda (1988)

"I have a 'fortune cookie maxim' that I'm very proud of: Nothing in life is quite as important as you think it is while you are thinking about it. So, nothing will ever make you as happy as you think it will."
—Nobel laureate psychologist Daniel Kahneman, Gallup interview, "What Were They Thinking?" 2005



surpass expectations), sometimes feel deprived (when they fall below), and sometimes feel neutral. *The point to remember:* Satisfaction and dissatisfaction, success and failure—all are relative to our recent experience. Satisfaction, as Richard Ryan (1999) said, "has a short half-life."

relative deprivation the perception that we are worse off relative to those with whom we compare ourselves.

Happiness and Others' Attainments

Happiness is relative not only to our past experience but also to our comparisons with others (Lyubomirsky, 2001). We are always comparing ourselves with others. And whether we feel good or bad depends on who those others are. We are slow-witted or clumsy only when others are smarter or more agile.

"Shortly after I realized I had plenty, I realized there was plenty more."

Two examples: To explain the frustration expressed by U.S. Air Corps soldiers during World War II, researchers formulated the concept of **relative deprivation**—the sense that we are worse off than others with whom we compare ourselves. Despite a relatively rapid promotion rate for the group, many soldiers were frustrated about their own promotion rates (Merton & Kitt, 1950). Apparently, seeing so many others being promoted inflated the soldiers' expectations. And when expectations soar above attainments, the result is disappointment. Alex Rodriguez's 10-year, $275 million baseball contract surely made him temporarily happy, but it likely also diminished other star players' satisfaction with their lesser, multimillion-dollar contracts. Likewise, the economic surge that has made some urban Chinese newly affluent appears to have fueled among others a sense of relative deprivation (Burkholder, 2005a,b).

The effect of comparison with others helps explain why students of a given level of academic ability tend to have a higher academic self-concept if they attend a school where most other students are not exceptionally able (Marsh & Parker, 1984). If you were near the top of your graduating class, you might feel inferior upon entering a college or university where all students were near the top of their class.

Such comparisons help us understand why the middle- and upper-income people in a given country, who can compare themselves with the relatively poor, tend to be slightly more satisfied with life than their less fortunate compatriots. Nevertheless, once people reach a moderate income level, further increases buy little more happiness. Why? Because as people climb the ladder of success they mostly compare themselves with peers who are at or above their current level (Gruder, 1977; Suls & Tesch, 1978). "Beggars do not envy millionaires, though of course they will envy other beggars who are more successful," noted Bertrand Russell (1930, p. 90). Thus, "Napoleon envied Caesar, Caesar envied Alexander, and Alexander, I daresay, envied Hercules, who never existed. You cannot, therefore, get away from envy by means of success alone, for there will always be in history or legend some person even more successful than you are" (pp. 68–69).

Just as comparing ourselves with those who are better off creates envy, so counting our blessings as we compare ourselves with those worse off boosts our contentment. Marshall Dermer and his colleagues (1979) demonstrated this by asking University of Wisconsin-Milwaukee women to study others' deprivation and suffering. After viewing vivid depictions of how grim life was in Milwaukee in 1900, or after imagining and then writing about various personal tragedies, such as being burned and disfigured, the women expressed greater satisfaction with their own lives. Similarly, when mildly depressed people read about someone who is even more depressed, they feel somewhat better (Gibbons, 1986). "I cried because I had no shoes," states a Persian saying, "until I met a man who had no feet."

"Researchers say I'm not happier for being richer, but do you know how much researchers make?"

Predictors of Happiness

If, as the adaptation-level phenomenon implies, our emotions tend to rebound toward our normal, why are some people normally so joyful and others so gloomy? The answers vary somewhat by culture. Self-esteem matters more to individualistic Westerners, social acceptance matters more to those in communal cultures (Diener et al., 2003). But across many countries, research does reveal several predictors of happiness (**TABLE 28.1**).

TABLE 28.1 Happiness Is . . .

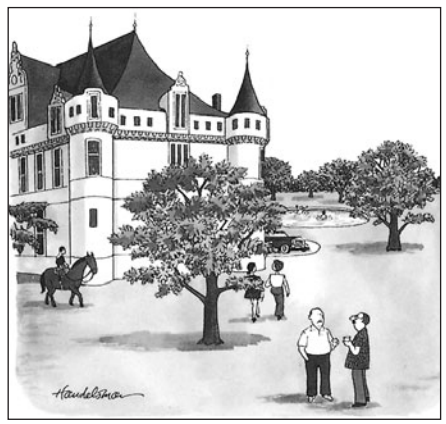
Researchers Have Found That Happy People Tend to	However, Happiness Seems Not Much Related to Other Factors, Such as
Have high self-esteem (in individualistic countries).	Age.
Be optimistic, outgoing, and agreeable.	Gender (women are more often depressed but also more often joyful).
Have close friendships or a satisfying marriage.	Parenthood (having children or not).
Have work and leisure that engage their skills.	Physical attractiveness.
Have a meaningful religious faith.	
Sleep well and exercise.	

Sources: Summarized from DeNeve & Cooper (1998), Diener et al. (2003), Lucas et al. (2004), Myers (1993, 2000), Myers & Diener (1995, 1996), and Steel et al. (2008).

Although tasks and relationships affect our happiness, genes matter, too. From their study of 254 identical and fraternal twins, David Lykken and Auke Tellegen (1996) estimated that 50 percent of the difference among people's happiness ratings is heritable. Thus, even identical twins raised apart are often similarly happy.

Studies of chimpanzees in zoos reveal that happiness in chimpanzees, as rated by 200 employees, is also genetically influenced (Weiss et al., 2000, 2002).

The point is not that, so far as long-term happiness goes, nothing really matters. After following thousands of lives over two decades, researchers have observed that people's "happiness set point" is not fixed (Lucas, 2008; Lucas & Donnellan, 2007). Satisfaction may rise or fall, and happiness can be influenced by factors that are under our control. A striking example: In a long-term German study, married partners were as similarly satisfied with their lives as were identical twins (Schimmack & Lucas, 2007). Genes matter. But as this study hints, relationship quality matters, too. (For research-based hints on enhancing your own happiness, see Close-Up: How to Be Happier on the next page.)



"I could cry when I think of the years I wasted accumulating money, only to learn that my cheerful disposition is genetic."

⋆ ⋆ ⋆

Our studies of happiness remind us that emotions combine physiological activation (left hemisphere especially), expressive behaviors (smiles), and conscious thoughts ("I was so ready for that test!") and feelings (pride, satisfaction). Fear, anger, happiness, and so much else have this in common: They are biopsychosocial phenomena. Our genetic predispositions, brain activity, outlooks, experiences, relationships, and cultures jointly form us.

Close-Up:

How to Be Happier

Happiness, like cholesterol level, is a genetically influenced trait. Yet as cholesterol is also influenced by diet and exercise, so our happiness is to some extent under our personal control. Here are some research-based suggestions for improving your mood and increasing your satisfaction with life.

1. ***Realize that enduring happiness may not come from financial success.*** People adapt to changing circumstances. Thus, wealth is like health: Its utter absence breeds misery, but having it (or any circumstance we long for) doesn't guarantee happiness.
2. ***Take control of your time.*** Happy people feel in control of their lives. To master your use of time, set goals and break them into daily aims. Although we often overestimate how much we will accomplish in any given day (leaving us frustrated), we generally underestimate how much we can accomplish in a year, given just a little progress every day.
3. ***Act happy.*** Manipulated into a smiling expression, people feel better, so put on a happy face. Talk as *if* you feel positive self-esteem, are optimistic, and are outgoing. Going through the motions can trigger the emotions.
4. ***Seek work and leisure that engage your skills.*** Happy people often are in a zone called *flow*—absorbed in tasks that challenge but don't overwhelm them. Passive forms of leisure (watching TV) often provide less flow experience than gardening, socializing, or craft work. Take time to savor such pleasant experiences.
5. ***Join the "movement" movement.*** Aerobic exercise can relieve mild depression and anxiety and promote health and energy. Sound minds reside in sound bodies. Off your duffs, couch potatoes.
6. ***Give your body the sleep it wants.*** Happy people live active, vigorous lives yet reserve time for renewing sleep and solitude. Many people suffer from sleep debt, with resulting fatigue, diminished alertness, and gloomy moods.
7. ***Give priority to close relationships.*** Intimate friendships with those who care deeply about you can help you weather difficult times. Confiding is good for soul and body. Resolve to nurture your closest relationships by *not* taking your loved ones for granted, by displaying to them the sort of kindness you display to others, by affirming them, by playing together and sharing together.
8. ***Focus beyond self.*** Reach out to those in need. Happiness increases helpfulness (those who feel good do good). But doing good also makes us feel good.
9. ***Count your blessings and record your gratitude.*** Keeping a gratitude journal heightens well-being (Emmons, 2007; Seligman et al., 2005). Try pausing each day to record positive events and why they occurred. Express your gratitude to others.
10. ***Nurture your spiritual self.*** For many people, faith provides a support community, a reason to focus beyond self, and a sense of purpose and hope. That helps explain why people active in faith communities report greater-than-average happiness and often cope well with crises.

Digested from David G. Myers, *The Pursuit of Happiness* (Harper, 1993).

Expressing and Experiencing Emotion

Module Review

28-1: How do we communicate nonverbally? Nonverbal communication includes gestures, facial expressions, and voice tones. Even very thin (seconds-long) filmed slices of behavior can reveal feelings. Women tend to be better at reading people's emotional cues, and their faces tend to express more emotion.

28-2: Are nonverbal expressions of emotion universally understood? The meaning of gestures varies from culture to culture. Facial expressions, such as those of happiness and fear, are common the world over. Cultures differ in the amount of emotion they express.

28-3: Do our facial expressions influence our feelings? Our facial expressions can amplify the emotions we are displaying and signal our body to respond accordingly. This is known as the facial feedback effect.

28-4: What are the causes and consequences of anger? Anger is most often evoked by events that are interpreted as willful, unjustified, and avoidable. Blowing off steam *(catharsis)* may be temporarily calming, but in the long run expressing anger can actually make us angrier.

28-5: What are the causes and consequences of happiness? A good mood boosts people's perceptions of the world and their willingness to help others (the *feel-good, do-good phenomenon*). Our moods tend to vary over the course of the day, and our good and bad moods tend to balance over the long run. We can explain the relativity of happiness with the *adaptation-level phenomenon* and the *relative deprivation* principle. Nevertheless, some people are usually happier than others, and researchers have identified factors that predict such *subjective well-being*.

Rehearse It!

1. People in different cultures are most likely to differ in their interpretations of
   a. adults' facial expressions.
   b. children's facial expressions.
   c. frowns.
   d. postures and gestures.

2. When people are induced to assume fearful expressions, they often report feeling a little fearful. This result is known as the _____ effect.
   a. facial feedback
   b. culture-specific
   c. natural mimicry
   d. emotional contagion

3. To bring down anger, a good first step is to
   a. retaliate verbally or physically.
   b. wait or "simmer down."
   c. express anger in action or fantasy.
   d. review the grievance silently.

4. After moving to a new apartment, you find the street noise irritatingly loud, but after a while, it no longer bothers you. This reaction illustrates the
   a. relative deprivation principle.
   b. adaptation-level principle.
   c. feel-good, do-good phenomenon.
   d. catharsis principle.

5. A philosopher observed that we cannot escape envy, because there will always be someone more successful, more accomplished, or richer with whom to compare ourselves. In psychology, this observation is embodied in the
   a. relative deprivation principle.
   b. adaptation-level principle.
   c. catharsis principle.
   d. feel-good, do-good phenomenon.

6. One of the most consistent findings of psychological research is that happy people are also
   a. more likely to express anger.
   b. generally luckier than others.
   c. concentrated in the wealthier nations.
   d. more likely to help others.

Answers: 1. d, 2. a, 3. b, 4. b, 5. a, 6. d.

Terms and Concepts to Remember

catharsis, p. 409
feel-good, do-good phenomenon, p. 410
subjective well-being, p. 411
adaptation-level phenomenon, p. 413
relative deprivation, p. 414

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. You are happy to have earned a B on an exam until you learn that most of your friends received an A. How can you explain your drop in mood?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

29

Stress and Health

What happens when our emotional experiences are both negative and prolonged? How does the human body respond to such experiences? And what strategies can help us cope with stress and lessen its effects?

Stress and Illness

29-1: What is stress?

You think roller coasters are scary? Imagine being 21-year-old Ben Carpenter on the world's wildest and fastest wheelchair ride. As he crossed an intersection on a sunny summer afternoon in 2007, the light changed. A large truck, whose driver didn't see him, started moving into the intersection. As they bumped, the wheelchair turned to face forward, its handles becoming stuck in the grille. And off they went, the driver unable to hear Ben's cries for help. As they sped down the highway about an hour from my home, passing motorists caught the bizarre sight of a truck pushing a wheelchair at 50 mph and started calling 911. (The first caller: "You are not going to believe this. There is a semi truck pushing a guy in a wheelchair on Red Arrow highway!") One passerby was an undercover police officer, who did a quick U-turn, followed the truck to its destination a couple of miles from where the incident started, and informed the disbelieving driver that he had a passenger hooked in his grille. "It was very scary," said Ben, who has muscular dystrophy.

AP Photo/Michigan State Police

Extreme stress Ben Carpenter experienced the wildest of rides after his wheelchair got stuck in a truck's grille.

Stress is a slippery concept. We sometimes use the word informally to describe threats or challenges ("Ben was under a lot of stress"), and at other times, to describe our responses ("Ben experienced acute stress"). To a psychologist, the dangerous truck ride was a *stressor.* Ben's physical and emotional responses were a *stress reaction*. And the process by which he related to the threat was *stress*.

Thus, **stress** is not just a stimulus or a response. It is the process by which we appraise and cope with environmental threats and challenges (**FIGURE 29.1**). Stress arises less from events themselves than from how we appraise them (Lazarus, 1998). One person, alone in a house, dismisses its creaking sounds and experiences no stress; someone else suspects an intruder and becomes alarmed.

When short-lived, or when perceived as challenges, stressors can have positive effects. A momentary stress can mobilize your immune system to fend off infection and heal a wound (Segerstrom, 2007). Stress can also arouse and motivate us to conquer problems. Championship athletes, successful entertainers, and great teachers

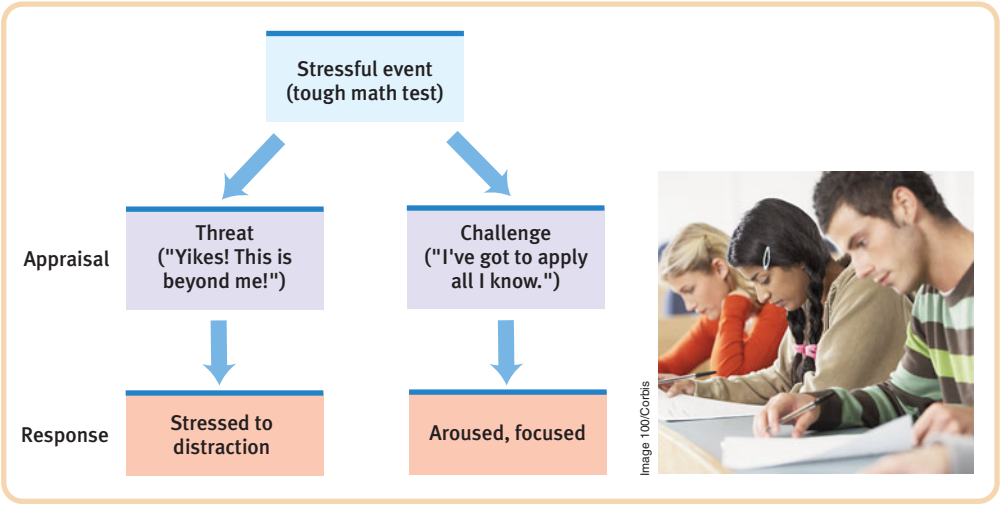


Image 100/Corbis

FIGURE 29.1 Stress appraisal The events of our lives flow through a psychological filter. How we appraise an event influences how much stress we experience and how effectively we respond.

and leaders all thrive and excel when aroused by a challenge (Blascovich et al., 2004). Having conquered cancer or rebounded from a lost job, some people emerge with stronger self-esteem and a deepened spirituality and sense of purpose. Indeed, some stress early in life is conducive to later emotional resilience (Landauer & Whiting, 1979). Adversity can beget growth.

But stressors can also threaten us. And experiencing severe or prolonged stress may harm us. Children's physiological responses to severe abuse put them at later risk of chronic disease (Repetti et al., 2002). Adults who had post-traumatic stress reactions to heavy combat in the Vietnam war went on to suffer greatly elevated rates of circulatory, digestive, respiratory, and infectious diseases (Boscarino, 1997).

stress the process by which we perceive and respond to certain events, called *stressors*, that we appraise as threatening or challenging.

general adaptation syndrome (GAS) Selye's concept of the body's adaptive response to stress in three phases—alarm, resistance, exhaustion.

The Stress Response System

Medical interest in stress dates back to Hippocrates (460–377 B.C.E.). But it was not until the 1920s that Walter Cannon (1929) confirmed that the stress response is part of a unified mind-body system. He observed that extreme cold, lack of oxygen, and emotion-arousing incidents all trigger an outpouring of the stress hormones epinephrine and norepinephrine from the central core of the adrenal glands. This is but one part of the sympathetic nervous system's response as it prepares the body for the wonderfully adaptive response Cannon called *fight or flight*.

There are alternatives to fight or flight. Faced with an extreme disaster, such as a ship sinking, some people become paralyzed by fear. Faced with a loved one's death, some withdraw, pull back, conserve energy.

Facing stress, men more often than women tend to socially withdraw, turn to alcohol, or become aggressive. Women more often respond to stress by nurturing and banding together for support (Taylor et al., 2000). Shelley Taylor (2006) attributes this *tend-and-befriend* response partly to *oxytocin*, a stress-moderating hormone associated with pair-bonding in animals and released by cuddling, massage, and breast-feeding in humans.

Canadian scientist Hans Selye (1936, 1976) devoted 40 years to understanding the body's response to stress. In studies of animals' reactions to various stressors, such as electric shock, surgical trauma, and immobilizing restraint, he discovered that the body's adaptive response is so general—like a single burglar alarm that sounds no matter what intrudes—that it merits the name **general adaptation syndrome (GAS).**

Selye saw the GAS as having three phases (**FIGURE 29.2**). Let's say you suffer a physical or emotional trauma. In Phase 1, you experience an *alarm reaction* due to the sudden activation of your sympathetic nervous system. Your heart rate zooms.

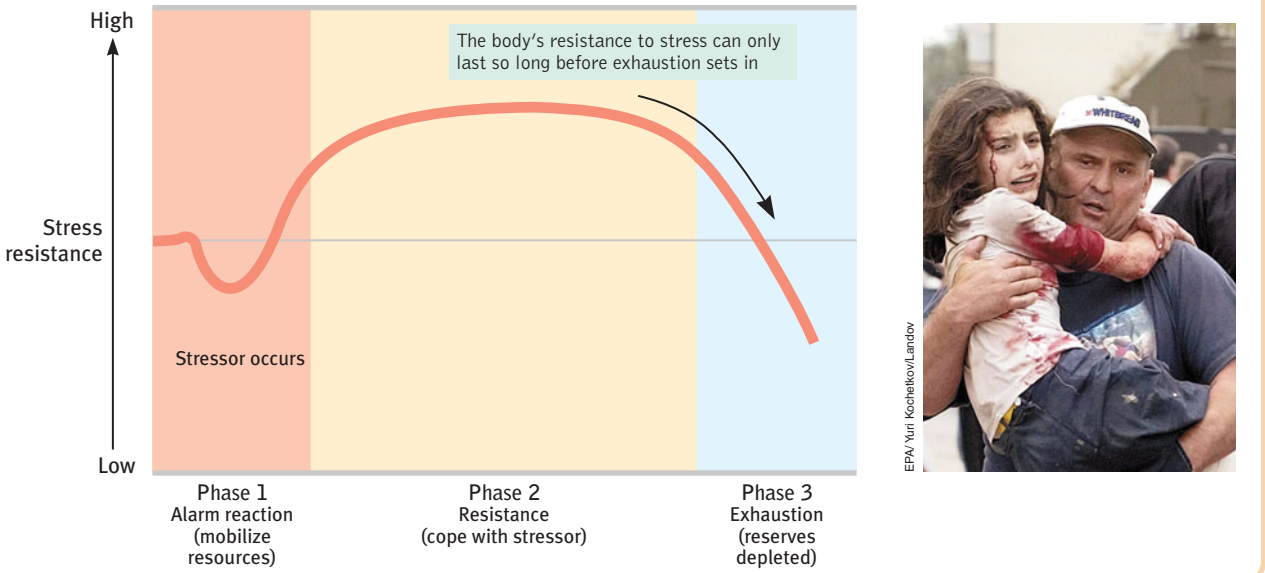


FIGURE 29.2 Selye's general adaptation syndrome This girl being carried to freedom and medical attention managed to escape her terrorist captors in a three-day school holdup in North Ossetia in 2004. After such a trauma, the body enters an alarm phase of temporary shock. From this it rebounds, as stress resistance rises. If the stress is prolonged, as it was for the 400 school hostages and their waiting loved ones, wear and tear may lead to exhaustion.

Blood is diverted to your skeletal muscles. You feel the faintness of shock. With your resources mobilized, you are now ready to fight the challenge during Phase 2, *resistance*. Your temperature, blood pressure, and respiration remain high, and there is a sudden outpouring of hormones. If persistent, the stress may eventually deplete your body's reserves during Phase 3, *exhaustion*. With exhaustion, you are more vulnerable to illness or even, in extreme cases, collapse and death.

Selye's work extended Cannon's findings and helped make stress a major concept in both psychology and medicine. Few today would quarrel with his basic point: Although the human body comes designed to cope with temporary stress, prolonged stress can produce physical deterioration. Even fearful, easily stressed rats have been found to die sooner (after about 600 days) than their more confident siblings, which average 700-day life spans. Still, questions remain: What stressors threaten us most? And how does stress harm us?

Stressful Life Events

29-2: What events provoke stress responses?

Research has focused on our responses to three types of stressors: catastrophes, significant life changes, and daily hassles.

Catastrophes

Catastrophes are unpredictable large-scale events, such as war and natural disasters, that nearly everyone appraises as threatening. Although people often provide one another with aid as well as comfort after such events, the health consequences can be significant. In the three weeks after the 9/11 terrorist attacks, two-thirds of Americans surveyed by University of Michigan researchers said they were having some trouble concentrating and sleeping (Wahlberg, 2001). In another national survey, New Yorkers were especially likely to report such symptoms (NSF, 2001). Sleeping pill prescriptions rose by a reported 28 percent in the New York area (HMHL, 2002).

Toxic stress On the day of its 1994 earthquake, Los Angeles experienced a fivefold increase in sudden-death heart attacks—especially in the first two hours after the quake and near its epicenter. Physical exertion (running, lifting debris) was a factor in only 13 percent of the deaths, leaving stress as the likely trigger for the others (Muller & Verier, 1996).

Les Stone/Corbis

Do other community disasters usually produce effects this great? After digesting data from 52 studies of catastrophic floods, hurricanes, and fires, Anthony Rubonis and Leonard Bickman (1991) found the typical effect more modest but nonetheless genuine. In disaster's wake, rates of psychological disorders such as depression and anxiety rose an average 17 percent. In the four months after Hurricane Katrina, New Orleans reportedly experienced a tripled suicide rate (Saulny, 2006). Refugees fleeing their homeland also suffer increased rates of psychological disorders. Their stress is twofold: the trauma of uprooting and family separation, and the challenges of adjusting to a foreign culture's new language, ethnicity, climate, and social norms (Pipher, 2002; Williams & Berry, 1991). In years to come, relocations necessitated by climate change may also produce such effects.

Significant Life Changes

The second type of life-event stressor is a significant personal life change—the death of a loved one, the loss of a job, leaving home, a marriage, a divorce. Life transitions and insecurities are often keenly felt during young adulthood. That helps explain why, when 15,000 Canadian adults were asked whether "You are trying to take on too many things at once," responses indicated highest stress levels among the youngest adults. The same is true of Americans: Half of adults under age 50 report "frequent" stress, as do fewer than 30 percent of those over 50 (Saad, 2001).

Some psychologists study the health effects of life changes by following people over time to see if such events precede illnesses. Others compare the life changes recalled by those who have or have not suffered a specific health problem, such as a heart attack. A

review of these studies commissioned by the U.S. National Academy of Sciences revealed that people recently widowed, fired, or divorced are more vulnerable to disease (Dohrenwend et al., 1982). A Finnish study of 96,000 widowed people confirmed the phenomenon: Their risk of death doubled in the week following their partner's death (Kaprio et al., 1987). Experiencing a cluster of crises puts one even more at risk.

Daily Hassles

Research shows that our happiness stems less from enduring good fortune than from our response to daily events—a hoped-for medical result, a perfect exam score, a gratifying e-mail, your team's winning the big game.

This principle works for negative events, too. Everyday annoyances—rush-hour traffic, aggravating housemates, long lines at the store, too many things to do, e-mail spam, and obnoxious cell-phone talkers—may be the most significant sources of stress (Kohn & Macdonald, 1992; Lazarus, 1990; Ruffin, 1993). Although some people can simply shrug off such hassles, others are "driven up the wall" by them. People's difficulties in letting go of unattainable goals is another everyday stressor with health consequences (Miller & Wrosch, 2007).

Over time, these little stressors can add up and take a toll on our health and well-being. Hypertension rates are high among residents of impoverished areas where the stresses that accompany inadequate income, unemployment, solo parenting, and overcrowding are part of daily life for many people. In Europe, hypertension rates are likewise highest in countries where people express the least satisfaction with their lives (Blanchflower & Oswald, 2008).

For minority populations, daily pressures may be compounded by racism, which—like other stressors—can have both psychological and physical consequences. Thinking that some of the people you encounter each day will distrust you, dislike you, or doubt your abilities makes daily life stressful. Such stress takes a toll on the health of many African-Americans, driving up blood pressure levels (Clark et al., 1999; Mays et al., 2007).

A 2009 Pew survey of 2969 American adults asked, "Is the recession causing stress in your family?"

Age	*"Yes" responses*
18–49	52%
50–64	58%
65+	38%

Stress and the Heart

29-3: Why are some of us more prone than others to coronary heart disease?

Elevated blood pressure is just one of the factors that increase the risk of **coronary heart disease,** the closing of the vessels that nourish the heart muscle. Although infrequent before 1900, this condition became by the 1950s North America's leading cause of death, and it remains so today. In addition to hypertension and a family history of the disease, many behavioral and physiological factors—smoking, obesity, a high-fat diet, physical inactivity, and an elevated cholesterol level—increase the risk of heart disease. The psychological factors of stress and personality also play a big role.

In a now-famous study, Meyer Friedman, Ray Rosenman, and their colleagues tested the idea that stress increases vulnerability to heart disease (Friedman & Ulmer, 1984). They measured the blood cholesterol level and clotting speed of 40 U.S. tax accountants. From January through March, both of these coronary warning indicators registered completely normal. Then, as the accountants began scrambling to finish their clients' tax returns before the April 15 filing deadline, their cholesterol and clotting measures rose to dangerous levels. In May and June, with the deadline past, the measures returned to normal. The researchers' hunch had paid off: Stress predicted heart attack risk.

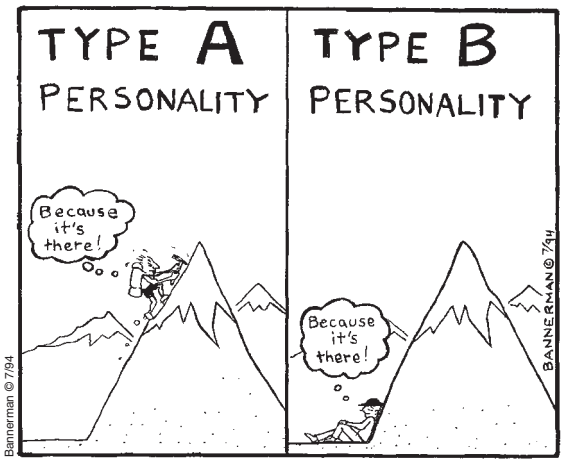
The stage was set for Friedman and Rosenman's classic nine-year study of more than 3000 healthy men aged 35 to 59. At the start of the study, they interviewed each man for 15 minutes about his work and eating habits. During the interview, they noted the man's manner of talking and other behavioral patterns. Those who seemed the most reactive, competitive, hard-driving, impatient, time-conscious, supermotivated, verbally aggressive, and easily angered they called **Type A.** The roughly equal number who were more easygoing they called **Type B.** Which group do you suppose turned out to be the most coronary prone?

coronary heart disease the clogging of the vessels that nourish the heart muscle; the leading cause of death in North America.

Type A Friedman and Rosenman's term for competitive, hard-driving, impatient, verbally aggressive, and anger-prone people.

Type B Friedman and Rosenman's term for easygoing, relaxed people.

In both India and America, Type A bus drivers are literally hard-driving: They brake, pass, and honk their horns more often than their more easygoing Type B colleagues (Evans et al., 1987).



By the time the study was complete, 257 men had suffered heart attacks; 69 percent of them were Type A. Moreover, not one of the "pure" Type Bs—the most mellow and laid-back of their group—had suffered a heart attack.

As often happens in science, this exciting and revolutionary discovery provoked enormous public interest. But after the honeymoon period, researchers began asking new questions: Is the finding reliable? If so, what is the toxic component of the Type A profile: Time-consciousness? Competitiveness? Anger?

Type A's toxic core was revealed to be negative emotions, especially the anger associated with an aggressively reactive temperament (Smith, 2006; Williams, 1993). Type A individuals are more often "combat ready," as their aroused sympathetic nervous systems redistribute bloodflow to their muscles and away from internal organs such as the liver, which normally removes cholesterol and fat from the blood. Thus, excess cholesterol and fat may continue to circulate in their bloodstream and later be deposited around their heart. Further stress—sometimes conflicts brought on by the Type A person's own abrasiveness—may trigger the altered heart rhythms that, in those with weakened hearts, can cause sudden death (Kamarck & Jennings, 1991). In important ways, people's minds and hearts interact.

"The fire you kindle for your enemy often burns you more than him."
—Chinese proverb

The effect of an anger-prone personality appears most noticeably in studies in which interviewers assess verbal assertiveness and emotional intensity. (If you pause in the middle of a sentence, an intense, anger-prone person may jump in and finish it for you.) One study of young and middle-aged adults found that those who react with anger over little things are the most prone to coronary problems, and that suppressing negative emotions only heightens the risk (Kupper & Denollet, 2007). Another study (Williams et al., 2000) that followed 13,000 middle-aged people for 5 years found that among those with normal blood pressure, people who had scored high on anger were three times more likely to have had heart attacks. Those odds held even after researchers controlled for smoking and weight, which, along with drinking, tend to correlate with hostility (Bunde & Suls, 2006). The link between anger and heart attacks also appeared in a study that followed 1055 male medical students over an average of 36 years. Those who had reported being hot-tempered were five times more likely to have had a heart attack by age 55 (Chang et al., 2002). As Charles Spielberger and Perry London (1982) put it, rage "seems to lash back and strike us in the heart muscle."

Pessimism seems to be similarly toxic. Laura Kubzansky and her colleagues (2001) studied 1306 initially healthy men who a decade earlier had scored as optimists, pessimists, or neither. Even after other risk factors such as smoking had been ruled out, pessimists were more than twice as likely as optimists to develop heart disease (**FIGURE 29.3**).

Depression, too, can be lethal. The accumulated evidence from 57 studies suggests that "depression substantially increases the risk of death, especially death by unnatural causes and cardiovascular disease" (Wulsin et al., 1999). One study of

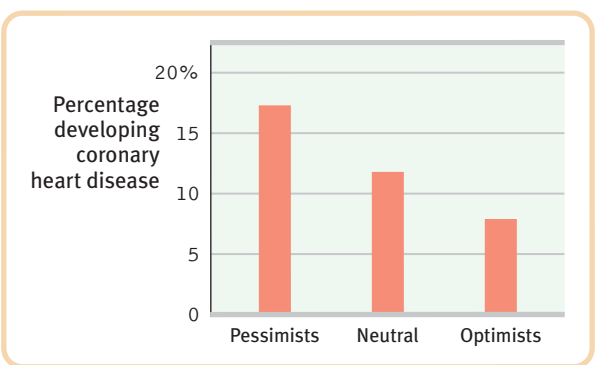


FIGURE 29.3 Pessimism and heart disease A Harvard School of Public Health team found pessimistic adult men at doubled risk of developing heart disease over a 10-year period. (From Kubzansky et al., 2001.)

7406 women age 67 or older found that among those with no depressive symptoms, 7 percent died within six years, as did 24 percent of those with six or more depressive symptoms (Whooley & Browner, 1998). In the years following a heart attack, people with high scores for depression are four times more likely than their low-scoring counterparts to develop further heart problems (Frasure-Smith & Lesperance, 2005). Depression is disheartening.

"A cheerful heart is a good medicine, but a downcast spirit dries up the bones."
—Proverbs 17:22

Stress and Susceptibility to Disease

29-4: How does stress make us more vulnerable to disease?

Not so long ago, the term *psychosomatic* described psychologically caused physical symptoms. To laypeople, the term implied that the symptoms were unreal—"merely" psychosomatic. To avoid such connotations and to better describe the genuine physiological effects of psychological states, most experts today refer instead to stress-related **psychophysiological illnesses,** such as hypertension and some headaches. Stress also affects our disease-fighting immune system.

Stress and the Immune System

Hundreds of experiments have revealed the nervous and endocrine systems' influences on the immune system (Sternberg, 2001). Your immune system is a complex surveillance system that defends your body by isolating and destroying bacteria, viruses, and other foreign substances. This system includes two types of white blood cells, called **lymphocytes.** *B lymphocytes* form in the *b*one marrow and release antibodies that fight bacterial infections. *T lymphocytes* form in the *t*hymus and other lymphatic tissue and attack cancer cells, viruses, and foreign substances—even "good" ones, such as transplanted organs. Two other important agents of the immune system are the *macrophage* ("big eater"), which identifies, pursues, and ingests harmful invaders and worn-out cells (FIGURE 29.4), and the *natural killer cells* (NK cells), which pursue diseased cells (such as those infected by viruses or cancer).

psychophysiological illness literally, "mind-body" illness; any stress-related physical illness, such as hypertension and some headaches.

lymphocytes the two types of white blood cells that are part of the body's immune system: *B lymphocytes* form in the *b*one marrow and release antibodies that fight bacterial infections; *T lymphocytes* form in the *t*hymus and other lymphatic tissue and attack cancer cells, viruses, and foreign substances.

Age, nutrition, genetics, body temperature, and stress all influence the immune system's activity, which can err in two directions. Responding too strongly, it may attack the body's own tissues, causing arthritis or an allergic reaction. Underreacting, it may allow a dormant herpes virus to erupt or cancer cells to multiply. Women are immunologically stronger than men, making them less susceptible to infections (Morell, 1995). But this very strength also makes them more susceptible to self-attacking diseases, such as lupus and multiple sclerosis.

Your immune system is not a headless horseman. The brain regulates the secretion of stress hormones, which suppress the disease-fighting lymphocytes. Thus, when animals are physically restrained, given unavoidable electric shocks, or subjected to noise, crowding, cold water, social defeat, or maternal separation, their immune systems become less active (Maier et al., 1994). One study monitored immune responses in 43 monkeys over six months (Cohen et al., 1992). Twenty-one were stressed by being housed with new roommates—three or four new monkeys—each month. (To empathize with the monkeys, recall the stress of leaving home to attend school or summer camp, and imagine having to repeat this experience monthly.)

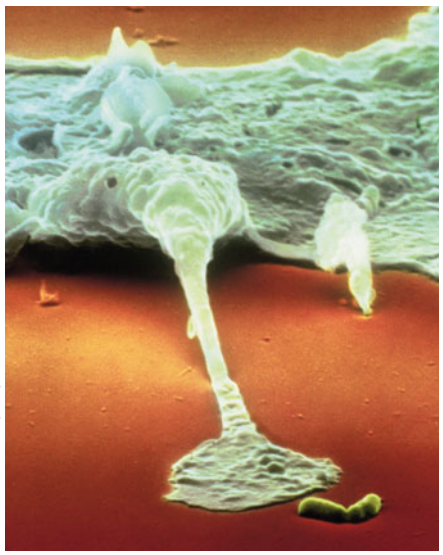

Lennart Nilsson/Boehringer Ingelheim International GmbH

FIGURE 29.4 **The immune system in action** A large macrophage (at top) is about to trap and ingest a tiny bacterium (lower right). Macrophages constantly patrol our bodies in search of invaders—such as this *Escherichia coli* bacterium—and debris, such as worn-out red blood cells.

Compared with monkeys left in stable groups, the socially disrupted monkeys experienced weakened immune systems. Stress similarly depresses the immune system of humans:

- *Slower healing of wounds.* In one experiment, dental students received punch wounds (precise small holes punched in the skin). Compared with wounds placed during summer vacation, those placed three days before a major exam healed 40 percent more slowly (Kiecolt-Glaser et al., 1998).
- *Greater vulnerability to infection.* After a virus was dropped in their nose, 47 percent of people living stress-filled lives developed colds, as did only 27 percent of those living relatively free of stress (**FIGURE 29.5**). In follow-up research, the happiest and most relaxed people were likewise markedly less vulnerable to an experimentally delivered cold virus (Cohen et al., 2003, 2006).

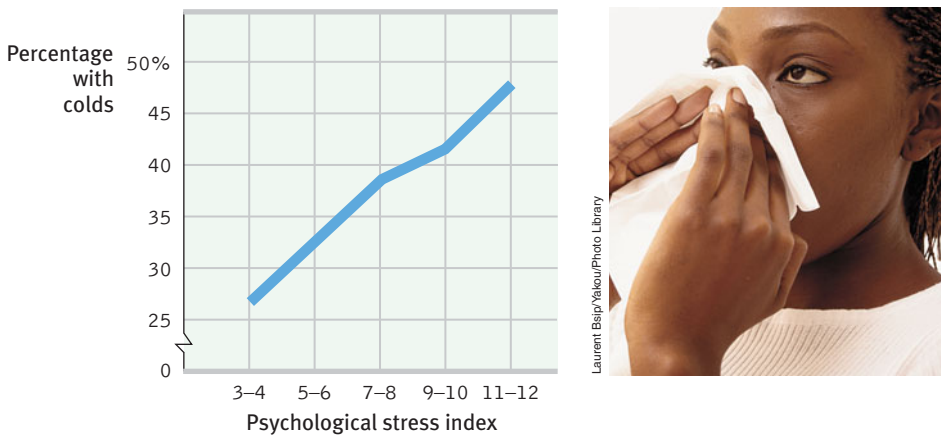


FIGURE 29.5 Stress and colds In an experiment by Sheldon Cohen and colleagues (1991), people with the highest life stress scores were also most vulnerable when exposed to an experimentally delivered cold virus.

The stress effect on immunity makes physiological sense (Maier et al., 1994). It takes energy to fight infections and maintain fevers. Thus, when diseased, our bodies reduce muscular energy output by inactivity and increased sleep. But stress creates a competing energy need. Stress triggers an aroused fight-or-flight response, diverting energy from the disease-fighting immune system to the muscles and brain, rendering us more vulnerable to illness. Perhaps it's not surprising, then, that one personality trait shared by 169 centenarians (people over 100) was their ability to manage stress well (Perls et al., 1999). *The bottom line:* Stress does not make us sick, but it does alter our immune functioning, making us less able to heal rapidly or to resist infection.

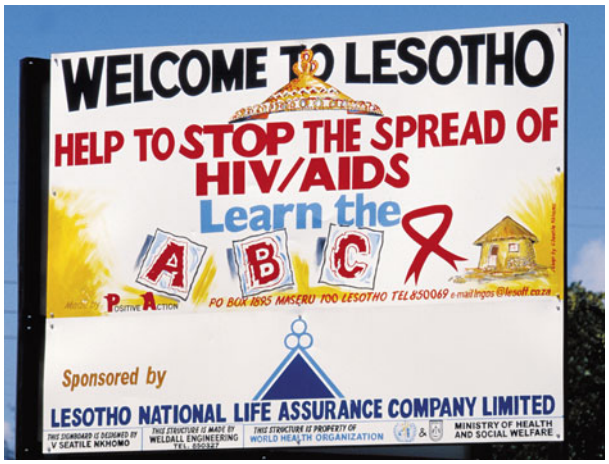
"When the heart is at ease, the body is healthy."
—Chinese proverb

Stress and AIDS

AIDS has become the world's fourth leading cause of death and the number one killer in Africa. As its name tells us, AIDS is an immune disorder—an *acquired immune deficiency syndrome* caused by the *human immunodeficiency virus (HIV)*, which is spread by the exchange of bodily fluids, primarily semen and blood. When a disease spread by human contact kills slowly, as AIDS does, it ironically can be lethal to more people. Those who carry the virus have time to spread it, often without realizing they are infected. When the HIV infection manifests itself as AIDS, some years after the initial infection, the person has difficulty fighting off other diseases, such as pneumonia. Worldwide, reports the United Nations, more than 20 million people have died of AIDS (UNAIDS, 2008). (In the United States, where "only" a half-million of these fatalities have occurred, AIDS has killed more people than did combat in all the twentieth-century wars.) In 2007, worldwide some 2.7 million—half of them women—were infected with HIV, often without their awareness (UNAIDS, 2008).

In North America and Western Europe, 75 percent of people with AIDS are men. In Sub-Saharan Africa, 60 percent of people with AIDS are women (and among 15- to 24-year-olds, 75 percent are women). Girls' thin layer of cervical cells makes them especially vulnerable (Altman, 2004; UNAIDS, 2005).

So if stress restrains the immune system's response to infections, could it also exacerbate the *course* of AIDS? Researchers have found that stress and negative emotions do correlate with (a) a progression from HIV infection to AIDS, and (b) the



UNAIDS/G. Pirozzi

Africa is ground zero for AIDS Part of the AIDS prevention effort in Lesotho and elsewhere is the "ABC" Campaign—Abstinence, Be faithful, and use Condoms.

speed of decline in those infected (Bower et al., 1998; Kiecolt-Glaser & Glaser, 1995; Leserman et al., 1999). HIV-infected men faced with stressful life circumstances, such as the loss of a partner, exhibit somewhat greater immune suppression and a faster disease progression.

Would efforts to reduce stress help control the disease? Although the benefits are small compared with available drug treatments, the answer appears again to be *yes*. Educational initiatives, bereavement support groups, cognitive therapy, relaxation training, and exercise programs that reduce distress have all had positive consequences for HIV-positive individuals (Baum & Posluszny, 1999; McCain et al., 2008; Schneiderman, 1999). Better yet is preventing HIV infection, which is the focus of many educational programs, such as the ABC (*a*bstinence, *b*eing faithful, *c*ondom use) program used in many countries, with seeming success in Uganda (Altman, 2004; USAID, 2004).

Stress and Cancer

Some investigators have reported that people are at increased risk for cancer within a year after experiencing depression, helplessness, or bereavement. One large Swedish study revealed that people with a history of workplace stress had 5.5 times greater risk of colon cancer than those who reported no such problems, a difference not attributable to differing age, smoking, drinking, or physical characteristics (Courtney et al., 1993).

Other researchers, however, have found no link between stress and human cancer (Edelman & Kidman, 1997; Fox, 1998; Petticrew et al., 1999, 2002). Concentration camp survivors and former prisoners of war, for example, have not exhibited elevated cancer rates.

One danger in hyping reports on stress management and cancer is that some patients may then blame themselves for their illness—"If only I had been more expressive, relaxed, and hopeful." A corollary danger is a "wellness macho" among the healthy, who take credit for their "healthy character" and lay a guilt trip on the ill: "She has cancer? That's what you get for holding your feelings in and being so nice." Dying thus becomes the ultimate failure.

"I didn't give myself cancer."

—Mayor Barbara Boggs Sigmund, 1939–1990, Princeton, New Jersey

The emerging view seems to be that stress does *not* create cancer cells. At worst, it may affect their growth by weakening the body's natural defenses against proliferating malignant cells (Antoni & Lutgendorf, 2007). Although a relaxed, hopeful state may enhance these defenses, we should be aware of the thin line that divides science from wishful thinking. The powerful biological processes at work in advanced cancer or AIDS are not likely to be completely derailed by avoiding stress or maintaining a relaxed but determined spirit (Anderson, 2002; Kessler et al., 1991). Often, however, patients or their friends and families look to less certain sources for help in preventing or defeating illnesses (see Thinking Critically About: Complementary and Alternative Medicine on the next page).

When organic causes of illness are unknown, it is tempting to invent psychological explanations. Before the germ that causes tuberculosis was discovered, personality explanations of TB were popular (Sontag, 1978).

Thinking Critically About:

Complementary and Alternative Medicine

One health care growth market is **complementary and alternative medicine (CAM),** which includes relaxation, acupuncture, massage therapy, homeopathy, spiritual healing, herbal remedies, chiropractic, and aromatherapy. In Germany, herbal remedies and homeopathy are enormously popular. In China, herbal therapies have long flourished, as have acupuncture and acupressure therapies that claim to correct "imbalances of energy flow" (called *Qi* or *Chi*) at identifiable points close to the skin. Andrew Weil's many books on alternative medicine have sold millions of copies, putting him on the cover of *Time* magazine.

Facing political pressure to explore these techniques, the U.S. National Institutes of Health (NIH) established the National Center for Complementary and Alternative Medicine, which the center defines as health care treatments not taught widely in medical schools, not usually reimbursed by insurance companies, and not used in hospitals (**TABLE 29.1**).

So what shall we make of CAM? Some aspects, such as life-style changes and stress management, have acknowledged validity. And certain techniques have proved useful for specific ailments, such as acupuncture, massage therapy, and aromatherapy for pain relief in cancer patients (Fellowes et al., 2004). Do the other aspects offer, as some believe, a new medical paradigm?

Critics point out that people consult physicians for diagnosable, curable diseases and turn to CAM techniques either for incurable illnesses or when well but feeling subpar. Thus, an otherwise healthy person with a cold may try an herbal remedy and then credit the subsequent return to good health to CAM, rather than to the body's natural return to normal. CAM will seem especially effective with cyclical diseases, such as arthritis and allergies, as people seek therapy during the downturn and presume its effectiveness during the ensuing upturn. Add to this the healing power of belief—the *placebo effect*—plus the natural disappearance *(spontaneous remission)* of many diseases, and CAM practices are bound to seem effective, whether they are or not. One study of 302 migraine headache patients in Germany found that 51 percent of those receiving acupuncture treatment found relief, as did only 15 percent of those in a waiting list control group. But among a third group that received "sham acupuncture" (needles inserted at nonacupuncture points), 53 percent enjoyed relief. Such results, the investigators suspected, may indicate "a powerful placebo effect" (Linde et al., 2005).

As always, the way to discern what works and what does not is to experiment: Randomly assign patients to receive the therapy or a placebo control. Then ask the critical question: When neither the therapist nor the patient knows who is getting the real therapy, is the real therapy effective?

Much of today's mainstream medicine began as yesterday's alternative medicine. Natural botanical life has given us digitalis (from purple foxglove), morphine (from the opium poppy), and penicillin (from penicillium mold). In each case, the active ingredient was verified in controlled trials. We have medical and public health science to thank for the antibiotics, vaccines, surgical procedures, sanitation, and emergency medicine that helped lengthen our life expectancy by three decades during the last century.

"CAM changes continually," notes the National Center for Complementary and Alternative Medicine (2006), "as those therapies that are proven to be safe and effective become adopted into conventional health care." Indeed, said *New England Journal of Medicine* editors Marcia Angell and Jerome Kassirer (1998), "there cannot be two kinds of medicine—conventional and alternative. There is only medicine that has been adequately tested and medicine that has not, medicine that works and medicine that may or may not work. Once a treatment has been tested rigorously, it no longer matters whether it was considered alternative at the outset."

"In God we trust. All others must have data."

—George Lundberg, Editor, *Journal of the American Medical Association,* 1998

complementary and alternative medicine (CAM) as yet unproven health care treatments intended to supplement (complement) or serve as alternatives to conventional medicine, and which typically are not widely taught in medical schools, used in hospitals, or reimbursed by insurance companies. When research shows a therapy to be safe and effective, it usually then becomes part of accepted medical practice.

TABLE 29.1 Five Domains of Complementary and Alternative Medicine

Alternative medical systems	Therapies used in place of conventional medicine, including homeopathy in Western cultures and traditional practices in non-Western cultures, such as those native to China and India.
Mind-body interventions	Techniques designed to enhance the mind's capacity to affect bodily functions and symptoms, including meditation, prayer, mental healing, and therapies that use creative outlets such as art, music, or dance.
Biologically based therapies	Therapies using natural substances such as herbs, foods, and vitamins.
Manipulative and body-based methods	Based on manipulation and/or movement of one or more parts of the body, including chiropractic or osteopathic manipulation, and massage.
Energy therapies	Theories using presumed energy fields. Biofield therapies, such as qi gong, Reiki, and therapeutic touch, are intended to affect energy fields that purportedly surround and penetrate the human body. Bioelectromagnetic-based therapies involve the unconventional use of electromagnetic fields, such as pulsed or magnetic fields.

Source: Adapted from the National Center for Complementary and Alternative Medicine, NIH http://nccam.nih.gov/health/whatiscam.

★ ★ ★

We can view the stress effect on our disease resistance as a price we pay for the benefits of stress. Stress invigorates our lives by arousing and motivating us. An unstressed life would hardly be challenging or productive. Moreover, it pays to spend our resources in fighting or fleeing an external threat. But we do so at the cost of diminished resources for fighting internal threats to health. When the stress is momentary, the cost is negligible. When uncontrollable aggravations persist, the cost may become considerable (**FIGURE 29.6**).

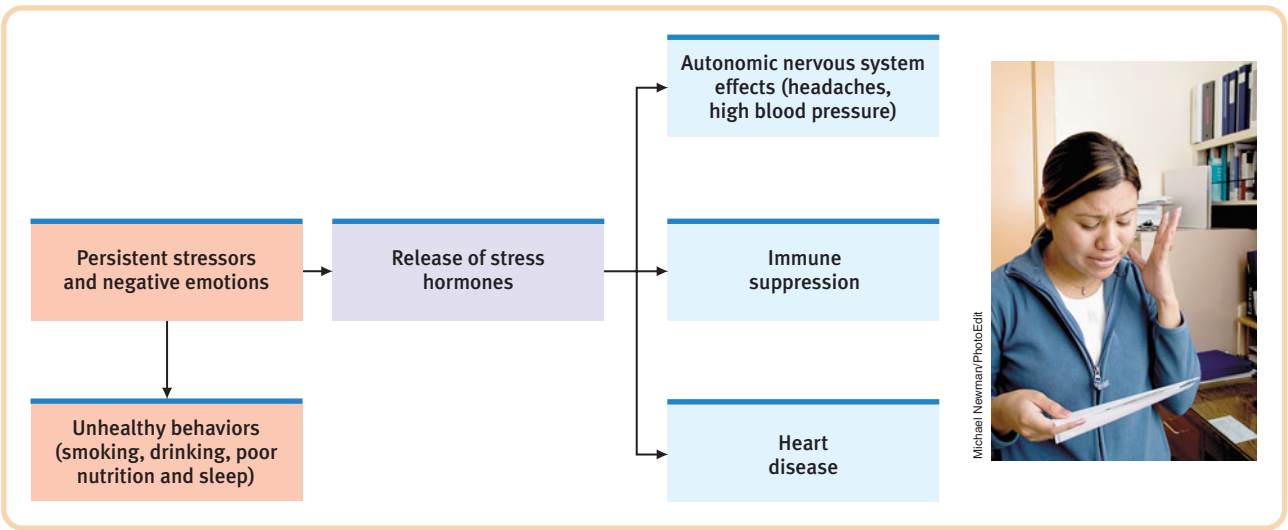


FIGURE 29.6 Stress can have a variety of health-related consequences This is especially so when experienced by "disease-prone" angry, depressed, or anxious persons.

The interplay between stress and health provides yet another reminder of one of contemporary psychology's overriding themes: *Mind and body interact; everything psychological is simultaneously physiological.* Psychological states are physiological events that influence other parts of our physiological system. Just pausing to *think* about biting into an orange section—the sweet, tangy juice from the pulpy fruit flooding across your tongue—can trigger salivation. As the Indian sage Santi Parva recognized more than 4000 years ago, "Mental disorders arise from physical causes, and likewise physical disorders arise from mental causes." We are biopsychosocial systems.

Promoting Health

Too often, we think about our health only when something goes wrong, and then rush to a physician for diagnosis and treatment. That strategy is like ignoring a car's maintenance and going to a mechanic only when the car breaks down. A wiser tactic is maintaining our health by alleviating stress, preventing illness, and promoting well-being.

Coping With Stress

29-5: What factors affect our ability to cope with stress?

Stressors are unavoidable. This fact, coupled with the fact that persistent stress correlates with heart disease, depression, and lowered immunity, sends us a clear message. We need to learn to **cope** with the stress in our lives. When we feel a sense of control over a situation and think we can change the circumstances or change ourselves, we may address stressors directly, with **problem-focused coping.** For example, if our impatience leads to a family fight, we may go directly to that family member to work things out. When we cannot—or believe we cannot—change a situation, we may turn to **emotion-focused coping.** If, despite our best efforts, we cannot get along with that family member, we may reach out to friends to help address our own emotional needs.

coping alleviating stress using emotional, cognitive, or behavioral methods.

problem-focused coping attempting to alleviate stress directly—by changing the stressor or the way we interact with that stressor.

emotion-focused coping attempting to alleviate stress by avoiding or ignoring a stressor and attending to emotional needs related to one's stress reaction.

Emotion-focused strategies can be nonadaptive, as when students worried about not keeping up with the reading in class go out and party to clear their mind. A problem-focused strategy (catching up with the reading) would more effectively reduce stress and promote long-term health and satisfaction. But when challenged, some people tend to respond more with cool problem-focused coping, others with emotion-focused coping (Connor-Smith & Flachsbart, 2007). Several factors affect the ability to cope successfully, including feelings of personal control, outlook, and supportive connections.

Perceived Control

Studies indicate that uncontrollable threats trigger the strongest stress responses (Dickerson & Kemeny, 2004). If two rats receive simultaneous shocks, but one can turn a wheel to stop the shocks, the helpless rat will be more susceptible to ulcers and lowered immunity to disease (Laudenslager & Reite, 1984). In humans, a bacterial infection often combines with uncontrollable stress to produce the most severe ulcers (Overmier & Murison, 1997). To cure the ulcer, kill the bug with antibiotics and control the stomach's acid secretions with reduced stress.

Perceiving a loss of control, we become more vulnerable to ill health. Elderly nursing home residents with little perceived control over their activities tend to decline faster and die sooner than do those given more control (Rodin, 1986). Workers who can control their work environment—by adjusting office furnishings and controlling interruptions and distractions—also experience less stress (O'Neill, 1993). This helps explain why Finnish workers with low job stress are less than half as likely to die of cardiovascular disease as are those with a demanding job and little control. The more control workers have, the longer they live (Bosma et al., 1997, 1998; Kivimaki et al., 2002; Marmot et al., 1997).

Control may also help explain a well-established link between economic status and longevity. In one study, inhabitants of Scottish regions with the least overcrowding and unemployment outlived less affluent Scots. There and elsewhere, high economic status predicts a lower risk of heart and respiratory diseases (Sapolsky, 2005). Wealthy predicts healthy among children, too, with reduced risks of infant mortality, low birth weight, smoking, and violence (Chen, 2004). Even among other primates, those at the top of the social pecking order are less likely than their lower-status companions to become sick when exposed to a coldlike virus (Cohen et al., 1997). But high status also entails stress for baboons and monkeys who frequently have to physically defend their dominant position (Sapolsky, 2005).

Why does perceived loss of control predict health problems? Animal studies show—and human studies confirm—that losing control provokes an outpouring of stress hormones. When rats cannot control shock or when primates or humans feel unable to control their environment, stress hormone levels rise, blood pressure increases, and immune responses drop (Rodin, 1986; Sapolsky, 2005). Captive animals therefore experience more stress and are more vulnerable to disease than are wild animals (Roberts, 1988). The crowding that occurs in high-density neighborhoods, prisons, and college and university dorms is another source of diminished feelings of control—and of elevated levels of stress hormones and blood pressure (Fleming et al., 1987; Ostfeld et al., 1987).

Optimism and Health

Can our basic outlook influence our ability to cope with stress? Studies indicate that it can. Compared with pessimists, *optimists*—people who agree with statements such as, "In uncertain times, I usually expect the best"—perceive more control, cope better with stressful events, and enjoy better health (Scheier & Carver, 1992). During the stressful first few weeks of law school, students who are optimistic ("It's unlikely that I will fail") enjoy better moods and stronger infection-thwarting immune systems (Segerstrom et al., 1998).

Consider the consistency and startling magnitude of the optimism and positive emotions factor in several other studies:

- One research team followed 941 Dutch people, ages 65 to 85, for nearly a decade (Giltay et al., 2004, 2007). Among those in the lowest optimism quartile, 57 percent died, as did only 30 percent of the top optimism quartile.
- Another study asked 795 Americans, ages 64 to 79 years, if they were "hopeful about the future." When the researchers checked up on these folks about 5 years later, 29 percent of those answering *no* had died—more than double the 11 percent of deaths among those who said *yes* (Stern et al., 2001).
- A now-famous study followed up on 180 Catholic nuns who had written brief autobiographies at about 22 years of age. Despite living thereafter with similar life-styles and status, those who had expressed happiness, love, and other positive feelings lived an average 7 years longer than their more dour counterparts (Danner et al., 2001). By age 80, some 54 percent of those expressing few positive emotions had died, as had only 24 percent of the most positive-spirited.

Social Support

More than 50 studies reveal that social support calms the cardiovascular system, lowering blood pressure and stress hormones (Graham et al., 2006; Uchino et al., 1996, 1999). James Coan and his colleagues (2006) observed the soothing benefit of social support when they subjected happily married women to the threat of electric shock to an ankle while lying in an fMRI machine. During the experiment, some women held their husband's hand. Others held the hand of an anonymous person or no hand at all. While awaiting the occasional shocks, the women holding their husband's hand showed less activity in threat-responsive brain areas. The benefit was greatest for those reporting the highest-quality marriages. Even pets can help us cope with stress. (See Close-Up: Pets Are Friends, Too.)

Social ties also foster stronger immune functioning, as Sheldon Cohen and his colleagues (1997, 2004) demonstrated by putting 276 healthy volunteers in quarantine for five days after administering nasal drops laden with a cold virus, and then repeating the experiment with 334 more volunteers. (In both experiments, the volunteers were paid $800 each to endure this experience.) The cold fact is that the effect of social ties is nothing to sneeze at. Age, race, sex, smoking, and other health habits being equal, those with the most social ties were least likely to catch a cold, and if they caught one, they produced less mucus.

Close-Up:

Pets Are Friends, Too

Have you ever wished for a friend who would love you just as you are, who is nonjudgmental, and who is always there for you, no matter your mood? For many tens of millions of people that friend exists, and it is a loyal dog or a friendly cat.

Many people describe their pet as a cherished family member who helps them feel calm, happy, and valued. Can pets also help people handle stress? If so, might pets have healing power? Karen Allen reports that the answers are yes and yes. For example, women's blood pressure rises as they struggle with challenging math problems in the presence of a best friend or even a spouse, but much less so in the presence of their dog (Allen, 2003).

Frank Siteman/Jupiterimages

And pets have been found to increase the odds of survival after a heart attack, to relieve depression among AIDS patients, and to lower the level of blood lipids that contribute to cardiovascular risk.

So, would pets be good medicine for people who do not have pets? To find out, Allen studied a group of stockbrokers who lived alone, described their work as stressful, and had high blood pressure. She randomly selected half to adopt an animal shelter cat or dog. When later facing stress, these new pet owners exhibited less than half the blood pressure increase of their counterparts without pets. The effect was greatest for those with few social contacts or friends. Allen's conclusion: For lowering blood pressure, pets are no substitute for effective drugs and exercise. But for those who enjoy animals, and especially for those who live alone, they are a healthy pleasure.

We should not be surprised, then, that seven massive investigations, each following thousands of people for several years, have revealed that close relationships—with friends, family, fellow workers, members of a faith community, or other support groups—predict health and a lower risk of premature death (Cohen, 1988; House et al., 1988; Nelson, 1988).

As in the Coan study, many people find social support in their marriage. In a seven-decades-long Harvard study, a good marriage at age 50 predicted healthy aging better than did a low cholesterol level at 50 (Vaillant, 2002). Many other carefully controlled studies also indicate that married people live longer, healthier lives than the unmarried (Kaplan & Kronick, 2006; National Center for Health Statistics, 2004; Wilson & Oswald, 2002). But, as Coan's study also indicated, marital *functioning* matters. Positive, happy, supportive marriages are conducive to health; conflict-laden ones are not (De Vogli et al., 2007; Kiecolt-Glaser & Newton, 2001). Moreover, middle-aged and older adults living alone are more likely to smoke, be obese, and have high cholesterol—and to have a doubled risk of heart attacks (Nielsen et al., 2006).

"Woe to one who is alone and falls and does not have another to help."
—Ecclesiastes 4:10

Close relationships give us an opportunity to confide painful feelings (Frattaroli, 2006). When researchers (Pennebaker & O'Heeron, 1984) contacted the surviving spouses of people who had committed suicide or died in car accidents, those who bore their grief alone had more health problems than those who could express it openly. Confiding in others can be "open heart therapy."

Talking about a stressful event can temporarily arouse people, but in the long run it calms them, by calming limbic system activity (Lieberman et al., 2007; Mendolia & Kleck, 1993). When James Pennebaker and his colleagues (1989) invited 33 Holocaust survivors to spend two hours recalling their experiences, many did so in intimate detail never before disclosed. In the weeks following, most watched a tape of their recollections and showed it to family and friends. Those who were most self-disclosing had the most improved health 14 months later. Confiding is good for the body and the soul.

"Is there anyone here who specializes in stress management?"

Managing Stress

29-6: What tactics can we use to manage stress and reduce stress-related ailments?

Having a sense of control, developing more optimistic thinking, and building social support can help us *experience* less stress and thus improve our health. Moreover, these factors interrelate: People who are upbeat about themselves and their future tend also to enjoy health-promoting social ties (Stinson et al., 2008). But sometimes we cannot alleviate stress and simply need to *manage* our stress, lessening its effects. Aerobic exercise, relaxation, meditation, and spirituality may help.

Aerobic Exercise

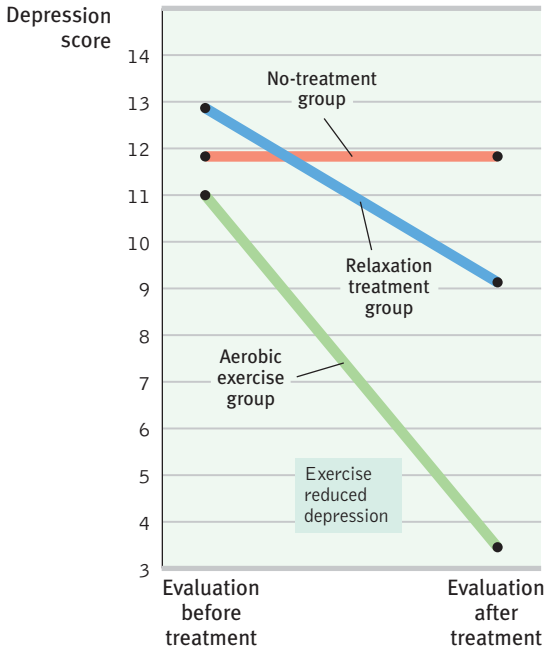
Aerobic exercise is sustained exercise, such as jogging, swimming, and biking, that increases heart and lung fitness. Does it also boost the spirit?

Exercise and Mood With less physical activity demanded of us to provide food, shelter, and mobility (machines do much of the work for us), our more sedentary life-style contributes to today's high rate of depression. Less exercise means less brain activity in areas essential for reward, motivation, and effective coping (Ilardi et al., 2007; Lambert, 2005, 2008). Many studies have suggested that aerobic exercise can reduce stress, depression, and anxiety. For example, 3 in 10 American and Canadian people, and 2 in 10 British people who do aerobic exercise at least three times a week also manage stressful events better, exhibit more self-confidence, feel more vigor, and feel depressed and fatigued less often than those who exercise less

aerobic exercise sustained exercise that increases heart and lung fitness; may also reduce stress, depression, and anxiety.

(McMurray, 2004). In a Gallup survey, nonexercisers were twice as likely as exercisers to report being "not too happy" (Brooks, 2002). But if we state this observation the other way around—that stressed and depressed people exercise less—cause and effect become unclear.

Experiments have resolved this ambiguity by randomly assigning stressed, depressed, or anxious people either to aerobic exercise or to other treatments. In one classic experiment, Lisa McCann and David Holmes (1984) assigned one-third of a group of mildly depressed female college students to a program of aerobic exercise, one-third to a treatment of relaxation exercises, and the remaining third (a control group) to no treatment. Ten weeks later, those in the aerobic exercise program reported the greatest decrease in depression (**FIGURE 29.7**). Many had, quite literally, run away from their troubles. Vigorous exercise provides a "substantial" immediate mood boost, reports David Watson (2000) from his monitoring of university students. Even a 10-minute walk stimulates two hours of increased well-being by raising energy levels and lowering tension (Thayer, 1987, 1993).




Newscom

FIGURE 29.7 Aerobic exercise and depression Mildly depressed college women who participated in an aerobic exercise program showed markedly reduced depression, compared with those who did relaxation exercises or received no treatment. (From McCann & Holmes, 1984.)

Researchers are now wondering *why* aerobic exercise alleviates negative emotions. Exercise orders up mood-boosting chemicals from our body's internal pharmacy—neurotransmitters such as norepinephrine, serotonin, and the endorphins (Jacobs, 1994; Salmon, 2001). In mice, exercise causes their brains to produce a molecule that acts as a natural antidepressant by stimulating the production of new neurons (Hunsberger et al., 2007). Perhaps the emotional benefits of exercise are also a side effect of increased warmth and body arousal (counteracting depression's low arousal state), or of the muscle relaxation and sounder sleep that occur afterward. Or perhaps a sense of accomplishment and an improved physique enhance one's emotional state.

Exercise and Health By one estimate, moderate exercise adds not only quality of life (more energy and better mood) but also quantity of life—two additional years, on average. "Perhaps God does not subtract the time spent exercising from your allotted time on Earth," jested Martin Seligman (1994, p. 193). Exercise strengthens the heart, increases bloodflow, keeps blood vessels open, and lowers both blood pressure and the blood pressure reaction to stress (Ford, 2002; Manson, 2002). Compared with inactive adults, people who exercise suffer half as many heart attacks (Powell et al., 1987). Exercise makes the muscles hungry for the "bad fats" that, if not used by the muscles, contribute to clogged arteries (Barinaga, 1997). One study following adult Finnish twins for nearly 20 years revealed that, other things being equal, occasional exercise (compared with no exercise) reduced the risk of death by 29 percent. Daily conditioning exercise reduced death risk by 43 percent (Kujala et al., 1998). In later life, regular exercise also predicts better cognitive functioning and reduced risk of dementia and Alzheimer's disease (Kramer & Erickson, 2007).


Kathryn Brownson

The mood boost When one's energy or spirits are sagging, few things reboot the day better than exercising (as I can vouch from my daily noontime basketball). Aerobic exercise appears to counteract depression partly by increasing arousal (replacing depression's low-arousal state) and by doing naturally what Prozac does—increasing the brain's serotonin activity.

Relaxation and Meditation

Knowing the damaging effects of stress, could we train people to counteract stress, bringing their heart rate and blood pressure under conscious control? Dozens of studies have found that relaxation procedures can help alleviate hypertension, anxiety, headaches, and insomnia (Nestoriuc et al., 2008; Stetter & Kupper, 2002). Such findings would not surprise Meyer Friedman and his colleagues. To find out whether teaching Type A heart attack victims to relax might reduce their risk of another attack, those researchers randomly assigned hundreds of middle-aged, male heart-attack survivors to one of two groups. The first group received standard advice from cardiologists concerning medications, diet, and exercise habits. The second group received similar advice plus continuing counseling on modifying their life-style—how to slow down and relax by walking, talking, and eating more slowly; by smiling at others and laughing at themselves; by admitting mistakes; by taking time to enjoy life; and by renewing their religious faith. As **FIGURE 29.8** indicates, during the ensuing three years, the second group experienced half as many repeat heart attacks as the first group. This, wrote the exuberant Friedman, was an unprecedented, spectacular reduction in heart-attack recurrence. A smaller-scale British study similarly divided heart-attack–prone people into control and life-style modification groups (Eysenck & Grossarth-Maticek, 1991). During the next 13 years, it also found a 50 percent reduction in death rate among those trained to alter their thinking and life-style. After suffering a heart attack at age 55, Friedman started taking his own behavioral medicine—and lived to age 90 (Wargo, 2007).

Meditation is a modern phenomenon with a long history: "Sit down alone and in silence. Lower your head, shut your eyes, breathe out gently, and imagine yourself looking into your own heart. . . . As you breathe out, say 'Lord Jesus Christ, have mercy on me.' . . . Try to put all other thoughts aside. Be calm, be patient, and repeat the process very frequently" (Gregory of Sinai, died 1346).

Cardiologist Herbert Benson (1996) became intrigued with meditative relaxation when he found that experienced meditators could decrease their blood pressure, heart rate, and oxygen consumption and could raise their fingertip temperature. His study led him to what he calls the *relaxation response,* described in Close-Up: The Relaxation Response.

Tibetan Buddhists deep in meditation and Franciscan nuns deep in centering prayer report a diminished sense of self, space, and time. Brain scans reveal the neural footprints of such spiritual feelings during these mystical experiences: A part of the parietal lobe that tracks where we are in space is less active than usual, and a frontal lobe area involved in focused attention is more active (Cahn & Polich, 2006; Newberg & D'Aquili, 2001).

Buddhist monks experienced in meditation display elevated levels of the left frontal lobe activity associated with positive emotions. To explore whether such activity is a result of meditation, psychologist Richard Davidson and his colleagues (2003) ran baseline brain scans of volunteers who were *not* experienced meditators, and then randomly assigned them either to a control group or to an eight-week course in "mindfulness meditation." Compared with both the control group and

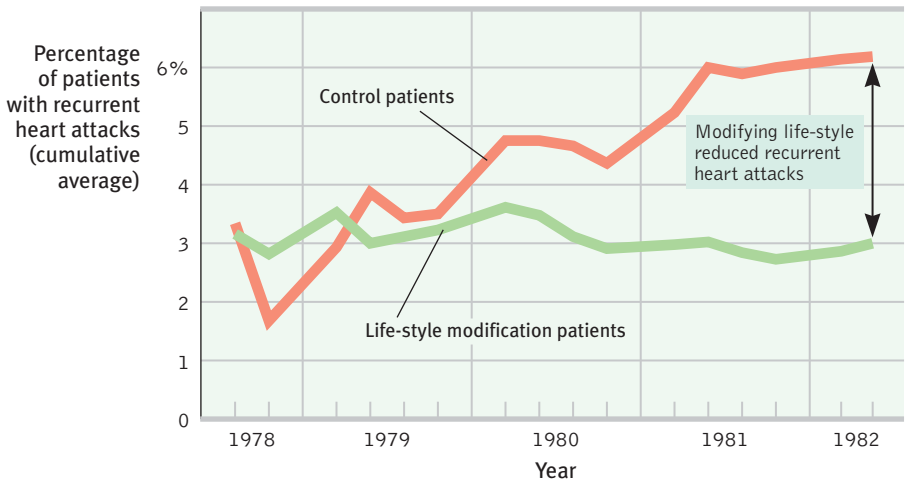


FIGURE 29.8 Recurrent heart attacks and life-style modification The San Francisco Recurrent Coronary Prevention Project offered counseling from a cardiologist to survivors of heart attacks. Those who were also guided in modifying their Type A life-style suffered fewer repeat heart attacks. (From Friedman & Ulmer, 1984.)

Ghislain and Marie David De Lossy/Getty Images

Close-Up:

The Relaxation Response

The relaxation response is a state of calm marked by relaxed muscles, slowed breathing and heart rate, and decreased blood pressure. Advocates such as cardiologist Herbert Benson claim lasting stress-reducing benefits when relaxation is practiced once or twice daily. For those who want to experience the relaxation response, the Benson-Henry Institute for Mind-Body Medicine has recommended these steps:

Sit quietly in a comfortable position. Close your eyes. Relax your muscles, starting with your feet, then your calves, and upward through your thighs, shoulders, neck, and head. Breathe slowly. As you exhale each breath, repeat a focus word, phrase, or prayer—something drawn from your own belief system. When other thoughts intrude, don't worry. Just return to your repetition and continue for 10 to 20 minutes. When finished, sit quietly for another minute or two, then open your eyes and sit for a few more moments.

their own baseline, the meditation participants exhibited noticeably more left-hemisphere activity, and also improved immune functioning after the training. Such effects may help explain the astonishing results of a study that randomly assigned 73 residents of homes for the elderly either to daily meditation or to none. After three years, one-fourth of the nonmeditators had died, but all the meditators were still alive (Alexander et al., 1989). A more recent study found that hypertension patients assigned to meditation training had (compared with other treatment groups) a 30 percent lower cardiovascular death rate over the ensuing 19-year study period (Schneider et al., 2005).

And then there are the mystics who seek to use the mind's power to enable novocaine-free cavity repair. Their aim: To transcend dental medication.

Spirituality and Health

More than a thousand studies have examined the relationship between health and healing. From those studies, a curious correlation, called the *faith factor,* has emerged: Religiously active people tend to live longer than those who are not religiously active. For example, one 16-year study (Kark et al., 1996) compared the death rates for 3900 Israelis either in one of 11 religiously orthodox or in one of 11 matched, nonreligious collective settlements (kibbutz communities). The researchers reported that "belonging to a religious collective was associated with a strong protective effect" not explained by age or economic differences. In every age group, religious community members were about half as likely to have died as were their nonreligious counterparts. This is roughly comparable to the gender difference in mortality.

Richard Sloan and his skeptical colleagues (1999, 2000, 2002, 2005) remind us that mere correlations can leave many factors uncontrolled. Consider one obvious possibility for such findings: Women are more religiously active than men, and women outlive men. Perhaps religious involvement is merely an expression of the gender effect on longevity.

The correlation between religious involvement and life expectancy is stronger among women. One 8-year study by the National Institutes of Health, for example, followed 92,395 women, ages 50 to 79. Even after controlling for many factors, women attending religious services weekly (or more often) experienced an approximately 20 percent reduced risk of death during the study period (Schnall et al., 2010). But the correlation also appears among men alone (McCullough et al., 2000, 2005). A 28-year study that followed 5286 Californians, controlling for age, gender, ethnicity, and education, found that frequent religious attenders were 36 percent less likely to have died in any year (Oman et al., 2002; Strawbridge et al., 1997, 1999). As a predictor of lowered risk of death, regular religious attendance rivaled the effects of nonsmoking and regular exercise.

After controlling for age, sex, race, and region, a U.S. National Health Interview Survey (of 21,204 people over 8 years) found that nonattenders were 1.87 times

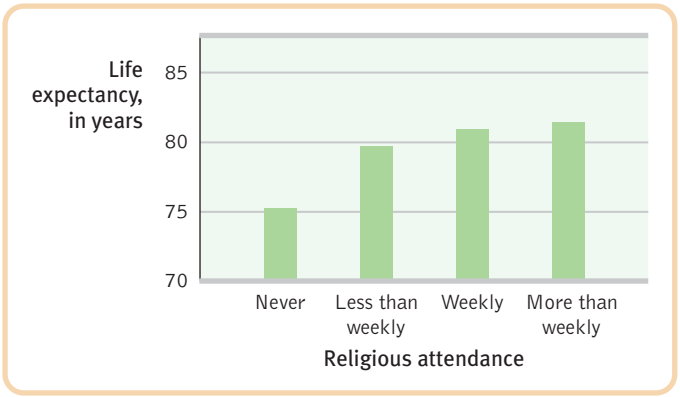


FIGURE 29.9 Religious attendance and life expectancy In a national health survey financed by the U.S. Centers for Disease Control and Prevention, religiously active people had longer life expectancies. (Data from Hummer et al., 1999.)

more likely to have died than were those attending more than weekly (Hummer et al., 1999). This translated into a life expectancy at age 20 of 83 years for frequent attenders and 75 years for infrequent attenders (**FIGURE 29.9**). These findings do not indicate that nonattenders who start attending services and change nothing else will live 8 years longer. But they do indicate that religious involvement is a *predictor* of health and longevity.

Such findings demand explanation. Can you imagine what intervening variables might account for the correlation?

First, religiously active people tend to have healthier lifestyles; for example, they smoke and drink less (Lyons, 2002; Park, 2007; Strawbridge et al., 2001). Health-oriented, vegetarian Seventh Day Adventists have a longer-than-usual life expectancy (Berkel & de Waard, 1983). Religiously orthodox Israelis eat less fat than do their nonreligious compatriots. But these differences are not great enough to explain the dramatically reduced mortality that was found in studies that controlled for unhealthy behaviors such as inactivity and smoking (Musick et al., 1999).

Could social support help explain the faith factor (Ai et al., 2007; George et al., 2002)? For Judaism, Christianity, and Islam, faith is not solo spirituality but a communal experience, providing support networks for their active participants—people who are there for one another when misfortune strikes. Moreover, religion encourages another predictor of health and longevity—marriage. In the religious kibbutzim, for example, divorce has been almost nonexistent.

Even after controlling for social ties, gender, unhealthy behaviors, and preexisting health problems, however, researchers find much of the mortality reduction remains (George et al., 2000; Powell et al., 2003). They therefore speculate that a third set of intervening variables is the stress protection and enhanced well-being associated with a coherent worldview, a sense of hope for the long-term future, feelings of ultimate acceptance, and the relaxed meditation of prayer or Sabbath observance (**FIGURE 29.10**). These variables might also help to explain other recent findings among the religiously active, such as healthier immune functioning, fewer hospital admissions, and, for AIDS patients, fewer stress hormones and longer survival (Ironson et al., 2002; Koenig & Larson, 1998; Lutgendorf et al., 2004).

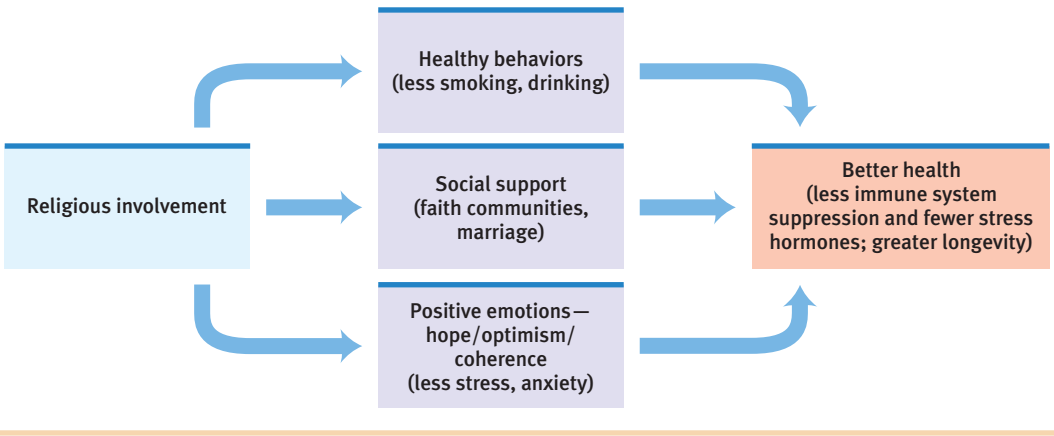


FIGURE 29.10 Possible explanations for the correlation between religious involvement and health/longevity

Stress and Health

Module Review

29-1: What is stress? *Stress* is the process by which we appraise and respond to stressors, events that challenge or threaten us. Cannon viewed stress as a "fight or flight" system. Selye saw it as a three-phase (alarm-resistance-exhaustion) *general adaptation syndrome (GAS)*.

29-2: What events provoke stress responses? There are three main categories of life-event stressors: catastrophic events, significant life changes, and daily hassles. Each type has the ability to have harmful effects on health and well-being.

29-3: Why are some of us more prone than others to coronary heart disease? *Coronary heart disease,* North America's number one cause of death, has been linked with the competitive, hard-driving, impatient, and (especially) anger-prone *Type A* personality. More frequent bouts of anger may trigger increased cholesterol levels and altered heart rhythms. *Type B* personalities, who are more relaxed and easygoing, are less prone to coronary attacks. Pessimism and depression are also correlated with higher-than-normal risks of heart disease.

29-4: How does stress make us more vulnerable to disease? Stress diverts energy from the immune system, inhibiting the activities of its B and T *lymphocytes,* macrophages, and NK cells. Stress does not cause diseases such as AIDS and cancer, but it may weaken the body's natural defenses to fight these and other diseases.

29-5: What factors affect our ability to cope with stress? We *cope* with stress emotionally, cognitively, and behaviorally. *Problem-focused coping* strategies alleviate stress directly, by changing the stressor or the way we interact with it; *emotion-focused coping* tries to alleviate stress indirectly by attending to emotional needs. Those with a sense of control, an optimistic outlook, and a base of social support seem to cope more successfully with stress and enjoy better health.

29-6: What tactics can we use to manage stress and reduce stress-related ailments? Stress-management programs may include *aerobic exercise,* relaxation, and meditation. Researchers are working toward understanding the active components of the religion-health correlation.

Rehearse It!

1. Selye's general adaptation syndrome (GAS) consists of an alarm reaction followed by
   a. fight or flight.
   b. resistance then exhaustion.
   c. challenge then recovery.
   d. stressful life events.

2. The number of short-term illnesses and stress-related psychological disorders was higher than usual in the months following an earthquake. Such findings suggest that
   a. daily hassles have adverse health consequences.
   b. experiencing a very stressful event increases a person's vulnerability to illness.
   c. the amount of stress a person feels is directly related to the number of stressors experienced.
   d. small, bad events don't cause stress, but large ones can be toxic.

3. Research suggests that the most significant sources of stress are
   a. catastrophes.
   b. traumatic events, such as the loss of a loved one.
   c. daily hassles.
   d. threatening events that we witness.

4. The component of Type A behavior linked most closely to coronary heart disease is
   a. living a fast-paced life-style.
   b. working in a competitive area.
   c. meeting deadlines and challenges.
   d. feeling angry and negative much of the time.

5. Stress hormones suppress lymphocytes, which ordinarily attack bacteria, viruses, cancer cells, and other foreign substances. The stress hormones are released mainly in response to a signal from the
   a. lymphocytes and macrophages.
   b. brain.
   c. upper respiratory tract.
   d. adrenal glands.

6. Research has shown that people are at increased risk for cancer a year or so after experiencing depression, helplessness, or bereavement. In describing this link, researchers are quick to point out that
   a. accumulated stress causes cancer.
   b. anger is the negative emotion most closely linked to cancer.
   c. stress does not create cancer cells, but it weakens the body's natural defenses against them.
   d. feeling optimistic about chances of survival ensures that a cancer patient will get well.

7. To cope with stress, we tend to use _____ strategies when we feel in control of our world, and to use _____ strategies when we believe we cannot change a situation.
   a. emotion-focused; problem-focused
   b. problem-focused; emotion-focused
   c. positive-emotion; negative-emotion
   d. negative-emotion; positive-emotion

8. Aerobic exercise raises energy levels and may reduce stress, depression, and anxiety by triggering the release of mood-boosting neurotransmitters, such as norepinephrine, serotonin, and the
   a. placebos.
   b. endorphins.
   c. B lymphocytes.
   d. T lymphocytes.

9. People who have close relationships—a strong social support system—are less likely to die prematurely than those who do not, supporting the idea that
   a. social ties can be a source of stress.
   b. gender influences longevity.
   c. Type A behavior is responsible for many premature deaths.
   d. social support has a beneficial effect on health.

Answers: 1. b, 2. b, 3. c, 4. d, 5. b, 6. c, 7. b, 8. b, 9. d.

Terms and Concepts to Remember

stress, p. 418
general adaptation syndrome (GAS), p. 419
coronary heart disease, p. 421
Type A, p. 421
Type B, p. 421
psychophysiological illness, p. 423
lymphocytes, p. 423
complementary and alternative medicine (CAM), p. 426
coping, p. 427
problem-focused coping, p. 427
emotion-focused coping, p. 427
aerobic exercise, p. 430

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. A self-help book declares that you can prevent cancer through "the power of positive thinking." How would you evaluate this claim?
2. A Chinese proverb warns, "The fire you kindle for your enemy often burns you more than him." How is this true of Type A individuals?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Personality

Personality

Lord of the Rings hobbit-hero Frodo Baggins knew that throughout his difficult journey there was one who would never fail him—his loyal and ever-cheerful companion, Sam Gamgee. Even before they left their beloved hometown, Frodo warned Sam that the journey would not be easy.

> "It is going to be very dangerous, Sam. It is already dangerous. Most likely neither of us will come back."
>
> "If you don't come back, sir, then I shan't, that's certain," said Sam. "[The Elves told me] 'Don't you leave him!' Leave him! I said. I never mean to. I am going with him, if he climbs to the Moon; and if any of those Black Riders try to stop him, they'll have Sam Gamgee to reckon with." (J.R.R. Tolkien, *The Fellowship of the Ring*, p. 96)

And so they did! Later in the story, when it becomes clear that Frodo's path will lead him into the land of Mordor, it is Sam who insists he will be at Frodo's side, come what may. It is Sam who lifts Frodo's spirits with songs and stories from their boyhood. And it is Sam whom Frodo leans upon when he can barely take another step. When Frodo is overcome by the evil of the ring he carries, it is Sam who saves him. In the end, it is Sam who helps Frodo successfully reach the end of his journey. Sam Gamgee—cheerful, optimistic, emotionally stable—never falters in his faithfulness or his belief that they will overcome the threatening darkness.

As he appears and reappears throughout the series, Tolkien's Sam Gamgee exhibits the distinctive and enduring behaviors that define *personality*—a person's characteristic pattern of thinking, feeling, and acting. Other modules in this book focus on our shared paths. In Modules 30 and 31, we focus on what makes us unique.

Actually, much of this book deals with personality. Across the field, psychologists study biological influences on personality; personality development across the life span; personality-related aspects of learning, motivation, emotion, and health; disorders of personality; and social influences on personality.

In Module 30, we begin with two historically significant perspectives that helped establish the field of personality psychology and raised key issues still being addressed in today's research and clinical work. The first, Sigmund Freud's *psychoanalytic* theory, proposed that childhood sexuality and unconscious motivations influence personality. The second, the *humanistic* approach, focused on our inner capacities for growth and self-fulfillment.

These classic theories, which offer sweeping perspectives on human nature, have become part of our cultural legacy. They are complemented by what Module 31 goes on to explore—today's more focused and down-to-earth scientific research on specific aspects of personality. Contemporary personality researchers study the basic dimensions of personality, the biological roots of these basic dimensions, and the interaction of persons and environments. They also study self-esteem, self-serving bias, and cultural influences on one's sense of self. And they study the unconscious mind—with findings that probably would have surprised Freud himself.

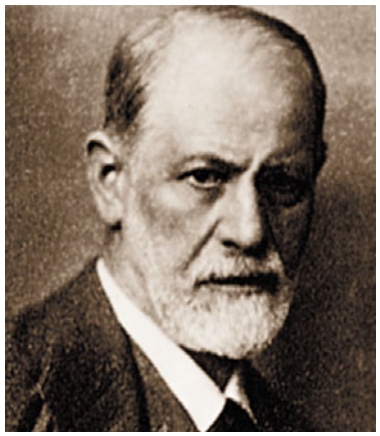
MODULE 30

Classic Perspectives on Personality

The Psychoanalytic Perspective

30-1: What was Freud's view of personality and its development?

Love him or hate him, Sigmund Freud has profoundly influenced Western culture. Ask 100 people on the street to name a notable deceased psychologist, suggested Keith Stanovich (1996, p. 1), and "Freud would be the winner hands down." In the popular mind, he is to psychology's history what Elvis Presley is to rock music's history. Freud's influence lingers in literary and film interpretation, psychiatry, and clinical psychology. So, who was this early **personality** theorist, and what did he teach?



Culver Pictures

Sigmund Freud, 1856–1939 "I was the only worker in a new field."

Long before entering the University of Vienna in 1873, a youthful Sigmund Freud showed signs of independence and brilliance. He had a prodigious memory and so loved reading plays, poetry, and philosophy that he once ran up a bookstore debt beyond his means. As a teen he often took his evening meal in his tiny bedroom in order to lose no time from his studies. After medical school he set up a private practice, specializing in nervous disorders. Before long, however, he faced patients whose disorders made no neurological sense. For example, a patient might have lost all feeling in a hand—yet there is no sensory nerve that, if damaged, would numb the entire hand and nothing else. Freud's search for a cause for such disorders set his mind running in a direction destined to change human self-understanding.

personality an individual's characteristic pattern of thinking, feeling, and acting.

free association in psychoanalysis, a method of exploring the unconscious in which the person relaxes and says whatever comes to mind, no matter how trivial or embarrassing.

unconscious according to Freud, a reservoir of mostly unacceptable thoughts, wishes, feelings, and memories. According to contemporary psychologists, information processing of which we are unaware.

psychoanalysis Freud's theory of personality that attributes thoughts and actions to unconscious motives and conflicts; the techniques used in treating psychological disorders by seeking to expose and interpret unconscious tensions.

Exploring the Unconscious

Might some neurological disorders have psychological causes? Observing patients led Freud to speculate that lost feeling in one's hand might be caused by a fear of touching one's genitals; that unexplained blindness or deafness might be caused by not wanting to see or hear something that aroused intense anxiety. After some early unsuccessful trials with hypnosis, Freud turned to **free association,** in which he told the patient to relax and say whatever came to mind, no matter how embarrassing or trivial. He assumed that a line of mental dominoes had fallen from his patients' distant past to their troubled present. Free association, he believed, would allow him to retrace that line, following a chain of thought leading into the patient's **unconscious** mind, where painful memories, often from childhood, could be retrieved and released.

Freud called his theory of personality and the associated treatment techniques **psychoanalysis.** Basic to his theory was the belief that the mind is mostly hidden (**FIGURE 30.1** on the next page). Our conscious awareness is like the part of an iceberg that floats above the surface. Beneath our awareness is the larger unconscious mind with its thoughts, wishes, feelings, and memories. Some of these thoughts we store temporarily in a *preconscious* area, from which we can retrieve them into conscious awareness. Of greater interest to Freud was the mass of unacceptable passions and thoughts that he believed we *repress,* or forcibly block from consciousness because they would be too unsettling to acknowledge. Nevertheless, these feelings and ideas lurking outside our awareness can powerfully influence us, sometimes gaining expression in disguised forms—the work we choose, the beliefs we hold, our daily habits, our troubling symptoms.

"Good morning, beheaded—uh, I mean beloved."

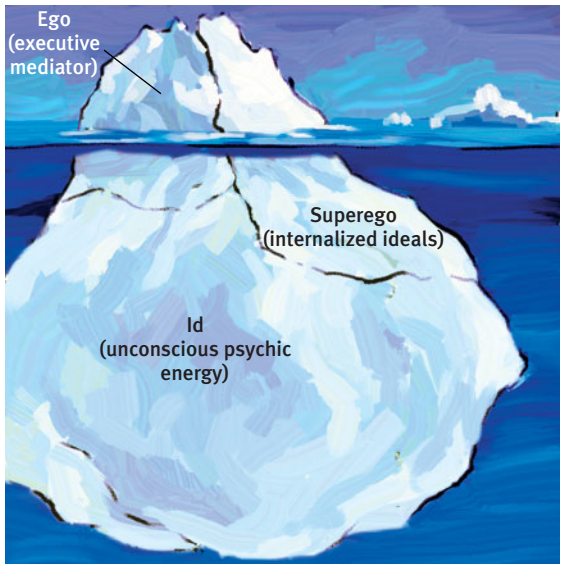


FIGURE 30.1 Freud's idea of the mind's structure Psychologists have used an iceberg image to illustrate Freud's idea that the mind is mostly hidden beneath the conscious surface. Note that the id is totally unconscious, but ego and superego operate both consciously and unconsciously. Unlike the parts of a frozen iceberg, however, the id, ego, and superego interact.

id contains a reservoir of unconscious psychic energy that, according to Freud, strives to satisfy basic sexual and aggressive drives. The id operates on the *pleasure principle,* demanding immediate gratification.

ego the largely conscious, "executive" part of personality that, according to Freud, mediates among the demands of the id, superego, and reality. The ego operates on the *reality principle,* satisfying the id's desires in ways that will realistically bring pleasure rather than pain.

superego the part of personality that, according to Freud, represents internalized ideals and provides standards for judgment (the conscience) and for future aspirations.

For Freud the determinist, nothing was ever accidental. He believed he could glimpse the unconscious seeping not only into people's free associations, beliefs, habits, and symptoms but also into slips of the tongue and pen. He illustrated with a financially stressed patient who, not wanting any large pills, said, "Please do not give me any bills, because I cannot swallow them." Similarly, Freud viewed jokes as expressions of repressed sexual and aggressive tendencies, and dreams as the "royal road to the unconscious." The remembered content of dreams (their *manifest content*) he believed to be a censored expression of the dreamer's unconscious wishes (the dream's *latent content*). In his dream analyses, Freud searched for patients' inner conflicts.

Personality Structure

In Freud's view, human personality—including its emotions and strivings—arises from a conflict between impulse and restraint—between our aggressive, pleasure-seeking biological urges and our internalized social controls over these urges. Freud believed personality is the result of our efforts to resolve this basic conflict—by expressing these impulses in ways that bring satisfaction without also bringing guilt or punishment. To understand the mind's dynamics during this conflict, Freud proposed three interacting systems: the *id*, *ego*, and *superego* (Figure 30.1).

The **id's** unconscious psychic energy constantly strives to satisfy basic drives to survive, reproduce, and aggress. The id operates on the *pleasure principle:* It seeks immediate gratification. To envision an id-dominated person, think of a newborn infant crying out for satisfaction, caring nothing for the outside world's conditions and demands. Or think of adults who often use tobacco, alcohol, and other drugs and would sooner party now than sacrifice today's pleasure for future success and happiness (Keough et al., 1999).

As the **ego** develops, the young child responds to the real world. The ego, operating on the *reality principle*, seeks to gratify the id's impulses in realistic ways that will bring long-term pleasure. (Imagine what would happen if, lacking an ego, we expressed all our unrestrained sexual or aggressive impulses.) The ego contains our partly conscious perceptions, thoughts, judgments, and memories.

Around age 4 or 5, Freud theorized, a child's ego recognizes the demands of the **superego,** the newly emerging moral compass *(conscience)* that forces the ego to consider the *ideal*—how we *ought* to behave. The superego strives for perfection, judging actions and producing positive feelings of pride or negative feelings of guilt. Someone with an exceptionally strong superego may be virtuous yet guilt-ridden; another with a weak superego may be wantonly self-indulgent and remorseless.

"Fifty is plenty." *"Hundred and fifty."*

The ego struggles to reconcile the demands of superego and id, said Freud.

Because the superego's demands often oppose the id's, the ego struggles to reconcile the two. It is the personality "executive," mediating the impulsive demands of the id, the restraining demands of the superego, and the real-life demands of the external world. If chaste Jane feels sexually attracted to John, she may satisfy both id and superego by joining a volunteer organization that John attends regularly.

From the K. Vandervelde private collection

Identification Freud believed that children cope with threatening feelings of competition with their same-sex parent by identifying with that parent.

Personality Development

Analysis of his patients' histories convinced Freud that personality forms during life's first few years. He concluded that children pass through a series of **psychosexual stages,** during which the id's pleasure-seeking energies focus on distinct *erogenous zones,* or pleasure-sensitive areas (**TABLE 30.1**). For example, during the *phallic stage,* Freud said, boys seek genital stimulation. They develop both unconscious sexual desires for their mother and jealousy and hatred for their father, whom they consider a rival. They then experience guilt and a lurking fear of punishment, perhaps by castration, from their father. Freud called this collection of feelings the **Oedipus complex** after the Greek legend of Oedipus, who unknowingly killed his father and married his mother. Some psychoanalysts in Freud's era believed that girls experience a parallel *Electra complex*.

Children eventually cope with the threatening feelings, said Freud, by repressing them and by identifying with (trying to become like) the rival parent. It's as though something inside the child decides, "If you can't beat 'em [the parent of the same sex], join 'em." Through this **identification** process, children's superegos gain strength as they incorporate many of their parents' values. Freud believed that identification with the same-sex parent provides what psychologists now call *gender identity*—the sense of being male or female. Freud presumed that our early childhood relations—especially with parents and caregivers—influence our developing identity, personality, and frailties.

In Freud's view, conflicts unresolved during earlier psychosexual stages could surface as maladaptive behavior in the adult years. At any point in the oral, anal, or phallic stages, strong conflict could lock, or **fixate,** the person's pleasure-seeking energies in that stage. A person who had been either orally overindulged or deprived (perhaps by abrupt, early weaning) might fixate at the oral stage. This orally fixated adult could exhibit either passive dependence (like that of a nursing infant) or an exaggerated denial of this dependence (by acting tough or uttering

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"Oh, for goodness' sake! Smoke!"

TABLE 30.1 Freud's Psychosexual Stages

Stage	Focus
Oral (0–18 months)	Pleasure centers on the mouth—sucking, biting, chewing
Anal (18–36 months)	Pleasure focuses on bowel and bladder elimination; coping with demands for control
Phallic (3–6 years)	Pleasure zone is the genitals; coping with incestuous sexual feelings
Latency (6 to puberty)	Dormant sexual feelings
Genital (puberty on)	Maturation of sexual interests

psychosexual stages the childhood stages of development (oral, anal, phallic, latency, genital) during which, according to Freud, the id's pleasure-seeking energies focus on distinct erogenous zones.

Oedipus [ED-uh-puss] **complex** according to Freud, a boy's sexual desires toward his mother and feelings of jealousy and hatred for the rival father.

identification the process by which, according to Freud, children incorporate their parents' values into their developing superegos.

fixation according to Freud, a lingering focus of pleasure-seeking energies at an earlier psychosexual stage, in which conflicts were unresolved.

defense mechanisms in psychoanalytic theory, the ego's protective methods of reducing anxiety by unconsciously distorting reality.

repression in psychoanalytic theory, the basic defense mechanism that banishes anxiety-arousing thoughts, feelings, and memories from consciousness.

collective unconscious Carl Jung's concept of a shared, inherited reservoir of memory traces from our species' history.

biting sarcasm). Or the person might continue to seek oral gratification by smoking or excessive eating. In such ways, Freud suggested, the twig of personality is bent at an early age.

Defense Mechanisms

Anxiety, said Freud, is the price we pay for civilization. As members of social groups, we must control our sexual and aggressive impulses, not act them out. But sometimes the ego fears losing control of this inner war between the id and superego. The presumed result is a dark cloud of unfocused anxiety that leaves us feeling unsettled but unsure why.

He proposed that the ego protects itself with **defense mechanisms**—tactics that function indirectly and unconsciously, reducing anxiety by disguising some threatening impulse. Just as the body unconsciously defends itself against disease, so also, believed Freud, does the ego unconsciously defend itself against anxiety. For example, **repression** banishes anxiety-arousing wishes from consciousness. According to Freud, *repression underlies all the other defense mechanisms*, each of which disguises threatening impulses and keeps them from reaching consciousness. Freud believed that repression is often incomplete, with repressed urges seeping out in dream symbols and slips of the tongue. **TABLE 30.2** describes six other well-known defense mechanisms.

TABLE 30.2 Six Defense Mechanisms

Freud believed that *repression,* the basic defense mechanism that banishes anxiety-arousing impulses, enables other defense mechanisms.

Defense mechanism	Unconscious process employed to avoid anxiety-arousing thoughts or feelings	Example
Regression	Retreating to a more infantile psychosexual stage, where some psychic energy remains fixated.	A little boy reverts to the oral comfort of thumb sucking in the car on the way to his first day of school.
Reaction formation	Switching unacceptable impulses into their opposites.	Repressing angry feelings, a person displays exaggerated friendliness.
Projection	Disguising one's own threatening impulses by attributing them to others.	An El Salvadoran saying captures the idea: "The thief thinks everyone else is a thief."
Rationalization	Offering self-justifying explanations in place of the real, more threatening unconscious reasons for one's actions.	A habitual drinker says she drinks with her friends "just to be sociable."
Displacement	Shifting sexual or aggressive impulses toward a more acceptable or less threatening object or person.	A little girl kicks the family dog after her mother sends her to her room.
Denial	Refusing to believe or even perceive painful realities.	A partner denies evidence of his loved one's affair.

The Neo-Freudian and Psychodynamic Theorists

30-2: Which of Freud's ideas did his followers accept or reject?

Freud's writings were controversial, but they soon attracted followers, mostly young, ambitious physicians who formed an inner circle around their strong-minded leader. These pioneering psychoanalysts and others, whom we now call *neo-Freudians*, accepted Freud's basic ideas: the personality structures of id, ego, and superego; the importance of the unconscious; the shaping of personality in childhood; and the dynamics of anxiety and the defense mechanisms. But they veered away from Freud in two important ways. First, they placed more emphasis on the conscious mind's role in interpreting experience and in coping with the environment. And second, they doubted that sex and aggression were all-consuming motivations. Instead, they tended to emphasize loftier motives and social interactions. The following examples illustrate.


National Library of Medicine

Alfred Adler "The individual feels at home in life and feels his existence to be worthwhile just so far as he is useful to others and is overcoming feelings of inferiority" (*Problems of Neurosis,* 1964).


The Bettmann Archive/Corbis

Karen Horney "The view that women are infantile and emotional creatures, and as such, incapable of responsibility and independence is the work of the masculine tendency to lower women's self-respect" (*Feminine Psychology,* 1932).


Archive of the History of American Psychology/University of Akron

Carl Jung "From the living fountain of instinct flows everything that is creative; hence the unconscious is the very source of the creative impulse" (*The Structure and Dynamics of the Psyche,* 1960).

Alfred Adler and Karen Horney [HORN-eye] agreed with Freud that childhood is important. But they believed that childhood *social,* not sexual, tensions are crucial for personality formation (Ferguson, 2003). Adler (who proposed the still-popular idea of the *inferiority complex*) had himself struggled to overcome childhood illnesses and accidents. He believed that much of our behavior is driven by efforts to conquer childhood feelings of inferiority, feelings that trigger our strivings for superiority and power. Horney said childhood anxiety, caused by the dependent child's sense of helplessness, triggers our desire for love and security. Horney also attempted to balance the masculine bias she detected in Freud's view of psychology, such as the assumptions that women have weak superegos and suffer "penis envy."

"The female . . . acknowledges the fact of her castration, and with it, too, the superiority of the male and her own inferiority; but she rebels against this unwelcome state of affairs."

—Sigmund Freud, *Female Sexuality,* 1931

Unlike other neo-Freudians, Carl Jung—Freud's disciple-turned-dissenter—placed less emphasis on social factors and agreed with Freud that the unconscious exerts a powerful influence. But to Jung (pronounced *Yoong*), the unconscious contains more than our repressed thoughts and feelings. He believed we also have a **collective unconscious,** a common reservoir of images derived from our species' universal experiences. This collective unconscious, said Jung, explains why people in different cultures share certain spiritual concerns, myths, and images, such as mother as a symbol of nurturance. (Today's psychologists discount the idea of inherited experiences. But many do believe that our shared evolutionary history shaped some universal dispositions.)

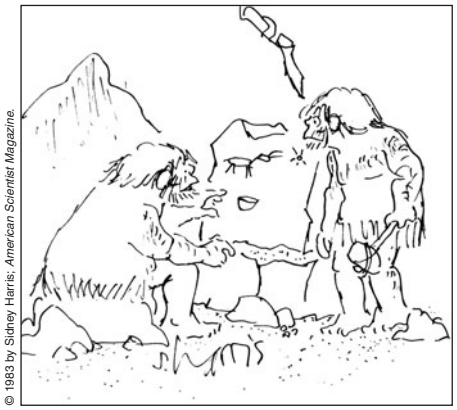
Freud died in 1939. Since then, some of his ideas have been incorporated into *psychodynamic theory.* "Most contemporary dynamic theorists and therapists are not wedded to the idea that sex is the basis of personality," noted Drew Westen (1996). They "do not talk about ids and egos, and do not go around classifying their patients as oral, anal, or phallic characters." What they do assume, with Freud, is that much of our mental life is unconscious; that we often struggle with inner conflicts among our wishes, fears, and values; and that childhood shapes our personality and ways of becoming attached to others.

Assessing Unconscious Processes

30-3: What are projective tests, and how are they used?

Personality assessment tools are useful to those who study personality or provide therapy. Such tools differ because they are tailored to specific theories. How might clinicians working in the Freudian tradition attempt to assess personality characteristics?

The first requirement would be some sort of a road into the unconscious. Objective assessment tools, such as agree-disagree or true-false questionnaires, would be



"The forward thrust of the antlers shows a determined personality, yet the small sun indicates a lack of self-confidence. . . ."

inadequate because they would merely tap the conscious surface. To track down residue from early childhood experiences, a test would need to move beyond surface pretensions and reveal hidden conflicts and impulses.

Projective tests aim to provide this "psychological X-ray," by asking test-takers to describe an ambiguous stimulus or tell a story about it. The stimulus has no inherent significance, so any meaning people read into it is presumably a projection of their interests and conflicts.

The most widely used projective test is the famous **Rorschach inkblot test,** in which people describe what they see in a series of inkblots (**FIGURE 30.2**). Swiss psychiatrist Hermann Rorschach [ROAR-shock] based it on a childhood game in which he and his friends dripped ink on a paper, folded it, and then said what they saw in the resulting blot (Sdorow, 2005). Do you see predatory animals or weapons? Perhaps you have aggressive tendencies. But is this a reasonable assumption?

"We don't see things as they are; we see things as we are."
—The Talmud

Clinicians' and critics' answers differ. Some clinicians cherish the Rorschach, even offering Rorschach-based assessments of criminals' violence potential to judges. Others view it as a helpful diagnostic tool, a source of suggestive leads, or an icebreaker and a revealing interview technique. The Society for Personality Assessment (2005) commends "its responsible use" (which would *not* include inferring past childhood sexual abuse). And—in response to past criticisms of test scoring and interpretation (Sechrest et al., 1998)—a research-based, computer-aided tool has been designed to improve agreement among raters and enhance the test's validity (Erdberg, 1990; Exner, 2003).

Note the difference:
Validity *is the extent to which a test measures or predicts what it is supposed to.*
Reliability *is the extent to which a test yields consistent results.*

But the evidence is insufficient to its revilers, who insist the Rorschach is no emotional MRI. They argue that only a few of the many Rorschach-derived scores, such as ones for hostility and anxiety, have demonstrated *validity* (Wood, 2006). Moreover, they say, these tests are not *reliable*. Inkblot assessments diagnose many normal adults as pathological (Wood et al., 2003, 2006). Alternative projective assessment techniques fare little better. "Even seasoned professionals can be fooled

FIGURE 30.2 The Rorschach test In this projective test, people tell what they see in a series of symmetrical inkblots. Some who use this test are confident that the interpretation of ambiguous stimuli will reveal unconscious aspects of the test-taker's personality. Others use it as an icebreaker or to supplement other information.

by their intuitions and their faith in tools that lack strong evidence of effectiveness," warned Scott Lilienfeld, James Wood, and Howard Garb (2001). "When a substantial body of research demonstrates that old intuitions are wrong, it is time to adopt new ways of thinking." Freud himself might have agreed. He probably would have been more interested in the therapist–patient interactions that take place during the testing process.

"The Rorschach Inkblot Test has been resoundingly discredited . . . I call it the Dracula of psychological tests, because no one has been able to drive a stake through the cursed thing's heart."

—Carol Tavris, "Mind Games: Psychological Warfare Between Therapists and Scientists," 2003

Evaluating the Psychoanalytic Perspective

30-4: How do contemporary psychologists view Freud and the unconscious?

Freud did not have access to neurotransmitter or DNA studies, or to all that we have since learned about human development, thinking, and emotion. To criticize his theory by comparing it with current concepts, some say, is like criticizing Henry Ford's Model T by comparing it with today's hybrid cars. (How tempting it always is to judge people in the past from our perspective in the present, a perspective that itself will be subject to revision in the future.) But both Freud's admirers and his critics agree that recent research contradicts many of his specific ideas. For example, history has failed to support Freud's belief that suppressed sexuality causes psychological disorders. From Freud's time to ours, sexual inhibition has diminished; psychological disorders have not. Consider, too, some other contradictory research.

"Many aspects of Freudian theory are indeed out of date, and they should be: Freud died in 1939, and he has been slow to undertake further revisions."

—Psychologist Drew Westen (1998)

Does Developmental Research Support Freud's Views of Childhood? Developmental psychologists now see our development as lifelong, not fixed in childhood. They doubt that infants' neural networks are mature enough to sustain as much emotional trauma as Freud assumed. Some think Freud overestimated parental influence and underestimated peer influence (and abuse). They also doubt that conscience and gender identity form as the child resolves the Oedipus complex at age 5 or 6. We gain our gender identity earlier and become strongly masculine or feminine even without a same-sex parent present. And they note that Freud's ideas about childhood sexuality arose from his skepticism of stories of childhood sexual abuse told by his female patients—stories that some scholars believe he attributed to their own childhood sexual wishes and conflicts (Esterson, 2001; Powell & Boer, 1994). Today, we understand how Freud's questioning might have created false memories of abuse, but we also know that childhood sexual abuse does happen.

Does Memory Research Support Freud's Idea of Repression? Freud's entire psychoanalytic theory rests on his assumption that the human mind often *represses* offending wishes, banishing them into the unconscious until they resurface, like long-lost books in a dusty attic. Recover and resolve childhood's conflicted wishes, and emotional healing should follow. Under Freud's influence, repression became a widely accepted concept, used to explain hypnotic phenomena and psychological disorders. Freud's followers extended repression to explain apparently lost and recovered memories of childhood traumas (Boag, 2006; Cheit, 1998; Erdelyi, 2006). In one survey, 88 percent of university students believed that painful experiences commonly get pushed out of awareness and into the unconscious (Garry et al., 1994).

Today's researchers acknowledge that we sometimes spare our egos by neglecting threatening information (Green et al., 2008). Yet, many contend that repression, if it ever occurs, is a rare mental response to terrible trauma. "Repression folklore is . . . partly refuted, partly untested, and partly untestable," said Elizabeth Loftus (1995). Even those who have witnessed a parent's murder or survived Nazi death camps retain their unrepressed memories of the horror (Helmreich, 1992, 1994; Malmquist, 1986; Pennebaker, 1990). "Dozens of formal studies have yielded not a single convincing case of repression in the entire literature on trauma," concludes personality researcher John Kihlstrom (2006).

projective test a personality test, such as the Rorschach inkblot test, that provides ambiguous stimuli designed to trigger projection of one's inner dynamics.

Rorschach inkblot test the most widely used projective test, a set of 10 inkblots, designed by Hermann Rorschach; seeks to identify people's inner feelings by analyzing their interpretations of the blots.

"During the Holocaust, many children . . . were forced to endure the unendurable. For those who continue to suffer [the] pain is still present, many years later, as real as it was on the day it occurred."

—Eric Zillmer, Molly Harrower, Barry Ritzler, and Robert Archer, *The Quest for the Nazi Personality,* 1995

Some researchers believe that extreme, prolonged stress, such as the stress some severely abused children experience, might disrupt memory by damaging the hippocampus (Schacter, 1996). But the far more common reality is that high stress and associated stress hormones enhance memory. Indeed, rape, torture, and other traumatic events haunt survivors, who experience unwanted flashbacks. They are seared onto the soul. "You see the babies," said Holocaust survivor Sally H. (1979). "You see the screaming mothers. You see hanging people. You sit and you see that face there. It's something you don't forget."

"For seven and a half years I've worked alongside President Reagan. We've had triumphs. Made some mistakes. We've had some sex . . . uh . . . setbacks."

—George H. W. Bush, 1988

Does Cognitive Research Support Freud's View of the Unconscious? New ideas about why we dream dispute Freud's belief that dreams disguise and fulfill wishes lurking in our unconscious. And slips of the tongue can be explained as competition between similar verbal choices in our memory network. Someone who says "I don't want to do that—it's a lot of brothel" may simply be blending *bother* and *trouble* (Foss & Hakes, 1978). But Freud was right about at least one thing: We indeed have limited access to all that goes on in our minds (Erdelyi, 1985, 1988, 2006; Kihlstrom, 1990). Research confirms the reality of unconscious *implicit learning* (Fletcher et al., 2005; Frensch & Rünger, 2003). In experiments, people have learned to anticipate where on a computer screen a character will appear next, even before being able to articulate the underlying rule (Lewicki, 1992, 1997). Our two-track mind has a vast out-of-sight realm.

"I remember your name perfectly but I just can't think of your face."

—Oxford professor W. A. Spooner, 1844–1930, famous for his linguistic flip-flops *(spoonerisms)*. Spooner rebuked one student for "fighting a liar in the quadrangle" and another who "hissed my mystery lecture," adding "You have tasted two worms."

But the "iceberg" notion held by today's researchers differs from Freud's (Greenwald, 1992). Many now think of the unconscious not as seething passions and repressive censoring but as cooler information processing that occurs without our awareness, such as

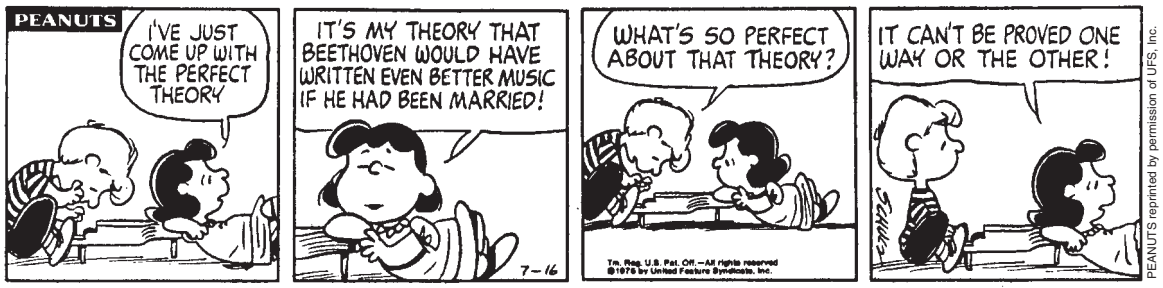
- the right-hemisphere activity that enables the split-brain patient's left hand to carry out an instruction the patient cannot verbalize.
- the parallel processing of different aspects of vision and thinking, and the schemas that automatically control our perceptions and interpretations.
- the implicit memories that operate without our conscious recall, and even among those with amnesia.
- the emotions that activate instantly, before conscious analysis.
- the self-concept and stereotypes that automatically and unconsciously influence how we process information about ourselves and others.

More than we realize, we fly on autopilot, guided by off-screen, out-of-sight, unconscious information processing. The unconscious mind is huge. This understanding of unconscious information processing is more like the pre-Freudian view of an underground, unattended stream of thought from which spontaneous behavior and creative ideas surface (Bargh & Morsella, 2008).

Researchers find little support for Freud's idea that defense mechanisms disguise sexual and aggressive impulses. More evidence exists for defenses that defend self-esteem. For example, Roy Baumeister and his colleagues (1998) found that people tend to see their foibles and attitudes in others, a phenomenon that Freud called projection and that today's researchers call the *false consensus effect*, the tendency to overestimate the extent to which others share our beliefs and behaviors. Although our cognitive gymnastics do work to support our self-esteem, supportive evidence is meager for other defenses, such as displacement, that are tied to instinctual energy. Defense mechanisms, Baumeister concluded, are motivated less by the seething impulses that Freud presumed than by our need to protect our self-image.

Can Freud's Theory Be Tested Scientifically? Good scientific theories explain observations and offer testable hypotheses. Freud's critics note that his theory rests on few objective observations, and parts of it offer few testable hypotheses. (For Freud, his own recollections and interpretations of patients' free associations, dreams, and slips were evidence enough.)

What is the most serious problem with Freud's theory? It offers after-the-fact explanations of any characteristic (of one person's smoking, another's fear of horses, another's sexual orientation) yet fails to *predict* such behaviors and traits. If you feel



angry at your mother's death, you illustrate his theory because "your unresolved childhood dependency needs are threatened." If you do not feel angry, you again illustrate his theory because "you are repressing your anger." That, said Calvin Hall and Gardner Lindzey (1978, p. 68), "is like betting on a horse after the race has been run." A good theory makes testable predictions.

For such reasons, some of Freud's critics offer harsh words. They see a decaying Freudian edifice built on the swamplands of childhood sexuality, repression, dream analysis, and after-the-fact speculation. "When we stand on [Freud's] shoulders, we only discover that we're looking further in the wrong direction," said John Kihlstrom (1997). To Freud's most searing critic, Frederick Crews (1998), what is original about Freud's ideas is not good, and what is good is not original (the unconscious mind is an idea that dates back to Plato).

So, should psychology post a "Do Not Resuscitate" order on this old theory? Freud's supporters object. To criticize Freudian theory for not making testable predictions is, they say, like criticizing baseball for not being an aerobic exercise, something it was never intended to be. Freud never claimed that psychoanalysis was predictive science. He merely claimed that, looking back, psychoanalysts could find meaning in our state of mind (Rieff, 1979).

Supporters also note that some of Freud's ideas *are* enduring. It was Freud who drew our attention to the unconscious and the irrational, to our self-protective defenses, to the importance of human sexuality, and to the tension between our biological impulses and our social well-being. It was Freud who challenged our self-righteousness, punctured our pretensions, and reminded us of our potential for evil.

In science, Darwin's legacy lives while Freud's is waning (Bornstein, 2001). But in the popular culture, Freud's legacy lives on. Some ideas that many people assume to be true—that childhood experiences mold personality, that dreams have meaning, that many behaviors have disguised motives—are part of that legacy. His early twentieth-century concepts penetrate our twenty-first-century language. Without realizing their source, we may speak of *ego, repression, projection, complex* (as in "inferiority complex"), *sibling rivalry, Freudian slips,* and *fixation.* "Freud's premises may have undergone a steady decline in currency within academia for many years," noted Martin Seligman (1994), "but Hollywood, the talk shows, many therapists, and the general public still love them."

"We are arguing like a man who should say, 'If there were an invisible cat in that chair, the chair would look empty; but the chair does look empty; therefore there is an invisible cat in it.'"

—C. S. Lewis, *Four Loves,* 1958

The Humanistic Perspective

30-5: How did humanistic psychologists view personality, and what was their goal in studying personality?

By the 1960s, some personality psychologists had become discontented with the negativity of Freudian theory and the mechanistic psychology of B. F. Skinner's behaviorism. In contrast to Freud's study of the base motives of "sick" people, these *humanistic psychologists* focused on the ways "healthy" people strive for self-determination and self-realization. In contrast to behaviorism's scientific objectivity, they studied people through their own self-reported experiences and feelings.

Two pioneering theorists—Abraham Maslow (1908–1970) and Carl Rogers (1902–1987)—instead emphasized human potential.

Ted Polumbaum/Time Pix/Getty Images

Abraham Maslow "Any theory of motivation that is worthy of attention must deal with the highest capacities of the healthy and strong person as well as with the defensive maneuvers of crippled spirits" (*Motivation and Personality,* 1970).

Abraham Maslow's Self-Actualizing Person

Maslow proposed that we are motivated by a hierarchy of needs. If our physiological needs are met, we become concerned with personal safety; if we achieve a sense of security, we can then seek to love, to be loved, and to love ourselves; with our love needs satisfied, we can seek self-esteem. Having achieved self-esteem, we can then ultimately seek **self-actualization** (the process of fulfilling our potential) and *self-transcendence* (meaning, purpose, and communion beyond the self).

Maslow (1970) developed his ideas by studying healthy, creative people rather than troubled clinical cases. He based his description of self-actualization on a study of those who seemed notable for their rich and productive lives—among them, Abraham Lincoln, Thomas Jefferson, and Eleanor Roosevelt. Maslow reported that these people shared certain characteristics: They were self-aware and self-accepting, open and spontaneous, loving and caring, and not paralyzed by others' opinions. They were secure in their sense of who they were, and their interests were problem-centered rather than self-centered. They focused their energies on a particular task, one they often regarded as their mission in life. Most enjoyed a few deep relationships rather than many superficial ones. Many had been moved by spiritual or personal *peak experiences* that surpassed ordinary consciousness.

These, said Maslow, are mature adult qualities, ones found in those who have learned enough about life to be compassionate, to have outgrown their mixed feelings toward their parents, to have found their calling, to have "acquired enough courage to be unpopular, to be unashamed about being openly virtuous, etc." Maslow's work with college students led him to speculate that those likely to become self-actualizing adults were likable, caring, "privately affectionate to those of their elders who deserve it," and "secretly uneasy about the cruelty, meanness, and mob spirit so often found in young people."

Carl Rogers' Person-Centered Perspective

Fellow humanistic psychologist Carl Rogers agreed with much of Maslow's thinking. Rogers believed that people are basically good and are endowed with self-actualizing tendencies. Unless thwarted by an environment that inhibits growth, each of us, like an acorn, is primed for growth and fulfillment. For Rogers (1980), a growth-promoting climate required three conditions:

- *Genuineness:* When people are *genuine,* they are open with their own feelings, drop their facades, and are transparent and self-disclosing.
- *Acceptance:* When people are *accepting,* they offer **unconditional positive regard,** an attitude of grace that values us even knowing our failings. It is a profound relief to drop our pretenses, confess our worst feelings, and discover that we are still accepted. In a good marriage, a close family, or an intimate friendship, we are free to be spontaneous without fearing the loss of others' esteem.
- *Empathy:* When people are *empathic,* they share and mirror others' feelings and reflect their meanings. "Rarely do we listen with real understanding, true empathy," said Rogers. "Yet listening, of this very special kind, is one of the most potent forces for change that I know."

Genuineness, acceptance, and empathy are the water, sun, and nutrients that enable people to grow like vigorous oak trees, according to Rogers. For "as persons are accepted and prized, they tend to develop a more caring attitude toward themselves" (Rogers, 1980, p. 116). As persons are empathically heard, "it becomes possible for them to listen more accurately to the flow of inner experiencings."

Writer Calvin Trillin (2006) recalls an example of parental genuineness and acceptance at a camp for children with severe disorders, where his wife, Alice, worked.

A father *not* offering unconditional positive regard:

"Just remember, son, it doesn't matter whether you win or lose—unless you want Daddy's love."

L., a "magical child," had genetic diseases that meant she had to be tube-fed and could walk only with difficulty. Alice recalled,

> One day, when we were playing duck-duck-goose, I was sitting behind her and she asked me to hold her mail for her while she took her turn to be chased around the circle. It took her a while to make the circuit, and I had time to see that on top of the pile [of mail] was a note from her mom. Then I did something truly awful. . . . I simply had to know what this child's parents could have done to make her so spectacular, to make her the most optimistic, most enthusiastic, most hopeful human being I had ever encountered. I snuck a quick look at the note, and my eyes fell on this sentence: "If God had given us all of the children in the world to choose from, L., we would only have chosen you." Before L. got back to her place in the circle, I showed the note to Bud, who was sitting next to me. "Quick. Read this," I whispered. "It's the secret of life."

Although today's science sees children as formed by much more than parental nurture, Maslow and Rogers would have smiled knowingly. For them a central feature of personality is one's **self-concept**—all the thoughts and feelings we have in response to the question, "Who am I?" If our self-concept is positive, we tend to act and perceive the world positively. If it is negative—if in our own eyes we fall far short of our *ideal self*—said Rogers, we feel dissatisfied and unhappy. A worthwhile goal for therapists, parents, teachers, and friends is therefore, he said, to help others know, accept, and be true to themselves.

Image Source/Jupiterimages

The picture of empathy Being open and sharing confidences is easier when the listener shows real understanding. Within such relationships people can relax and fully express their true selves.

Assessing the Self

30-6: How did humanistic psychologists assess a person's sense of self?

Humanistic psychologists sometimes assessed personality by asking people to fill out questionnaires that would evaluate their self-concept. One questionnaire, inspired by Carl Rogers, asked people to describe themselves both as they would *ideally* like to be and as they *actually* are. When the ideal and the actual self are nearly alike, said Rogers, the self-concept is positive. Assessing his clients' personal growth during therapy, he looked for successively closer ratings of actual and ideal selves.

Some humanistic psychologists believed that any standardized assessment of personality, even a questionnaire, is depersonalizing. Rather than forcing the person to respond to narrow categories, these humanistic psychologists presumed that interviews and intimate conversation would provide a better understanding of each person's unique experiences.

Evaluating the Humanistic Perspective

30-7: How has the humanistic perspective influenced psychology? What criticisms has it faced?

One thing said of Freud can also be said of the humanistic psychologists: Their impact has been pervasive. Maslow's and Rogers' ideas have influenced counseling, education, child-rearing, and management.

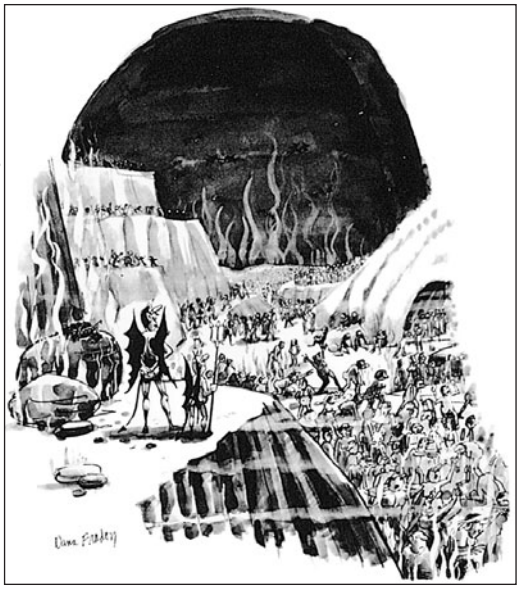
They have also influenced—sometimes in ways they did not intend—much of today's popular psychology. Is a positive self-concept the key to happiness and success? Do acceptance and empathy nurture positive feelings about oneself? Are people basically good and capable of self-improvement? Many people answer *yes*, *yes*, and *yes*. Responding to a 1992 *Newsweek* Gallup poll, 9 in 10 people rated self-esteem as very important for "motivating a person to work hard and succeed." Humanistic psychology's message has been heard.

The prominence of the humanistic perspective set off a backlash of criticism. First, said the critics, its concepts are vague and *subjective*. Consider Maslow's description of self-actualizing people as open, spontaneous, loving, self-accepting, and productive. Is this a scientific description? Isn't it merely a description of the theorist's own values and ideals? Maslow, noted M. Brewster Smith (1978),

self-actualization according to Maslow, one of the ultimate psychological needs that arises after basic physical and psychological needs are met and self-esteem is achieved; the motivation to fulfill one's potential.

unconditional positive regard according to Rogers, an attitude of total acceptance toward another person.

self-concept all our thoughts and feelings about ourselves, in answer to the question, "Who am I?"



"We do pretty well when you stop to think that people are basically good."

offered impressions of his own personal heroes. Imagine another theorist who began with a different set of heroes—perhaps Napoleon, John D. Rockefeller, Sr., and former U.S. Vice President Dick Cheney. This theorist would likely describe self-actualizing people as "undeterred by others' needs and opinions," "motivated to achieve," and "comfortable with power."

Critics have also objected to the idea that, as Rogers put it, "The only question which matters is, 'Am I living in a way which is deeply satisfying to me, and which truly expresses me?'" (quoted by Wallach & Wallach, 1985). The *individualism* encouraged by humanistic psychology—trusting and acting on one's feelings, being true to oneself, fulfilling oneself—can, the critics have said, lead to self-indulgence, selfishness, and an erosion of moral restraints (Campbell & Specht, 1985; Wallach & Wallach, 1983). Indeed, it is those who focus beyond themselves who are most likely to experience social support, to enjoy life, and to cope effectively with stress.

Humanistic psychologists reply that a secure, nondefensive self-acceptance is actually the first step toward loving others. Indeed, people who feel intrinsically liked and accepted—for who they are, not just for their achievements—exhibit less-defensive attitudes (Schimel et al., 2001).

A final accusation leveled against humanistic psychology is that it is *naive,* that it fails to appreciate the reality of our human capacity for evil. Faced with global climate change, overpopulation, terrorism, and the spread of nuclear weapons, we may become apathetic from either of two rationalizations. One is a naive optimism that denies the threat ("People are basically good; everything will work out"). The other is a dark despair ("It's hopeless; why try?"). Action requires enough realism to fuel concern and enough optimism to provide hope. Humanistic psychology, say the critics, encourages the needed hope but not the equally necessary realism about evil.

Classic Perspectives on Personality

Module Review

30-1: What was Freud's view of personality and its development? Freud believed that emotional disorders spring from *unconscious* dynamics, which he sought to analyze through *free association* and dreams. He referred to his theory and techniques as *psychoanalysis.* He saw *personality* as composed of pleasure-seeking psychic impulses (the *id*), a reality-oriented executive (the *ego*), and an internalized set of ideals (the *superego*). He believed that children develop through *psychosexual stages,* and that failure to resolve conflicts associated with a particular stage may result in *fixation* at that stage. To ward off free-floating anxiety, the ego employs *defense mechanisms,* especially *repression.*

30-2: Which of Freud's ideas did his followers accept or reject? Neo-Freudians Adler and Horney accepted many of Freud's ideas, but they argued for motives other than sex and aggression and for greater conscious control than Freud supposed. Jung also accepted many of Freud's ideas but also proposed a *collective unconscious.* Psychodynamic theorists share Freud's view that unconscious mental processes, inner conflicts, and childhood experiences are important influences on personality.

30-3: What are projective tests, and how are they used? *Projective tests* attempt to assess personality by presenting ambiguous stimuli designed to reveal the unconscious. The most famous projective test, the *Rorschach inkblot test,* has questionable reliability and validity.

30-4: How do contemporary psychologists view Freud and the unconscious? Freud's critics note that his theory offers only after-the-fact explanations, and that repression rarely occurs. Current information-processing research confirms that our access to all that goes on in our mind is very limited, but it does not support Freud's view of the unconscious. Rather, the unconscious consists of schemas that control our perceptions; parallel processing that occurs without our conscious knowledge; implicit memories of learned skills; instantly activated emotions; and self-concepts and stereotypes that filter information about ourselves and others. With the exception of projection and reaction formation, there is little support for Freud's proposed defense mechanisms.

Nevertheless, Freud drew psychology's attention to the unconscious, to the struggle to cope with anxiety and sexuality, and to the conflict between biological impulses and social restraints. His cultural impact has been enormous.

30-5: How did humanistic psychologists view personality, and what was their goal in studying personality? Humanistic psychologists sought to turn psychology's attention toward the growth potential of healthy people. Maslow believed that if basic human needs are fulfilled, people will strive toward *self-actualization* and self-transcendence. To nurture growth in others, Rogers advised being genuine, accepting, and empathic. In this climate of *unconditional positive regard,* he believed, people can develop a deeper self-awareness and a more realistic and positive *self-concept.*

30-6: How did humanistic psychologists assess a person's sense of self? Some humanistic psychologists assessed personality through questionnaires on which people reported their self-concept. Others believed the only acceptable approach is understanding others' subjective personal experiences in face-to-face situations.

30-7: How has the humanistic perspective influenced psychology? What criticisms has it faced? Humanistic psychology helped to renew psychology's interest in the concept of self. Its critics have complained that its concepts are vague and subjective, its values self-centered, and its assumptions naively optimistic.

Rehearse It!

1. Freud believed that we may block from consciousness the thoughts, wishes, feelings, or memories that are unbearably painful or unacceptable. He called this unconscious process
   a. free association.
   b. repression.
   c. anxiety.
   d. identification.

2. According to Freud's view of personality structure, the "executive" system, the _____, seeks to gratify the impulses of the _____ in more acceptable ways.
   a. id; ego
   b. ego; superego
   c. ego; id
   d. id; superego

3. Freud proposed that the development of the "voice of conscience" is related to the _____, which internalizes ideals and provides standards for judgments.
   a. ego
   b. superego
   c. id
   d. collective unconscious

4. According to the psychoanalytic view of development, we all pass through a series of psychosexual stages, such as the oral, anal, and phallic stages. Conflicts unresolved at any of these stages may lead to
   a. dormant sexual feelings.
   b. fixation in that stage.
   c. preconscious blocking of impulses.
   d. a distorted gender identity.

5. Freud believed that all defense mechanisms distort or disguise reality, and all are
   a. conscious.
   b. unconscious.
   c. preconscious.
   d. rationalizations.

6. Projective tests ask test-takers to respond to an ambiguous stimulus, for example, by describing it or telling a story about it. The creator of the well-known projective test that uses inkblots as stimuli was
   a. Alfred Adler.
   b. Karen Horney.
   c. Sigmund Freud.
   d. Hermann Rorschach.

7. In general, neo-Freudians such as Adler and Horney accepted many of Freud's views but placed more emphasis on
   a. development throughout the life span.
   b. the collective unconscious.
   c. the role of the id.
   d. social interactions.

8. Psychodynamic theorists and therapists tend to reject Freud's view that sex is the basis of personality. But they would agree with Freud about
   a. the existence of unconscious mental processes.
   b. the Oedipus and Electra complexes.
   c. the predictive value of Freudian theory.
   d. the superego's role as the executive part of personality.

9. Which of the following is not part of the CONTEMPORARY view of the unconscious?
   a. Repressed memories of anxiety-provoking events.
   b. Schemas that influence our perceptions and interpretations.
   c. Parallel processing that occurs without our conscious knowledge.
   d. Instantly activated emotions and implicit memories of learned skills.

10. Maslow's hierarchy of needs proposes that we must satisfy basic physiological and psychological needs before we seek self-actualization. Maslow based his ideas on
   a. Freudian theory.
   b. his experiences with patients.
   c. a series of laboratory experiments.
   d. his study of healthy, creative people.

11. The total acceptance Rogers advocated as part of a growth-promoting environment is called
   a. self-concept.
   b. unconditional positive regard.
   c. self-actualization.
   d. the "ideal self."

Answers: 1. b, 2. c, 3. b, 4. b, 5. b, 6. d, 7. d, 8. a, 9. a, 10. d, 11. b.

Terms and Concepts to Remember

personality, p. 438
free association, p. 439
unconscious, p. 439
psychoanalysis, p. 439
id, p. 440
ego, p. 440
superego, p. 440
psychosexual stages, p. 441
Oedipus [ED-uh-puss] complex, p. 441
identification, p. 441
fixation, p. 441
defense mechanisms, p. 442
repression, p. 442
collective unconscious, p. 443
projective test, p. 444
Rorschach inkblot test, p. 444
self-actualization, p. 448
unconditional positive regard, p. 448
self-concept, p. 449

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. How might Freud and Rogers differ in their explanations of how the environment influences the development of a criminal?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 31

Contemporary Perspectives on Personality

The Trait Perspective

31-1: How do psychologists use traits to describe personality?

In J.R.R. Tolkien's *Lord of the Rings,* Frodo Baggins' faithful companion, Sam Gamgee, is unwaveringly loyal and optimistic. In psychology, trait researchers attempt to define **personality** in terms of such stable and enduring behavior patterns. This perspective can be traced in part to a remarkable meeting in 1919, when Gordon Allport, a curious 22-year-old psychology student, interviewed Sigmund Freud in Vienna. Allport soon discovered just how preoccupied the founder of psychoanalysis was with finding hidden motives, even in Allport's own behavior during the interview. That experience ultimately led Allport to a new approach to personality. Meeting Freud, he said, "taught me that [psychoanalysis], for all its merits, may plunge too deep, and that psychologists would do well to give full recognition to manifest motives before probing the unconscious." Allport came to define personality in terms of fundamental **traits**—people's characteristic behavior patterns and conscious motives (such as the curiosity that actually motivated Allport to see Freud). He was concerned less with *explaining* individual traits than with *describing* them.

personality an individual's characteristic pattern of thinking, feeling, and acting.

trait a characteristic pattern of behavior or a disposition to feel and act, as assessed by self-report inventories and peer reports.

Exploring Traits

Classifying people as one or another distinct personality type fails to capture their full individuality. We are each a unique complex of multiple traits. So how else could we describe our personalities? We might describe an apple by placing it along several trait dimensions—relatively large or small, red or yellow, sweet or sour. By placing people on several trait dimensions simultaneously, psychologists can describe countless individual personality variations, much as researchers can describe many thousands of colors in terms of their variations on just three color dimensions—hue, saturation, and brightness.

What trait dimensions describe personality? If you had an upcoming blind date, what personality traits might give you an accurate sense of the person? Allport and his associate H. S. Odbert (1936) counted all the words in an unabridged dictionary with which one could describe people. How many were there? Almost 18,000! How, then, could psychologists condense the list to a manageable number of basic traits?

One way has been to propose traits, such as anxiety, that some theory regards as basic. A newer technique is *factor analysis,* a statistical procedure that has been used to identify clusters of test items that tap basic components of intelligence (such as spatial ability or verbal skill). Imagine that people who describe themselves as outgoing also tend to say that they like excitement and practical jokes and dislike quiet reading. Such a statistically correlated cluster of behaviors reflects a basic *factor,* or trait—in this case, *extraversion*.

AP Photo/Peter Kramer

Jon Stewart: The extravert Trait labels such as *extraversion* can describe our temperament and typical behaviors.

Brain-activity scans indicate that extraverts seek stimulation because their normal *brain arousal* is relatively low. PET scans, for example, show that a frontal lobe area involved in behavior inhibition is less active in extraverts than in introverts (Johnson et al., 1999).

Our biology influences our personality in other ways as well. Twin and adoption studies indicate that our *genes* have much to say about our temperament and behavioral style, which help define our personality. Jerome Kagan, for example, has attributed differences in children's shyness and inhibition to their

Thinking Critically About:

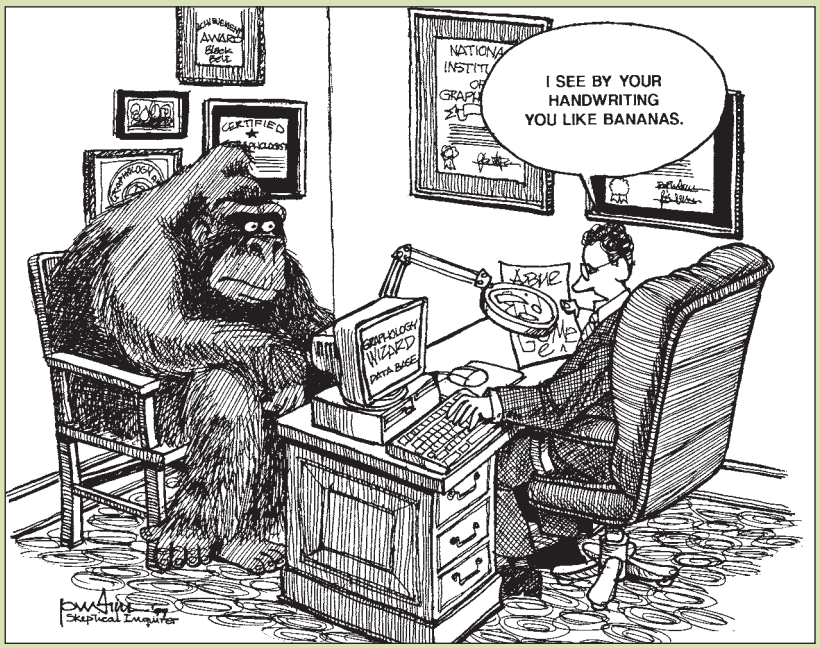
How to Be a "Successful" Astrologer or Palm Reader

Can we discern people's traits from the alignment of the stars and planets at the time of their birth? From their handwriting? From lines on their palms?

Astronomers scoff at the naiveté of astrology—the constellations have shifted in the millennia since astrologers formulated their predictions (Kelly, 1997, 1998). Humorists mock it: "No offense," wrote Dave Barry, "but if you take the horoscope seriously your frontal lobes are the size of Raisinets." Psychologists instead ask questions: Does it work? Can astrologers surpass chance when given someone's birth date and asked to identify the person from a short lineup of different personality descriptions? Can people pick out their own horoscopes from a lineup of horoscopes?

The consistent answers have been *no, no,* and *no* (British Psychological Society, 1993; Carlson, 1985; Kelly, 1997). For example, one researcher examined census data from 20 million married people in England and Wales and found that "astrological sign has no impact on the probability of marrying—and staying married to—someone of any other sign" (Voas, 2008).

Graphologists, who make predictions from handwriting samples, have similarly been found to do no better than chance when trying to discern people's occupations from examining several pages of their handwriting (Beyerstein & Beyerstein, 1992; Dean et al., 1992). Nevertheless, graphologists—and introductory psychology students—will often *perceive* correlations between personality and handwriting even where there are none (King & Koehler, 2000).



If all these perceived correlations evaporate under close scrutiny, how do astrologers, palm readers, and crystal-ball gazers persuade millions of people worldwide to buy their services? Ray Hyman (1981), palm reader turned research psychologist, has revealed some of their suckering methods.

The first technique, the "stock spiel," builds on the observation that each of us is in some ways like no one else and in other ways just like everyone. That some things are true of us all enables the "seer" to offer statements that seem impressively accurate: "I sense that you worry about things more than you let on, even to your best friends." A number of such generally true statements can be combined into a personality description. Imagine that you take a personality test and then receive the following character sketch:

> You have a strong need for other people to like and to admire you. You have a tendency to be critical of yourself. . . . You pride yourself on

autonomic nervous system reactivity. Given a reactive autonomic nervous system, we respond to stress with greater anxiety and inhibition. The fearless, curious child may become the rock-climbing or fast-driving adult.

Samuel Gosling and his colleagues (2003; Jones & Gosling, 2005) report that personality differences among dogs (in energy, affection, reactivity, and curious intelligence) are as evident, and as consistently judged, as personality differences among humans. Monkeys, chimpanzees, orangutans, and even birds have stable personalities (Weiss et al., 2006). Among the Great Tit (a European relative of the American chickadee), bold birds more quickly inspect new objects and explore trees (Groothuis & Carere, 2005; Verbeek et al., 1994). By selective breeding, researchers can produce bold or shy birds. Both have their place in natural history. In lean years, bold birds are more likely to find food; in abundant years, shy birds feed with less risk.

being an independent thinker and do not accept other opinions without satisfactory proof. You have found it unwise to be too frank in revealing yourself to others. At times you are extraverted, affable, sociable; at other times you are introverted, wary, and reserved. Some of your aspirations tend to be pretty unrealistic (Davies, 1997; Forer, 1949).

In experiments, college students have received stock assessments like this one, drawn from statements in a newsstand astrology book. When they think the bogus, generic feedback was prepared just for them and when it is favorable, they nearly always rate the description as either "good" or "excellent" (Davies, 1997). Even skeptics given a flattering description attributed to an astrologer, begin to think that "maybe there's something to this astrology stuff after all" (Glick et al., 1989). An astrologer, it has been said, is someone "prepared to tell you what you think of yourself" (Jones, 2000).

French psychologist Michael Gauguelin offered a free personal horoscope in an ad he placed in a Paris newspaper. Ninety-four percent of those receiving the horoscope praised the description as accurate. Whose horoscope had they all received? That of France's Dr. Petiot, a notorious mass murderer (Kurtz, 1983). This acceptance of stock, positive descriptions is called the *Barnum effect,* named in honor of master showman P. T. Barnum's dictum, "There's a sucker born every minute."

"Madame Zelinski can provide an even more accurate reading with your date of birth and Social Security number."

A second technique used by seers is to "read" our clothing, physical features, nonverbal gestures, and reactions to what they are saying. No wonder, say the skeptics, that when mediums cannot see the person who has come to them, their clients cannot recognize the reading that was meant for them from among other readings (O'Keeffe & Wiseman, 2005).

If you are not as shrewd as most character readers, Hyman says it hardly matters. If people seek you out for a reading, start with some safe sympathy: "I sense you're having some problems lately. You seem unsure what to do. I get the feeling another person is involved." Then tell them what they want to hear. Memorize some Barnum statements from astrology and fortune-telling manuals and use them liberally. Tell people it is their responsibility to cooperate by relating your message to their specific experiences. Later they will recall that you predicted those specific details. Phrase statements as questions, and when you detect a positive response assert the statement strongly. Finally, be a good listener, and later, in different words, reveal to people what they earlier revealed to you. If you dupe them, they will come.

Better yet, beware of those who, by exploiting people with these techniques, are fortune takers rather than fortune tellers.

Assessing Traits

31-2: What are personality inventories, and what are their strengths and weaknesses as trait-assessment tools?

If stable and enduring traits guide our actions, can we devise valid and reliable tests of them? Several trait assessment techniques exist—some more valid than others (see Thinking Critically About: How to Be a "Successful" Astrologer or Palm Reader). Some profile a person's behavior patterns—often providing quick assessments of a single trait, such as extraversion, anxiety, or self-esteem. **Personality inventories**—longer questionnaires covering a wide range of feelings and behaviors—are designed to assess several traits at once.

The classic personality inventory is the **Minnesota Multiphasic Personality Inventory (MMPI).** Although it assesses "abnormal" personality tendencies

personality inventory a questionnaire (often with *true-false* or *agree-disagree* items) on which people respond to items designed to gauge a wide range of feelings and behaviors; used to assess selected personality traits.

Minnesota Multiphasic Personality Inventory (MMPI) the most widely researched and clinically used of all personality tests. Originally developed to identify emotional disorders (still considered its most appropriate use), this test is now used for many other screening purposes.

rather than normal personality traits, the MMPI illustrates a good way of developing a personality inventory. One of its creators, Starke Hathaway (1960), compared his effort to that of Alfred Binet, who developed the first intelligence test by selecting items that identified children who would probably have trouble progressing normally in French schools. The MMPI items, too, were **empirically derived.** That is, from a large pool of items, Hathaway and his colleagues selected those on which particular diagnostic groups differed. They then grouped the questions into 10 clinical scales, including scales that assess depressive tendencies, masculinity-femininity, and introversion-extraversion.

Hathaway and others initially gave hundreds of true-false statements ("No one seems to understand me"; "I get all the sympathy I should"; "I like poetry") to groups of psychologically disordered patients and to "normal" people. They retained any statement—no matter how silly it sounded—on which the patient group's answer differed from that of the normal group. "Nothing in the newspaper interests me except the comics" may seem senseless, but it just so happened that depressed people were more likely to answer *True*. (Nevertheless, people have had fun spoofing the MMPI with their own mock items: "Weeping brings tears to my eyes," "Frantic screams make me nervous," and "I stay in the bathtub until I look like a raisin" [Frankel et al., 1983].) Today's MMPI-2 also has scales assessing, for instance, work attitudes, family problems, and anger.

In contrast to the subjectivity of most projective tests, personality inventories are scored objectively—so objectively that a computer can administer and score them. (The computer can also provide descriptions of people who previously responded similarly.) Objectivity does not, however, guarantee validity. For example, individuals taking the MMPI for employment purposes can give socially desirable answers to create a good impression. But in so doing they may also score high on a *lie scale* that assesses faking (as when people respond *False* to a universally true statement such as "I get angry sometimes"). The objectivity of the MMPI has contributed to its popularity and to its translation into more than 100 languages.

The Big Five Factors

31-3: Which traits seem to provide the most useful information about personality variation?

Today's trait researchers believe that simple trait factors are important, but they do not tell the whole story. A slightly expanded set of factors—dubbed the *Big Five*—does a better job (Costa & McCrae, 2006; John & Srivastava, 1999). If a test specifies where you are on the five dimensions (*conscientiousness, agreeableness, neuroticism, openness,* and *extraversion,* as in **TABLE 31.1**), it has said much of what there is to say about your personality. Around the world—across 56 nations and 29 languages in one study (Schmitt et al., 2007)—people describe others in terms roughly consistent with this list. The Big Five may not be the last word, but for now, at least, it is the winning number in the personality lottery. The Big Five—today's "common currency for personality psychology" (Funder, 2001)—has been the most active personality research topic since the early 1990s and is currently our best approximation of the basic trait dimensions.

The recent wave of Big Five research explores various questions, including these:

- ***How stable are these traits?*** In adulthood, the Big Five traits are quite stable, with some tendencies (neuroticism, extraversion, and openness) waning a bit during early and middle adulthood, and others (agreeableness and conscientiousness) rising (McCrae et al., 1999; Vaidya et al., 2002). Conscientiousness increases the most during people's twenties, as people mature and learn to manage their jobs and relationships. Agreeableness increases the most during people's thirties and continues to increase through their sixties (Srivastava et al., 2003).

empirically derived test a test (such as the MMPI) developed by testing a pool of items and then selecting those that discriminate between groups.

TABLE 31.1 The "Big Five" Personality Factors

(*Memory tip:* Picturing a **CANOE** will help you recall these.)

Trait Dimension	Endpoints of the Dimension	
***C**onscientiousness*	Organized ⟷	Disorganized
	Careful ⟷	Careless
	Disciplined ⟷	Impulsive
***A**greeableness*	Soft-hearted ⟷	Ruthless
	Trusting ⟷	Suspicious
	Helpful ⟷	Uncooperative
***N**euroticism (emotional stability vs. instability)*	Calm ⟷	Anxious
	Secure ⟷	Insecure
	Self-satisfied ⟷	Self-pitying
***O**penness*	Imaginative ⟷	Practical
	Preference for variety ⟷	Preference for routine
	Independent ⟷	Conforming
***E**xtraversion*	Sociable ⟷	Retiring
	Fun-loving ⟷	Sober
	Affectionate ⟷	Reserved

Source: Adapted from McCrae & Costa (1986, p. 1002).

- ***How heritable are they?*** Heritability of individual differences varies with the diversity of people studied, but it generally runs about 50 percent for each dimension. Genetic influences are similar in different nations (Loehlin et al., 1998; Yamagata et al., 2006).

Change and consistency can co-exist. If all people were to become somewhat less shy with age, there would be personality change, but also relative stability and predictability.

By exploring such questions, Big Five research has sustained trait psychology and renewed appreciation for the importance of personality.

Evaluating the Trait Perspective

31-4: Does research support the consistency of personality traits over time and across situations?

Are our personality traits stable and enduring? Or does our behavior depend on where and with whom we find ourselves? Both. Our behavior is influenced by the interaction of our inner disposition with our environment. Still, the question lingers: Which is more important?

Roughly speaking, the temporary, external influences on behavior are the focus of social psychology, and the enduring, inner influences are the focus of personality psychology. In actuality, behavior always depends on the interaction of persons with situations.

The Person-Situation Controversy

To explore this *person-situation controversy,* we look for genuine personality traits that persist over time and across situations. Are some people dependably conscientious and others unreliable, some cheerful and others dour, some friendly and outgoing and others shy? If we are to consider friendliness a trait, friendly people must act friendly at different times and places. Do they?

In considering research that has followed lives through time, some scholars (especially those who study infants) are impressed with personality change, others are struck by personality stability during adulthood. As **FIGURE 31.1** on the next page illustrates, data from 152 long-term studies reveal that personality trait scores are positively correlated with scores obtained seven years later, and that as people grow older their personality stabilizes. Interests may change—the avid collector of tropical fish may become an avid gardener. Careers may change—the determined salesperson may become a determined social worker. Relationships may change—the hostile spouse may start over with a new partner. But most people recognize their traits as their own, noted

"Mr. Coughlin over there was the founder of one of the first motorcycle gangs."

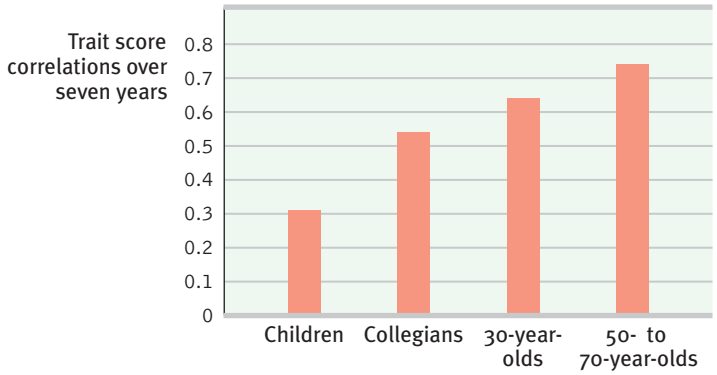


FIGURE 31.1 Personality stability With age, personality traits become more stable. Thus, as people age, their trait scores increasingly correlate with follow-up scores seven years later. (Data from Roberts & DelVecchio, 2000.)

Robert McCrae and Paul Costa (1994), "and it is well that they do. A person's recognition of the inevitability of his or her one and only personality is . . . the culminating wisdom of a lifetime." Moreover, our traits are socially significant. They influence our health, our thinking, and our job performance (Deary & Matthews, 1993; Hogan, 1998). Studies that follow lives through time show that personality traits rival socioeconomic status and cognitive ability as predictors of mortality, divorce, and occupational attainment (Roberts et al., 2007).

Although our personality *traits* may be both stable and potent, the consistency of our specific *behaviors* from one situation to the next is another matter. As Walter Mischel (1968, 1984, 2004) has pointed out, people do not act with predictable consistency. Mischel's studies of college students' conscientiousness revealed but a modest relationship between a student's being conscientious on one occasion (say, showing up for class on time) and being similarly conscientious on another occasion (say, turning in assignments on time). If you've noticed how outgoing you are in some situations and how reserved you are in others, perhaps you're not surprised. Being a different person to different people, you perhaps are content to have your boss or your family members *not* become your Facebook friends.

This inconsistency in behaviors also makes personality test scores weak predictors of behaviors. People's scores on an extraversion test, for example, do not neatly predict how sociable they actually will be on any given occasion. If we remember such results, says Mischel, we will be more cautious about labeling and pigeonholing individuals. Years in advance, science can tell us the phase of the Moon for any given date. A day in advance, meteorologists can often predict the weather. But we are much further from being able to predict how *you* will feel and act tomorrow.

However, people's *average* outgoingness, happiness, or carelessness over many situations is predictable (Epstein, 1983a,b). This consistency enables people who know someone well to agree in their ratings of the person's shyness or agreeableness (Kenrick & Funder, 1988).

By collecting snippets of people's daily experience via body-worn recording devices, Matthias Mehl and his colleagues (2006) have confirmed that extraverts really do talk more. (I have repeatedly vowed to cut back on my jabbering and joking during my noontime pickup basketball games with friends. Alas, moments later, the irrepressible chatterbox inevitably reoccupies my body.) As our best friends can verify, we do have genetically influenced personality traits. And those traits even lurk, report Samuel Gosling and his colleagues in a series of studies, in our

- *music preferences*. Classical, jazz, blues, and folk music lovers tend to be open to experience and verbally intelligent; country, pop, and religious music lovers tend to be cheerful, outgoing, and conscientious (Rentfrow & Gosling, 2003, 2006).
- *dorm rooms and offices*. Our personal spaces display our identity and leave a behavioral residue (in our scattered laundry or neat desktop). And that helps explain why just a few minutes' inspection of our living and working spaces can enable someone to assess with reasonable accuracy our conscientiousness, our openness to new experiences, and even our emotional stability (Gosling et al., 2002).

"I'm going to France—I'm a different person in France."

- *personal Web sites*. Is a personal Web site or a Facebook profile also a canvas for self-expression? Or is it an opportunity for people to present themselves in false or misleading ways? It's more the former (Gosling et al., 2007; Marcus et al., 2006; Vazire & Gosling, 2004). Visitors to personal Web sites quickly gain important clues to the owner's extraversion, conscientiousness, and openness to experience.
- *e-mail.* If you have ever felt you could detect someone's personality from the writing voice in their e-mail, you are right. People's ratings of others' personalities based solely on their e-mails correlate with actual personality scores on measures such as extraversion and neuroticism (Gill et al., 2006; Oberlander & Gill, 2006). Extraverts, for example, use more adjectives. (What a cool, exciting finding!!!)

John Langford Photography

Our spaces express our personalities
Even at "zero acquaintance," people can discern something of others' personality from glimpsing their Web site, dorm room, or office. So, what is your read on University of Texas researcher Samuel Gosling?

In unfamiliar, formal situations—perhaps as a guest in the home of a person from another culture—our traits remain hidden as we carefully attend to social cues. In familiar, informal situations—just hanging out with friends—we feel less constrained, allowing our traits to emerge (Buss, 1989). In these informal situations, our expressive styles—our animation, manner of speaking, and gestures—are impressively consistent. That's why those very thin slices of someone's behavior—even just three 2-second clips of a teacher—can be revealing (Ambady & Rosenthal, 1992, 1993).

To sum up, we can say that at any moment the immediate situation powerfully influences a person's behavior, especially when the situation makes clear demands. We can better predict drivers' behavior at traffic lights from knowing the color of the lights than from knowing the drivers' personalities. Averaging our behavior across many occasions does, however, reveal distinct personality traits. Traits exist. We differ. And our differences matter.

The Social-Cognitive Perspective

31-5: In the view of social-cognitive psychologists, what mutual influences shape an individual's personality?

Much as nature and nurture always work together, so do individuals and their situations. Albert Bandura (1986, 2006, 2008) emphasized this interaction of our traits with our situations when he proposed the **social-cognitive perspective** on personality.

Social-cognitive theorists believe we learn many of our behaviors either through conditioning or by observing others and modeling our behavior after theirs. (That is the "social" part.) But mental processes are also important: What we *think* about our situation affects our behavior. (That is the "cognitive" part.) Instead of focusing solely on how our environment *controls* us (behaviorism), social-cognitive theorists focus on how we and our environment *interact:* How do we interpret and respond to external events? How do our schemas, our memories, and our expectations influence our behavior patterns?

Reciprocal Influences

Bandura (1986, 2006) views the person-environment interaction as **reciprocal determinism.** "Behavior, internal personal factors, and environmental influences," he has said, "all operate as interlocking determinants of each other" (**FIGURE 31.2** on the next page). For example, children's TV-viewing habits (past behavior) influence their viewing preferences (internal factor), which influence how television (environmental factor) affects their current behavior. The influences are mutual.

social-cognitive perspective views behavior as influenced by the interaction between people's traits (including their thinking) and their social context.

reciprocal determinism the interacting influences of behavior, internal cognition, and environment.

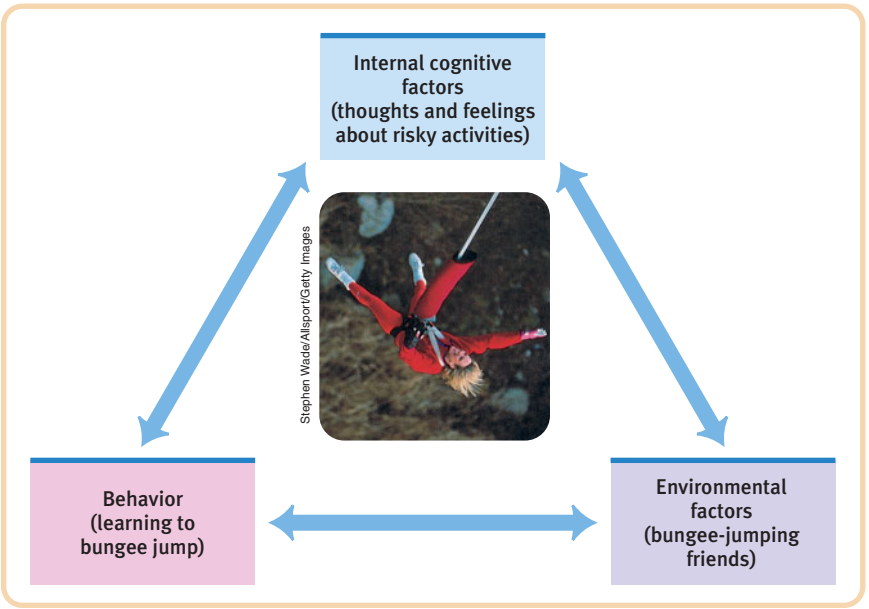


FIGURE 31.2 Reciprocal determinism The social-cognitive perspective proposes that our personalities are shaped by the interaction of our personal traits (including our thoughts and feelings), our environment, and our behaviors.

Consider three specific ways in which individuals and environments interact:

1. **Different people choose different environments.** The school you attend, the material you read, the programs you watch, the Web sites you visit, the music you listen to, the friends you associate with—all are parts of an environment you have chosen, based partly on your dispositions (Ickes et al., 1997). You choose your environment and it then shapes you.
2. **Our personalities shape how we interpret and react to events.** Anxious people, for example, are attuned to potentially threatening events (Eysenck et al., 1987). Thus, they perceive the world as threatening, and they react accordingly.
3. **Our personalities help create situations to which we react.** Many experiments reveal that how we view and treat people influences how they in turn treat us. If we expect someone to be angry with us, we may give the person a cold shoulder, touching off the very anger we expect. If we have an easygoing, positive disposition, we will likely enjoy close, supportive friendships (Donnellan et al., 2005; Kendler, 1997).

In such ways, we are both the products and the architects of our environments.

If all this has a familiar ring, it may be because it parallels and reinforces a pervasive theme in psychology and in this book: *Behavior emerges from the interplay of external and internal influences.* Boiling water turns an egg hard and a potato soft. A threatening environment turns one person into a hero, another into a scoundrel. *At every moment,* our behavior is influenced by our biology, our social and cultural experiences, and our cognition and dispositions, including our feelings about our control over our environment (**FIGURE 31.3**).

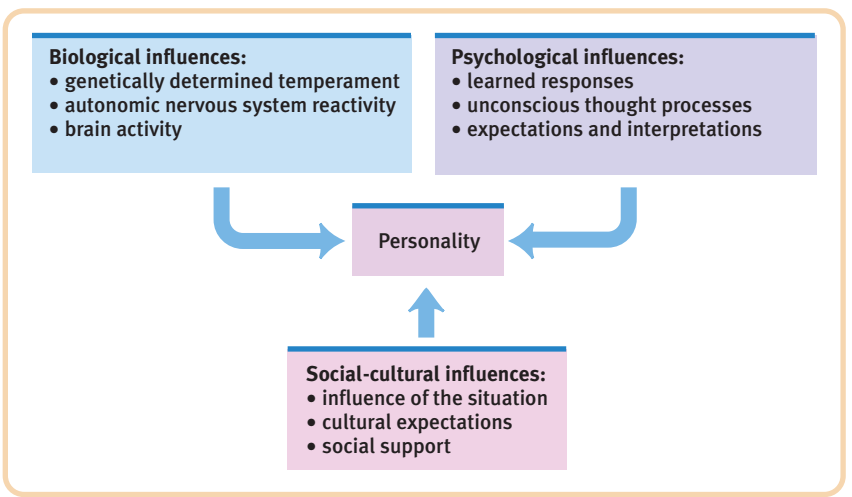


FIGURE 31.3 The biopsychosocial approach to the study of personality As with other psychological phenomena, personality is fruitfully studied at multiple levels.

Personal Control

31-6: What are the causes and consequences of personal control?

Consider your own feelings of **personal control.** Do you believe that your life is beyond your control? That the world is run by a few powerful people? That getting a good job depends mainly on being in the right place at the right time? Or do you more strongly believe that what happens to you is your own doing? That the average person can influence government decisions? That being a success is a matter of hard work?

Hundreds of studies have compared people who differ in their perceptions of control. On the one side are those who have what psychologist Julian Rotter called an **external locus of control**—the perception that chance or outside forces determine their fate. On the other are those who perceive an **internal locus of control,** who believe that they control their own destiny.

In study after study, "internals" achieve more in school and work, act more independently, enjoy better health, and feel less depressed than do "externals" (Lefcourt, 1982; Ng et al., 2006). Moreover, they score higher on measures of *self-control*—the ability to control impulses and delay gratification (Miller et al., 1986). Self-control in turn predicts good adjustment, better grades, and social success (Tangney et al., 2004). Students who plan their day's activities and then live out their day as planned tend to be at low risk for depression (Nezlek, 2001).

None of us experiences unvarying self-control; like a muscle, self-control temporarily weakens after an exertion. Exercising willpower can deplete your mental energy and even the blood sugar and neural activity associated with mental focus (Inzlicht & Gutsell, 2007). Hungry people who had resisted the temptation to eat chocolate chip cookies gave up sooner on a tedious task in one experiment. In others, people who had expended willpower on laboratory tasks, such as stifling prejudice or saying the color of words (for example, "red" even if the red-colored word was *green*), later became less restrained in their aggressive responses to provocation and in their sexual behavior (DeWall et al., 2007; Gaillot & Baumeister, 2007).

In the long run, self-control requires attention and energy. Giving people energy-boosting sugar (in a naturally rather than an artificially sweetened lemonade)—as experimenters did in another experiment—strengthened their effortful thinking (Masicampo & Baumeister, 2008). Self-control also replenishes with rest and becomes stronger with exercise (Baumeister & Exline, 2000). People who practice self-regulation through physical exercise and time-managed study programs develop strengthened self-control, as seen both in their performance on laboratory tasks and in their improved self-management of eating, drinking, smoking, and household chores (Oaten & Cheng, 2006a,b). Develop your self-discipline in one area of your life and your strengthened self-control may spill over into other areas as well.

We can study the effect of personal control (or any personality factor) in two ways:
1. Correlate *people's feelings of control with their behaviors and achievements.*
2. Experiment, *by raising or lowering people's sense of control and noting the effects.*

personal control the extent to which people perceive control over their environment rather than feeling helpless.

external locus of control the perception that chance or outside forces beyond your personal control determine your fate.

internal locus of control the perception that you control your own fate.

learned helplessness the hopelessness and passive resignation an animal or human learns when unable to avoid repeated aversive events.

Personal Control, Learned Helplessness, and Empowerment

People who feel helpless and oppressed often perceive control as external. This perception may then deepen their feelings of resignation. In fact, this is precisely what researcher Martin Seligman (1975, 1991) and others found in experiments with both animals and people. Dogs strapped in a harness and given repeated shocks, with no opportunity to avoid them, developed a sense of passive resignation now called **learned helplessness.** Later placed in another situation where they *could* escape the punishment by simply leaping a hurdle, the dogs cowered as if without hope. In contrast, animals able to escape the first shocks learned personal control and easily escaped the shocks in the new situation (**FIGURE 31.4**).

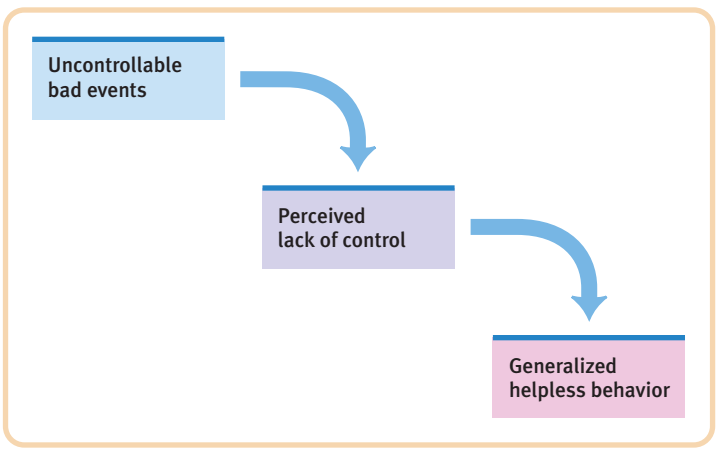


FIGURE 31.4 Learned helplessness When animals and people experience no control over repeated bad events, they often learn helplessness.

Peter Turnley/Corbis

Happy are those who choose their own path These happy East Berliners, crossing over to West Berlin after the Wall came down in 1989, seem to personify this sentiment from the Roman philosopher Seneca.

People, too, when repeatedly faced with traumatic events over which they have no control, come to feel helpless, hopeless, and depressed. As researcher Ellen Langer (1983, p. 291) has concluded, "perceived control is basic to human functioning." People given little control over their world in prisons, factories, colleges, and nursing homes experience lower morale and increased stress. Measures that increase control—allowing prisoners to move chairs and control room lights and the TV, having workers participate in decision making, offering nursing home patients choices about their environment—noticeably improve health and morale (Humphrey et al., 2007; Ruback et al., 1986; Wener et al., 1987). In one famous study of nursing home patients, 93 percent of those encouraged to exert more control became more alert, active, and happy (Rodin, 1986). "For the young and old alike," noted Langer, it is important to create environments that enhance a sense of control and personal efficacy. No wonder so many people like their iPods and TiVos, which give them control of the content and timing of their entertainment.

The verdict of such studies is reassuring: Under conditions of personal freedom and empowerment, people thrive. Small wonder that the citizens of stable democracies report higher levels of happiness (Inglehart, 1990, 2009). Shortly before the democratic revolution in the former East Germany, psychologists Gabriele Oettingen and Martin Seligman (1990) studied the telltale body language of working-class men in East and West Berlin bars. Compared with their counterparts on the other side of the Wall, the empowered West Berliners much more often laughed, sat upright rather than slumped, and had upward- rather than downward-turned mouths.

Some freedom and control is better than none, notes Barry Schwartz (2000, 2004). But does ever-increasing choice breed ever-happier lives? Actually not. Schwartz notes that the "excess of freedom" in today's Western cultures contributes to decreasing life satisfaction, increased depression, and sometimes paralysis. Increased consumer choices, as when buying a car or phone, are not an unmixed blessing. After choosing among 30 brands of jam or chocolate, people express less satisfaction than those choosing among a half-dozen options (Iyengar & Lepper, 2000). This *tyranny of choice* brings information overload and a greater likelihood that we will feel regret over some of the unchosen options.

Optimism Versus Pessimism

Positive expectations often motivate eventual success.

"We just haven't been flapping them hard enough."

One measure of how helpless or effective you feel is where you stand on optimism-pessimism. How do you characteristically explain negative and positive events? Perhaps you have known students whose *attributional style* is pessimistic—who attribute poor performance to their lack of ability ("I can't do this") or to situations enduringly beyond their control ("There is nothing I can do about it"). Such students are more likely to persist in getting low grades than are students who adopt the more hopeful attitude that effort, good study habits, and self-discipline can make a difference (Noel et al., 1987; Peterson & Barrett, 1987). Mere fantasies do not fuel motivation and success, but realistic positive expectations do (Oettingen & Mayer, 2002).

Attributional style also matters when dating couples wrestle with conflicts. Optimists and their partners see each other as engaging constructively, and they then tend to feel more supported and satisfied with the resolution and with their relationship (Srivastava et al., 2006). Expect good things from others, and often you will get what you expect. Such studies helped point Seligman toward proposing a more positive psychology (see Close-Up: Toward a More Positive Psychology).

Close-Up:

Toward a More Positive Psychology

During its first century, psychology understandably focused much of its attention on understanding and alleviating negative states. Psychologists have studied abuse and anxiety, depression and disease, prejudice and poverty. Articles on selected negative emotions since 1887 have outnumbered those on positive emotions by 17 to 1.

In ages past, notes American Psychological Association past-president Martin Seligman (2002), times of relative peace and prosperity have enabled cultures to turn their attention from repairing weakness and damage to promoting "the highest qualities of life." Prosperous fifth-century Athens nurtured philosophy and democracy. Flourishing fifteenth-century Florence nurtured great art. Victorian England, flush with the bounty of the British empire, nurtured honor, discipline, and duty. In this millennium, Seligman believes, thriving Western cultures have a parallel opportunity to create, as a "humane, scientific monument," a more **positive psychology**—a psychology concerned not only with weakness and damage but also with strength and virtue. Thanks to his own leadership and to some $30 million in funding, the new positive psychology movement has gained strength (Seligman, 2004).

Positive psychology shares with humanistic psychology an interest in advancing human fulfillment, but its methodology is scientific. From these roots have grown not only the new studies of happiness and health, but also the shift in emphasis from learned helplessness and depression to optimism and thriving. "Positive psychology," say Seligman and colleagues (2005) "is an umbrella term for the study of positive emotions, positive character traits, and enabling institutions."

Courtesy of Martin E. P. Seligman, Ph.D. Director, Positive Psychology Center/University of Pennsylvania

Martin E. P. Seligman "The main purpose of a positive psychology is to measure, understand, and then build the human strengths and the civic virtues."

Taken together, satisfaction with the past, happiness with the present, and optimism about the future define the movement's first pillar: *positive emotions.* Happiness, Seligman argues, is a by-product of a pleasant, engaged, and meaningful life.

Positive psychology is about building not just a pleasant life, says Seligman, but also a *good life* that engages one's skills, and a *meaningful life* that points beyond oneself. Thus, the second pillar, *positive character,* focuses on exploring and enhancing creativity, courage, compassion, integrity, self-control, leadership, wisdom, and spirituality. Current research examines the roots and fruits of such characteristics, sometimes by studying individuals who exemplify them in extraordinary ways.

The third pillar, *positive groups, communities, and cultures,* seeks to foster a positive social ecology, including healthy families, communal neighborhoods, effective schools, socially responsible media, and civil dialogue.

Will psychology have a more positive mission in this century? Without slighting the need to repair damage and cure disease, positive psychology's proponents hope so. With *American Psychologist* and *British Psychologist* special issues devoted to positive psychology, with lots of books, with networked scientists working in worldwide research groups, and with prizes, research awards, summer institutes, and a graduate program promoting positive psychology scholarship, these psychologists have reason to be positive.

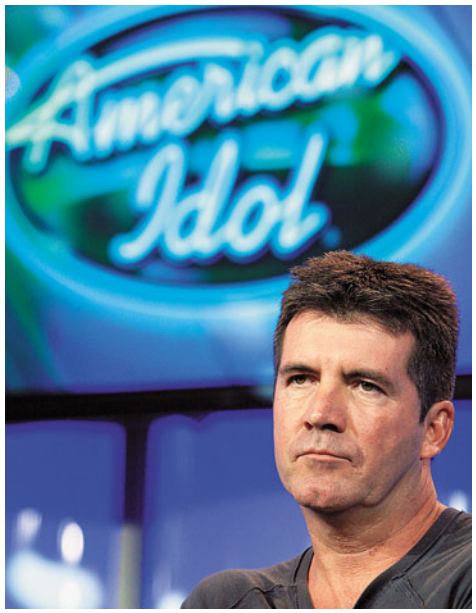
positive psychology the scientific study of optimal human functioning; aims to discover and promote strengths and virtues that enable individuals and communities to thrive.

Positive thinking in the face of adversity can pay dividends, but so, too, can a dash of realism (Schneider, 2001). Realistic anxiety over possible *future* failures can fuel energetic efforts to avoid the dreaded fate rather than depress ambition (Goodhart, 1986; Norem, 2001; Showers, 1992). Concerned about failing an upcoming exam, students may study thoroughly and outperform their equally able but more confident peers. Asian-American students express somewhat greater pessimism than their European-American counterparts, which Edward Chang (2001) suspects helps explain their impressive academic achievements. Success requires enough optimism to provide hope and enough pessimism to prevent complacency. We want our airline pilots to be mindful of worst-possible outcomes.

Excessive optimism, however, can blind us to real risks. Neil Weinstein (1980, 1982, 1996) has shown how our natural positive-thinking bias can promote "an unrealistic optimism about future life events." Most late adolescents see themselves as much less vulnerable than their peers to the HIV virus that causes AIDS (Abrams,

"O God, give us grace to accept with serenity the things that cannot be changed, courage to change the things which should be changed, and the wisdom to distinguish the one from the other."

—Reinhold Niebuhr, "The Serenity Prayer," 1943



AP Photo/Rene Macura

Ignorance of one's incompetence Assessing one's competence often requires getting others' feedback, as sometimes happens for naïve would-be contestants for *American Idol*.

"I didn't think it could happen to me."
—Earvin "Magic" Johnson, *My Life*, 1993 (after contracting HIV)

1991). Most college students perceive themselves as less likely than their average classmate to develop drinking problems, drop out of school, have a heart attack by age 40, or go deeply into debt on their high-interest credit cards (Yang et al., 2006).

Like pride, blind optimism may go before a fall. And so may blindness to our own incompetence. Ironically, we are often most overconfident when most incompetent. That's because it often takes competence to recognize competence (Kruger & Dunning, 1999). This helps explain why so many low-scoring students are dumbfounded after doing badly on an exam. If you don't know all the Scrabble word possibilities you've overlooked, you may feel pretty smart—until someone points them out. Our ignorance of what we don't know helps sustain our confidence in our own abilities (Caputo & Dunning, 2005).

This phenomenon has a parallel, as I can confirm, in hard-of-hearing people's difficulty recognizing their own hearing loss. We're not so much "in denial" as we are simply unaware of what we don't hear. If I fail to hear my friend calling my name, the friend notices my inattention. But for me it's a nonevent. I hear what I hear—which, to me, seems pretty normal. But my family tells a different story.

DOONESBURY

Assessing Behavior in Situations

31-7: What underlying principle guides social-cognitive psychologists in their assessment of people's behavior and beliefs?

To judge one's competence and predict one's future performance, it often pays to invite others' assessments, notes David Dunning (2006). Based on studies in which both individuals and their acquaintances predict their future, we can hazard some advice: If you're a junior doctor and want to predict how well you will do on a surgical skills exam, don't rate yourself—ask your peers for their candid prediction. If you're a Naval officer and need to assess your leadership ability—don't rate yourself, ask your fellow officers. And if you're in love and want to predict whether it will last, don't listen to your heart—ask your roommate.

To predict people's behavior, social-cognitive psychologists often observe them in action in realistic situations. The idea, though effective, is not new. One ambitious example was the U.S. Army's World War II strategy for assessing candidates for spy missions. Rather than using paper-and-pencil tests, Army psychologists subjected the candidates to simulated undercover conditions. They tested their ability to handle stress, solve problems, maintain leadership, and withstand intense interrogation without blowing their cover. Although time-consuming and expensive, this assessment of behavior in a realistic situation helped predict later success on actual spy missions (OSS Assessment Staff, 1948).

Military and educational organizations and many Fortune 500 companies are adopting assessment center strategies in their evaluations of hundreds of thousands of people each year (Bray et al., 1991, 1997; Thornton & Rupp, 2005). Most American cities with populations of 50,000 or more have used assessment centers in evaluating police and fire officers (Lowry, 1997). These procedures exploit the principle that the best means of predicting future behavior is neither a personality test nor an interviewer's intuition. Rather, it is the person's past behavior patterns in similar situations (Mischel, 1981; Ouellette & Wood, 1998; Schmidt & Hunter, 1998). As long as the situation and the person remain much the same, the best predictor of future job performance is past job performance; the best predictor of future grades is past grades; the best predictor of future aggressiveness is past aggressiveness; the best predictor of drug use in young adulthood is drug use in high school. If you can't check the person's past behavior, the next-best thing is to create an assessment situation that simulates the task so you can see how the person handles it.

© NBC/Courtesy Everett Collection

Assessing behavior in situations Reality TV shows, such as Donald Trump's *The Apprentice,* may take "show me" job interviews to the extreme, but they do illustrate a valid point. Seeing how a potential employee behaves in a job-relevant situation helps predict job performance.

A New York Times *analysis of 100 rampage murders over the last half-century revealed that 55 of the killers had regularly exploded in anger and 63 had threatened violence (Goodstein & Glaberson, 2000). Most didn't, out of the blue, "just snap."*

Evaluating the Social-Cognitive Perspective

31-8: What has the social-cognitive perspective contributed to the study of personality, and what criticisms has it faced?

The social-cognitive perspective on personality sensitizes researchers to how situations affect, and are affected by, individuals. More than other perspectives, it builds from psychological research on learning and cognition.

Critics charge that the social-cognitive perspective focuses so much on the situation that it fails to appreciate the person's inner traits. Where is the person in this view of personality, ask the dissenters, and where are human emotions? True, the situation does guide our behavior. But, say the critics, in many instances our unconscious motives, our emotions, and our pervasive traits shine through. Personality traits have been shown to predict behavior at work, love, and play. Our biologically influenced traits really do matter. Consider Percy Ray Pridgen and Charles Gill. Each faced the same situation: They had jointly won a $90 million lottery jackpot (Harriston, 1993). When Pridgen learned of the winning numbers, he began trembling uncontrollably, huddled with a friend behind a bathroom door while confirming the win, then sobbed. When Gill heard the news, he told his wife and then went to sleep.

Exploring the Self

31-9: Are we helped or hindered by high self-esteem?

Psychology's concern with people's sense of self dates back at least to William James, who devoted more than 100 pages of his 1890 *Principles of Psychology* to the topic. By 1943, Gordon Allport lamented that the self had become "lost to view." Although humanistic psychology's emphasis on the self did not instigate much scientific research, it did help renew the concept of self and keep it alive. Now, more than a century after James, the self is one of Western psychology's most vigorously researched topics. Every year, new studies galore appear on self-esteem, self-disclosure, self-awareness, self-schemas, self-monitoring, and so forth. Underlying this research is an assumption that the **self,** as organizer of our thoughts, feelings, and actions, is the center of personality.

"The first step to better times is to imagine them."

—Chinese fortune cookie

One example of thinking about self is the concept of *possible selves* put forth by Hazel Markus and her colleagues (Cross & Markus, 1991; Markus & Nurius, 1986). Your possible selves include your visions of the self you dream of becoming—the rich self, the successful self, the loved and admired self. They also include the self you fear becoming—the unemployed self, the lonely self, the academically failed self. Such possible selves motivate us by laying out specific goals and calling forth the energy to work toward them. University of Michigan students in a combined undergraduate/medical school program earn higher grades if they undergo the program with a clear vision of themselves as successful doctors. Dreams do often give birth to achievements.

Possible selves By giving them a chance to try out many possible selves, pretend games offer children important opportunities to grow emotionally, socially, and cognitively. This young boy may or may not grow up to be a physician, but playing adult roles will certainly bear fruit in terms of an expanded vision of what he might become.

Sybil Shackman

Our self-focused perspective may motivate us, but it can also lead us to presume too readily that others are noticing and evaluating us. Thomas Gilovich (1996) demonstrated this **spotlight effect** by having individual Cornell University students don Barry Manilow T-shirts before entering a room with other students. Feeling self-conscious, the T-shirt wearers guessed that nearly half their peers would take note of the shirt as they walked in. In reality, only 23 percent did. This absence of attention applies not only to our dorky clothes and bad hair but also to our nervousness, irritation, or attraction: Fewer people notice than we presume (Gilovich & Savitsky, 1999). Others are also less aware than we suppose of the variability—the ups and downs—of our appearance and performance (Gilovich et al., 2002). Even after a blunder (setting off a library alarm, showing up in the wrong clothes), we stick out like a sore thumb less than we imagine (Savitsky et al., 2001). Knowing about the spotlight effect can be empowering. Help public speakers to understand that their natural nervousness is not so apparent to their audience and their speaking performance improves (Savitsky & Gilovich, 2003).

The Benefits of Self-Esteem

How we feel about ourselves is also important. High **self-esteem**—a feeling of self-worth—pays dividends. People who feel good about themselves (who strongly agree with self-affirming questionnaire statements such as, "I am fun to be with") have fewer sleepless nights; succumb less easily to pressures to conform; are more persistent at difficult tasks; are less shy, anxious, and lonely; and are just plain happier (Greenberg, 2008; Leary, 1999; Murray et al., 2002; Watson et al., 2002). Moreover, today's self-esteem sometimes predicts tomorrow's achievements. In one study of 297 Finnish university students, self-esteem scores predicted employment, salary, and job satisfaction a decade later (Salmela-Aro & Nurmi, 2007).

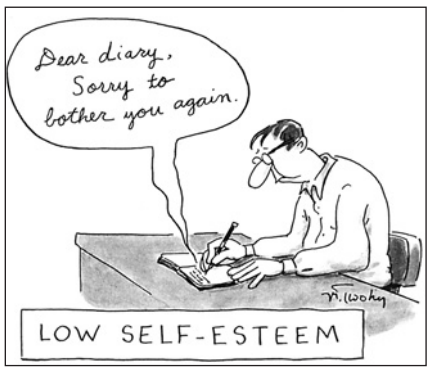
"There's a lot of talk about self-esteem these days. It seems pretty basic to me. If you want to feel proud of yourself, you've got to do things you can be proud of."

—Oseola McCarty, Mississippi laundry worker, after donating $150,000 to the University of Southern Mississippi

Is high self-esteem really "the armor that protects kids" from life's problems? Some psychologists have their doubts (Baumeister, 2006; Dawes, 1994; Leary, 1999; Seligman, 1994, 2002). Children's *academic self-concept*—their confidence that they can do well in a subject—predicts school achievement. But *general self-image* does not (Marsh & Craven, 2006; Swann et al., 2007; Trautwein et al., 2006). Maybe self-esteem simply reflects reality. Maybe feeling good *follows* doing well. Maybe it's a side effect of meeting challenges and surmounting difficulties. Maybe

self-esteem is a gauge that reads out the state of our relationships with others. If so, isn't pushing the gauge artificially higher akin to forcing a car's low fuel gauge to display "full"? And if problems and failures cause low self-esteem, won't the best boost therefore come not so much from our repeatedly telling children how wonderful they are as from their own effective coping and hard-won achievements?

However, experiments do reveal an *effect* of low self-esteem. Temporarily deflate people's self-image (say, by telling them they did poorly on an aptitude test or by disparaging their personality) and they will be more likely to disparage others or to express heightened racial prejudice (Ybarra, 1999). Those who are negative about themselves also tend to be thin-skinned and judgmental (Baumgardner et al., 1989; Pelham, 1993). In experiments, people made to feel insecure often become excessively critical, as if to impress others with their own brilliance (Amabile, 1983). Such findings are consistent with humanistic psychologists Abraham Maslow's and Carl Rogers' presumptions that a healthy self-image pays dividends. Accept yourself and you'll find it easier to accept others. Disparage yourself and you will be prone to the floccinaucinihilipilification[1] of others. Said more simply, some "love their neighbors as themselves"; others loathe their neighbors as themselves.



Self-Serving Bias

Carl Rogers (1958) once objected to the religious doctrine that humanity's problems arise from excessive self-love, or pride. He noted that most people he had known "despise themselves, regard themselves as worthless and unlovable." Mark Twain had a similar idea: "No man, deep down in the privacy of his heart, has any considerable respect for himself."

Actually, most of us have a good reputation with ourselves. In studies of self-esteem, even those who score low respond in the midrange of possible scores. (A low–self-esteem person responds to statements such as "I have good ideas" with qualifying adjectives such as *somewhat* or *sometimes*.) Moreover, one of psychology's most provocative and firmly established recent conclusions concerns our potent **self-serving bias**—our readiness to perceive ourselves favorably (Mezulis et al., 2004; Myers, 2008). Consider these findings:

People accept more responsibility for good deeds than for bad, and for successes than for failures. Athletes often privately credit their victories to their own prowess, and their losses to bad breaks, lousy officiating, or the other team's exceptional performance. People are quick to credit themselves as good drivers, but on insurance forms, they have explained accidents in such words as: "An invisible car came out of nowhere, struck my car, and vanished." "As I reached an intersection, a hedge sprang up, obscuring my vision, and I did not see the other car." "A pedestrian hit me and went under my car." The question "What have I done to deserve this?" is one we usually ask of our troubles, not our successes—those, we assume we deserve.

Most people see themselves as better than average. This is true for nearly any commonplace behavior that is subjectively assessed and socially desirable. In national surveys, most business executives say they are more ethical than their average counterpart. In several studies, 90 percent of business managers and more than 90 percent of college professors rated their performance as superior to that of their average peer. In Australia, 86 percent of people rate their job performance as above average, and only 1 percent as below average. The phenomenon, which reflects the overestimation of self rather than the underestimation of others (Epley & Dunning, 2000), is less striking in Asia, where people value modesty (Heine & Hamamura, 2007). Yet self-serving biases have been observed worldwide: among Dutch, Australian, and Chinese students; Japanese drivers; Indian Hindus; and French people of most walks of life. In every one of 53 countries surveyed, people expressed self-esteem above the midpoint of the most widely used scale (Schmitt & Allik, 2005).

[1]I couldn't resist throwing that in. But don't worry, you won't be tested on floccinaucinihilipilification, which is the act of estimating something as worthless (and was the longest nontechnical word in the first edition of the *Oxford English Dictionary*).

"To love oneself is the beginning of a life-long romance."
—Oscar Wilde, *An Ideal Husband*, 1895

self in contemporary psychology, assumed to be the center of personality, the organizer of our thoughts, feelings, and actions.

spotlight effect overestimating others' noticing and evaluating our appearance, performance, and blunders (as if we presume a spotlight shines on us).

self-esteem one's feelings of high or low self-worth.

self-serving bias a readiness to perceive oneself favorably.

PEANUTS

Ironically, people even see themselves as more immune than others to self-serving bias (Pronin, 2007). The world, it seems, is Garrison Keillor's Lake Wobegon writ large—a place where "all the women are strong, all the men are good-looking, and all the children are above average." And so are the pets. Three in four owners believe their pet is smarter than average (Nier, 2004).

After tracking self-importance across the last several decades, psychologist Jean Twenge (2006; Twenge et al., 2008) reports that today's new generation—*Generation Me,* she calls it—expresses more *narcissism* (by agreeing more often with statements such as, "If I ruled the world, it would be a better place," or "I think I am a special person"). Agreement with such statements correlates with materialism, the desire to be famous, inflated expectations, more hookups with fewer committed relationships, more gambling, and more cheating, all of which have been on the rise as narcissism has increased.

As religion and literature together remind us, pride does often go before a fall. Self-serving perceptions underlie conflicts ranging from blaming one's spouse for marital discord to arrogantly promoting one's own ethnic superiority. Finding their self-esteem threatened, people with large egos may do more than put others down; they may react violently. "Aryan pride" fueled Nazi atrocities. "These biases have the effect of making wars more likely to begin and more difficult to end," note Daniel Kahneman and Jonathan Renshon (2007).

Brad Bushman and Roy Baumeister (1998; Bushman et al., 2009) experimented with the "dark side of high self-esteem" by having 540 undergraduate volunteers write a paragraph, in response to which another supposed student gave them either praise ("Great essay!") or stinging criticism ("One of the worst essays I have read!"). Then the essay writers played a reaction-time game in which, after wins, they could assault an opponent with noise of any intensity for any duration. Can you anticipate the result? After criticism, those with narcissism were "exceptionally aggressive." They delivered three times the auditory torture of those with normal self-esteem. Threatened egotism, more than low self-esteem, it seems, predisposes aggression. "Encouraging people to feel good about themselves when they haven't earned it" poses problems, Baumeister (2001) concluded. "Conceited, self-important individuals turn nasty toward those who puncture their bubbles of self-love."

"The enthusiastic claims of the self-esteem movement mostly range from fantasy to hogwash. The effects of self-esteem are small, limited, and not all good."

—Roy Baumeister (1996)

Despite the demonstrated perils of pride, many people reject the idea of self-serving bias, insisting it overlooks those who feel worthless and unlovable and seem to despise themselves. If self-serving bias prevails, why do so many people disparage themselves? For four reasons: Some self-disparaging thoughts—"How could I have been so stupid!"—*protect us from repeating mistakes*. Sometimes self-directed putdowns are *subtly strategic:* They elicit reassuring strokes. Saying "No one likes me" may at least elicit "But not everyone has met you!" Other times, such as before a game or an exam, self-disparaging comments *prepare us for possible failure*. The coach who extols the superior strength of the upcoming opponent makes a loss understandable, a victory noteworthy. And finally, self-disparagement also frequently *pertains to one's old self.* People are much more critical of their distant past selves than of their current selves—even when they have not changed (Wilson & Ross, 2001). "At 18, I was a jerk; today I'm more sensitive." In their own eyes, chumps yesterday, champs today.

"If you compare yourself with others, you may become vain and bitter; for always there will be greater and lesser persons than yourself."

—Max Ehrmann, "Desiderata," 1927

Even so, it's true: All of us some of the time, and some of us much of the time, do feel inferior—especially when we compare ourselves with those who are a step or two higher on the ladder of status, looks, income, or ability. The deeper and more frequently we have such feelings, the more unhappy, even depressed, we are. But for most people, thinking has a naturally positive bias. And positive self-esteem correlates with happiness, initiative, and persistence after failure (Baumeister et al., 2003).

While recognizing the dark side of self-serving bias and self-esteem, some researchers prefer isolating the effects of two types of self-esteem—defensive and secure (Kernis, 2003; Lambird & Mann, 2006; Ryan & Deci, 2004). *Defensive*

self-esteem is fragile. It focuses on sustaining itself, which makes failures and criticism feel threatening. Such egotism exposes one to perceived threats, which feed anger and disorder, note Jennifer Crocker and Lora Park (2004).

Secure self-esteem is less fragile, because it is less contingent on external evaluations. To feel accepted for who we are, and not for our looks, wealth, or acclaim, relieves pressures to succeed and enables us to focus beyond ourselves. By losing ourselves in relationships and purposes larger than self, Crocker and Park add, we may achieve a more secure self-esteem and greater quality of life.

REVIEWING

Contemporary Perspectives on Personality

Module Review

31-1: How do psychologists use traits to describe personality? Rather than explain the hidden aspects of personality, *trait* theorists attempt to describe our stable and enduring characteristics. Through factor analysis, researchers have isolated important dimensions of personality. Genetic predispositions influence many traits.

31-2: What are personality inventories, and what are their strengths and weaknesses as trait-assessment tools? *Personality inventories* (like the *MMPI*) are questionnaires on which people respond to items designed to gauge a wide range of feelings and behaviors. Items on the test are *empirically derived,* and the tests are objectively scored.

31-3: Which traits seem to provide the most useful information about personality variation? The Big Five personality dimensions—conscientiousness, agreeableness, neuroticism, openness, and extaversion—offer a reasonably comprehensive picture of personality. They have been tested worldwide.

31-4: Does research support the consistency of personality traits over time and across situations? People's traits persist over time, but their behaviors vary widely from situation to situation. A person's average behavior across different situations tends to be fairly consistent.

31-5: In the view of social-cognitive psychologists, what mutual influences shape an individual's personality? The *social-cognitive perspective* applies principles of learning, cognition, and social behavior to personality, with particular emphasis on the ways in which personality influences and is influenced by interactions with the environment. It assumes *reciprocal determinism*—that personal-cognitive factors interact with the environment to influence people's behavior.

31-6: What are the causes and consequences of personal control? By studying how people vary in their perceived *locus of control* (*external* or *internal*), researchers have found that a sense of *personal control* helps people to cope with life. Research on *learned helplessness* evolved into research on the effects of optimism and pessimism, which led to a broader *positive psychology* movement.

31-7: What underlying principle guides social-cognitive psychologists in their assessment of people's behavior and beliefs? Social-cognitive researchers tend to believe that the best way to predict someone's behavior in a given situation is to observe that person's behavior in similar situations.

31-8: What has the social-cognitive perspective contributed to the study of personality, and what criticisms has it faced? The social-cognitive perspective builds on psychology's well-established concepts of learning and cognition and reminds us of the power of social situations. It has been faulted for underemphasizing the importance of inner traits.

31-9: Are we helped or hindered by high self-esteem? In contemporary psychology, the *self* is assumed to be the center of personality, the organizer of our thoughts, feelings, and actions. Research confirms the benefits of high *self-esteem,* but it also warns of the dangers of narcissism. The *self-serving bias* leads us to perceive ourselves favorably, often causing us to overestimate our abilities and underestimate our faults.

Rehearse It!

1. Trait theory describes personality in terms of characteristic behavior patterns, or traits, such as agreeableness or extraversion. A pioneering trait theorist was
   a. Sigmund Freud.
   b. Martin Seligman.
   c. Gordon Allport.
   d. Albert Bandura.
2. Personality inventories are long questionnaires that ask people to report their characteristic feelings and behaviors. One famous personality inventory is the
   a. Extraversion-Introversion Scale.
   b. Person-Situation Inventory.
   c. MMPI.
   d. Positive Psychology Scale.
3. Which of the following is NOT one of the Big Five personality factors?

a. Conscientiousness
b. Anxiety
c. Extraversion
d. Agreeableness

4. People's scores on personality tests are only mildly predictive of their behavior. Such tests best predict
a. a person's behavior on a specific occasion.
b. a person's average behavior across many situations.
c. behavior involving a single trait, such as conscientiousness.
d. behavior that depends on the situation or context.

5. The social-cognitive perspective proposes that interacting with our environment involves reciprocal determinism, or mutual influences among personal factors, environmental factors, and behavior. An example of an environmental factor is
a. the presence of books in a home.
b. a preference for outdoor play.
c. the ability to read at a fourth-grade level.
d. the fear of violent action on television.

6. When elderly patients take an active part in managing their own care and surroundings, their morale and health tend to improve. Such findings indicate that people do better when they experience
a. learned helplessness.
b. an external locus of control.
c. an internal locus of control.
d. reciprocal determinism.

7. Seligman's research showed that a dog will respond with learned helplessness if it has received repeated shocks and has had
a. the opportunity to escape.
b. no control over the shocks.
c. pain or discomfort.
d. no food or water prior to the shocks.

8. Critics say that _____ personality theory is very sensitive to the way people interact with particular situations, but it says little about their enduring traits.
a. psychoanalytic
b. humanistic
c. trait
d. social-cognitive

9. The *spotlight effect* is our tendency to
a. perceive ourselves favorably and perceive others unfavorably.
b. try out many possible selves.
c. become excessively critical when made to feel insecure.
d. overestimate others' attention to and evaluation of our appearance, performance, and blunders.

10. Researchers have found that low self-esteem tends to be linked with life problems. How should this link be interpreted?
a. Life problems cause low self-esteem.
b. The answer isn't clear because the link is correlational and does not indicate cause and effect.
c. Low self-esteem leads to life problems.
d. Because of the self-serving bias, we must assume that external factors cause low self-esteem.

11. People tend to accept responsibility for their successes or good qualities and blame circumstances or luck for their failures. This is an example of
a. low self-esteem.
b. self-actualization.
c. self-serving bias.
d. narcissism.

Answers: 1. c, 2. c, 3. b, 4. b, 5. a, 6. c, 7. b, 8. d, 9. d, 10. b, 11. c.

Terms and Concepts to Remember

personality, p. 453
trait, p. 453
personality inventory, p. 455
Minnesota Multiphasic Personality Inventory (MMPI), p. 455
empirically derived test, p. 456
social-cognitive perspective, p. 459
reciprocal determinism, p. 459
personal control, p. 461
external locus of control, p. 461
internal locus of control, p. 461
learned helplessness, p. 461
positive psychology, p. 463
self, p. 466
spotlight effect, p. 466
self-esteem, p. 466
self-serving bias, p. 467

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. In *Essays,* Michel de Montaigne (1588) suggested, "There is as much difference between us and ourselves, as between us and others." Does research on the trait perspective support his claim?

2. You think you are talented enough to compete on *American Idol,* but you don't want to make a fool of yourself on TV. What is the best way to accurately assess your talent beforehand?

3. A fortune cookie advises, "Love yourself and happiness will follow." Is this good advice?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Psychological Disorders

Psychological Disorders

> I felt the need to clean my room at home in Indianapolis every Sunday and would spend four to five hours at it. I would take every book out of the bookcase, dust and put it back. At the time I loved doing it. Then I didn't want to do it anymore, but I couldn't stop. The clothes in my closet hung exactly two fingers apart. . . . I made a ritual of touching the wall in my bedroom before I went out because something bad would happen if I didn't do it the right way. I had a constant anxiety about it as a kid, and it made me think for the first time that I might be nuts.
>
> *Marc, diagnosed with obsessive-compulsive disorder (from Summers, 1996)*

> Whenever I get depressed it's because I've lost a sense of self. I can't find reasons to like myself. I think I'm ugly. I think no one likes me. . . . I become grumpy and short-tempered. Nobody wants to be around me. I'm left alone. Being alone confirms that I am ugly and not worth being with. I think I'm responsible for everything that goes wrong.
>
> *Greta, diagnosed with depression (from Thorne, 1993, p. 21)*

> Voices, like the roar of a crowd, came. I felt like Jesus; I was being crucified. It was dark. . . . I just continued to huddle under the blanket, feeling weak, laid bare and defenseless in a cruel world I could no longer understand.
>
> *Stuart, diagnosed with schizophrenia (from Emmons et al., 1997)*

People are fascinated by the exceptional, the unusual, the abnormal. "The sun shines and warms and lights us and we have no curiosity to know why this is so," observed Ralph Waldo Emerson, "but we ask the reason of all evil, of pain, and hunger, and [unusual] people." But why such fascination with disturbed people? Do we see in them something of ourselves? At various moments, all of us feel, think, or act the way disturbed people do much of the time. We, too, get anxious, depressed, withdrawn, suspicious, or deluded, just less intensely and more briefly. It's no wonder that studying psychological disorders may at times evoke an eerie sense of self-recognition, one that illuminates the dynamics of our own personality. "To study the abnormal is the best way of understanding the normal," proposed William James (1842–1910).

Another reason for our curiosity is that so many of us have felt, either personally or through friends or family, the bewilderment and pain of a psychological disorder that may bring unexplained physical symptoms, irrational fears, or a feeling that life is not worth living. Indeed, as members of the human family, most of us will at some point encounter a psychologically disturbed person.

The World Health Organization reports that, worldwide, some 450 million people have psychological disorders (WHO, 2008). These disorders account for 15.4 percent of the years of life lost due to death or disability—scoring slightly below cardiovascular conditions and slightly above cancer (Murray & Lopez, 1996). Rates and symptoms of psychological disorders vary by culture, but no known society is free of two terrible maladies: depression and schizophrenia (Baumeister & Härter, 2007; Draguns, 1990a,b, 1997).

Module 32 introduces psychological disorders, explaining the major perspectives, categories, and risks—and advantages—of labeling. It also considers the prevalence of various disorders and then takes an in-depth look at *mood disorders.* Module 33 outlines the symptoms and characteristics of *schizophrenia,* a frightening split from reality. Module 34 describes *anxiety disorders,* characterized by persistent distressing anxiety or maladaptive behaviors that reduce anxiety; the *somatoform disorders,* which involve bodily symptoms in the absence of a physical cause; the rare and controversial *dissociative disorders;* and the problematic *personality disorders,* which impair social functioning.

MODULE 32

Basic Concepts and Mood Disorders

Most people would agree that someone too depressed to get out of bed for weeks at a time has a psychological disorder. But what about those who, having experienced a loss, are unable to resume their usual social activities? Where should we draw the line between sadness and depression? Between zany creativity and bizarre irrationality? Between normality and abnormality? Let's start with three questions. How should we *define* psychological disorders? How should we *understand* disorders—as sicknesses that need to be diagnosed and cured, or as natural responses to a troubling environment? How should we *classify* psychological disorders? And can we do so in a way that allows us to help people without stigmatizing them with labels? After considering these questions, we'll look closely at mood disorders.

Defining Psychological Disorders

32-1: How should we draw the line between normality and disorder?

Mental health workers view **psychological disorders** as ongoing patterns of thoughts, feelings, and actions that are deviant, distressful, and dysfunctional (Comer, 2004).

Being different *(deviant)* from most other people in one's culture is *part* of what it takes to define a psychological disorder. As the reclusive poet Emily Dickinson observed in 1862,

Assent—and you are sane—
Demur—you're straightaway dangerous—
and handled with a Chain.

Standards for deviant behavior vary by context and by culture. In one context—wartime—mass killing may be viewed as normal and even heroic. In some contexts, people are presumed deranged when they hear voices. But in cultures practicing ancestor worship, people may claim to talk with the dead and not be seen as disordered because other people find them rational (Friedrich, 1987).

Standards for deviance also vary with time. From 1952 through December 9, 1973, homosexuality was classified as an illness. By day's end on December 10, it was not. The American Psychiatric Association had dropped homosexuality as a disorder because more and more of its members no longer viewed it as a psychological problem. Also in 1952, a distractible, fidgety, and impulsive 8-year-old would have been considered rambunctious. Today, she—but more often he—may be diagnosed with *attention-deficit hyperactivity disorder* (see Thinking Critically About: ADHD—Normal High Energy or Genuine Disorder? on the next page).

But there is more to a disorder than being deviant. Olympic gold medalists deviate from the norm in their physical abilities, and society honors them. To be considered disordered, deviant behavior usually causes the person *distress.*

Deviant and distressful behaviors are more likely to be considered disordered when also judged to be a *harmful dysfunction* (Wakefield, 1992, 2006). By this measuring stick, even typical behaviors, such as the occasional despondency many college students feel, may signal a psychological disorder *if they become disabling.* Dysfunction is key to defining a disorder: An intense fear of spiders may be deviant, but if it doesn't impair your life it is not a disorder.

"Who in the rainbow can draw the line where the violet tint ends and the orange tint begins? Distinctly we see the difference of the colors, but where exactly does the one first blendingly enter into the other? So with sanity and insanity."

—Herman Melville, *Billy Budd, Sailor*, 1924

psychological disorder deviant, distressful, and dysfunctional patterns of thoughts, feelings, and actions.

Carol Beckwith

Culture and normality Men of the West African Wodaabe tribe put on elaborate makeup and costumes to attract women. In Western society, the same behavior would break behavioral norms and might be judged abnormal.

Thinking Critically About:

ADHD—Normal High Energy or Genuine Disorder?

Eight-year-old Todd has always been energetic. At home, he chatters away and darts from one activity to the next, rarely settling down to read a book or focus on a game. At play, he is reckless and overreacts when playmates bump into him or take one of his toys. At school, his exasperated teacher complains that fidgety Todd doesn't listen, follow instructions, or stay in his seat and do his lessons.

If taken for a psychological evaluation, Todd may be diagnosed with **attention-deficit hyperactivity disorder (ADHD),** as are some 4 percent of children who display at least one of its key symptoms (extreme inattention, hyperactivity, and impulsivity) (NIMH, 2003).

To skeptics, being distractible, fidgety, and impulsive sounds like a "disorder" caused by a single genetic variation: a Y chromosome. And sure enough, ADHD is diagnosed two to three times more often in boys than in girls.

Critics note that in the decade after 1987 the proportion of American children being treated for ADHD nearly quadrupled (Olfson et al., 2003). By 2005, a Gallup survey showed that 10 percent of American 13- to 17-year-olds were being medicated for ADHD (Mason, 2005). The diagnosis depends in part on teacher referrals. Some refer lots of kids for ADHD assessment, others none. ADHD rates have therefore varied widely—in New York State, for example, by a factor of 10 in different counties (Carlson, 2000).

Others argue that the more frequent diagnoses of ADHD today reflect increased awareness of the disorder, especially in those areas where rates are highest. They acknowledge that diagnoses can be inconsistent—ADHD is not as objectively defined as is a broken arm. Nevertheless, declared the World Federation for Mental Health (2005), "there is strong agreement among the international scientific community that ADHD is a real neurobiological disorder whose existence should no longer be debated." In neuroimaging studies, ADHD has associations with certain brain activity patterns, notes a consensus statement by 75 researchers (Barkley et al., 2002).

What, then, is known about ADHD's causes? It is not caused by too much sugar or poor schools. (Researchers have found, however, that toddlers who watch lots of TV are, at age 7, more likely than average to display ADHD symptoms [Christakis et al., 2004].) It often coexists with a learning disorder or with defiant and temper-prone behavior. The U.S. National Institute of Mental Health (1999, 2003) reports that ADHD is heritable, and research teams are sleuthing the culprit genes (Brookes et al., 2006). It is treatable with nonaddictive medications such as Ritalin and Adderall, which are stimulants but help calm hyperactivity and increase one's ability to sit and focus on a task. Psychological therapies, such as those focused on shaping behaviors in the classroom and at home, have also helped address the distress of ADHD. Finally, many children diagnosed with ADHD exhibit delayed brain maturation. Thus, many fidgety, hyperactive 5-year-olds mature into normal teens.

The bottom line: Extreme inattention, hyperactivity, and impulsivity can derail social, academic, and vocational achievements, and these symptoms can be treated with medication and other treatment. But the debate continues over whether normal rambunctiousness is too often diagnosed as a psychiatric disorder, and whether there is a cost to the long-term use of stimulant drugs in treating ADHD.

attention-deficit hyperactivity disorder (ADHD) a psychological disorder marked by the appearance by age 7 of one or more of three key symptoms: extreme inattention, hyperactivity, and impulsivity.

Understanding Psychological Disorders

32-2: What perspectives can help us understand psychological disorders?

To explain puzzling behavior, people in earlier times often presumed that strange forces—the movements of the stars, godlike powers, or evil spirits—were at work. Had you lived during the Middle Ages, you might have said "The devil made him do it," and you might have approved of an exorcism to get rid of the evil demon. Until the last two centuries, "mad" people were sometimes caged in zoolike conditions or given "therapies" appropriate to a demon: beatings, burning, or castration. In other times, therapy included trephination (drilling holes in the skull), pulling teeth, removing lengths of intestines, cauterizing the clitoris, or giving transfusions of animal blood (Farina, 1982).

The Medical Model

medical model the concept that diseases, in this case psychological disorders, have physical causes that can be *diagnosed, treated,* and, in most cases, *cured,* often through treatment in a hospital.

In opposition to brutal treatments, reformers, including Philippe Pinel (1745–1826) in France, insisted that madness is not demon possession but a sickness of the mind caused by severe stresses and inhumane conditions. For Pinel and others, "moral treatment" included boosting patients' morale by unchaining them and talking with

them, and by replacing brutality with gentleness, isolation with activity, and filth with clean air and sunshine.

By the 1800s, the discovery that syphilis infects the brain and distorts the mind provided the impetus for further reform. Hospitals replaced asylums, and the medical world began searching for physical causes of mental disorders, and for treatments that would cure them. Today, this **medical model** is recognizable in the terminology of the mental *health* movement: A mental *illness* (also called a psycho*pathology*) needs to be *diagnosed* on the basis of its *symptoms* and *cured* through *therapy*, which may include *treatment* in a psychiatric *hospital*.

The medical perspective has gained credibility from recent discoveries that genetically influenced abnormalities in brain structure and biochemistry contribute to many disorders. But as we will see, psychological factors, such as enduring or traumatic stress, also play an important role.

George Wesley Bellows, *Dance in a Madhouse*, 1907. © 1997 The Art Institute of Chicago

"Moral treatment" Under Philippe Pinel's influence, hospitals sometimes sponsored patient dances, such as the "Lunatic Ball" depicted in this painting by George Bellows *(Dance in a Madhouse)*.

The Biopsychosocial Approach

Today's psychologists believe that the medical model gives an incomplete understanding of disorders. To presume that a person is "mentally ill," they say, attributes the condition to a "sickness" that must be identified and cured. But instead or additionally, there may be a difficulty in the person's environment, in the person's current interpretations of events, or in the person's bad habits and poor social skills.

Evidence of such effects comes from links between specific disorders and cultures (Beardsley, 1994; Castillo, 1997). Cultures differ in their sources of stress, and they produce different ways of coping. The eating disorders anorexia nervosa and bulimia nervosa, for example, occur mostly in Western cultures. Latin America lays claim to *susto*, a condition marked by severe anxiety, restlessness, and a fear of black magic. *Taijin-kyofusho*, social anxiety about one's appearance, combined with a readiness to blush and a fear of eye contact, appears in Japan. Such disorders may share an underlying dynamic (such as anxiety) while differing in the symptoms (an eating problem or a type of fear) manifested in a particular culture. But not all disorders are culture-bound. Depression and schizophrenia, for example, occur worldwide. From Asia to Africa and across the Americas, schizophrenia's symptoms often include irrationality and incoherent speech.

In Malaysia, amok *describes a sudden outburst of violent behavior (thus the phrase "run amok").*

To assess the whole set of interacting influences—genetic predispositions and physiological states; inner psychological dynamics; and social and cultural circumstances—the biopsychosocial model helps (**FIGURE 32.1**). This approach recognizes that mind and body are inseparable. Negative emotions contribute to physical illness, and physical abnormalities contribute to negative emotions. We are mind embodied.

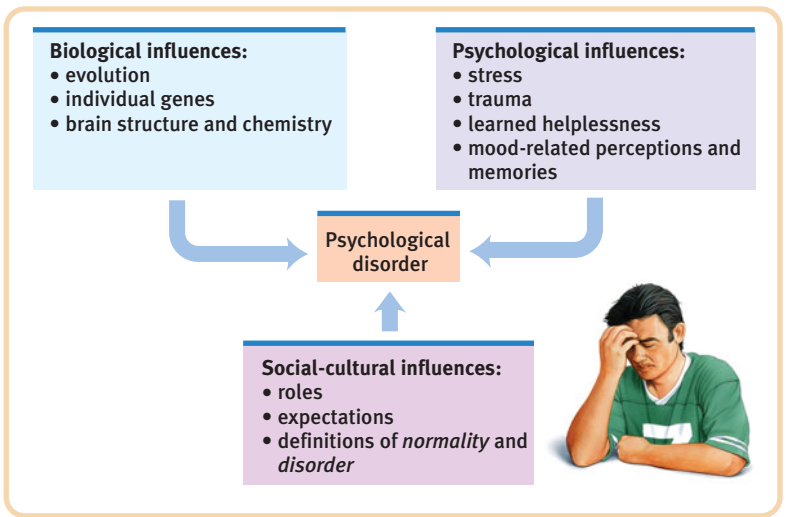


FIGURE 32.1 The biopsychosocial approach to psychological disorders
Today's psychology studies how biological, psychological, and social-cultural factors interact to produce specific psychological disorders.

"I'm always like this, and my family was wondering if you could prescribe a mild depressant."

Classifying Psychological Disorders

32-3: How and why do clinicians classify psychological disorders?

In biology and the other sciences, classification creates order. To classify an animal as a "mammal" says a great deal—that it is warm-blooded, has hair or fur, and nourishes its young with milk. In psychiatry and psychology, too, classification orders and describes symptoms. To classify a person's disorder as "schizophrenia" suggests that the person talks incoherently; has hallucinations (false sensory experiences) or delusions (bizarre beliefs); shows either little emotion or inappropriate emotion; or is socially withdrawn. "Schizophrenia" provides a handy shorthand for describing a complex disorder.

Diagnostic classification aims not only to describe a disorder but also to predict its future course, imply appropriate treatment, and stimulate research into its causes. Indeed, to study a disorder we must first name and describe it. A current authoritative scheme for classifying psychological disorders is the **DSM-IV-TR.** This volume is the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders,* Fourth Edition, updated as a 2000 "text revision"; a more substantially revised DSM-V will appear in 2012. (A set of case illustrations accompanying DSM-IV-TR provides the basis for several of this book's case examples.) DSM-IV-TR was developed in coordination with the tenth edition of the World Health Organization's *International Classification of Diseases* (ICD-10), which covers both medical and psychological disorders.

Despite its medical terminology *(diagnosing, symptoms, illness),* most practitioners find the DSM-IV-TR a helpful and practical tool. It is also financially necessary: North American health insurance companies usually require a DSM-IV-TR diagnosis before they pay for therapy.

The DSM-IV-TR defines a diagnostic process and 16 clinical syndromes (**TABLE 32.1**). Without presuming to explain their causes, it describes various disorders. To be helpful and useful, these categories and diagnostic guidelines must be reliable, and to a reasonable extent they are. If one psychiatrist or psychologist diagnoses someone as having, say, catatonic schizophrenia, the chances are good that another mental health worker will independently give the same diagnosis. Following these guidelines, clinicians answer a series of objective questions about observable behaviors, such as, "Is the person afraid to leave home?" In one study, 16 psychologists used this structured-interview procedure to diagnose 75 psychiatric patients as experiencing (1) depression, (2) generalized anxiety, or (3) some other disorder (Riskind et al., 1987). Without knowing the first psychologist's diagnosis, another psychologist viewed a videotape of each interview and offered a second opinion. For 83 percent of the patients, the two opinions agreed.

TABLE 32.1 How Are Psychological Disorders Diagnosed?

Based on assessments, interviews, and observations, many clinicians diagnose by answering the following questions from the five levels, or *axes,* of the DSM-IV-TR.

Axis I Is a *Clinical Syndrome* present?

Using specifically defined criteria, clinicians may select none, one, or more syndromes from the following list:

- Disorders usually first diagnosed in infancy, childhood, and adolescence
- Delirium, dementia, amnesia, and other cognitive disorders
- Mental disorders due to a general medical condition
- Substance-related disorders
- Schizophrenia and other psychotic disorders
- Mood disorders
- Anxiety disorders
- Somatoform disorders
- Factitious disorders, intentionally faked
- Dissociative disorders
- Eating disorders
- Sexual disorders and gender identity disorder
- Sleep disorders
- Impulse-control disorders not classified elsewhere
- Adjustment disorders
- Other conditions that may be a focus of clinical attention

Axis II Is a *Personality Disorder* or *Mental Retardation* present?
Clinicians may or may not also select one of these two conditions.

Axis III Is a *General Medical Condition,* such as diabetes, hypertension, or arthritis, also present?

Axis IV Are *Psychosocial* or *Environmental Problems,* such as school or housing issues, also present?

Axis V What is the *Global Assessment* of this person's functioning?
Clinicians assign a code from 0–100.

Close-Up:

The "un-DSM": A Diagnostic Manual of Human Strengths

The Values in Action Classification of Strengths is an expression of the *positive psychology movement*. Psychological science seeks to understand and help alleviate human ills and evils, agree positive psychology advocates, but also to understand and promote human strengths and virtues. Their complementary classification resembles the DSM-IV-TR in proposing a research-based common vocabulary. A questionnaire, taken by some 1 million people worldwide (at viastrengths.org), assesses six clusters of 24 strengths:

- ***Wisdom and knowledge***—creativity; curiosity; judgment and open-mindedness; love of learning; and perspective (wisdom)
- ***Courage (overcoming opposition)***—bravery; perseverance; honesty; and zest
- ***Humanity***—love; kindness; and social intelligence
- ***Justice***—teamwork; fairness; and leadership
- ***Temperance***—forgiveness and mercy; modesty and humility; prudence; and self-regulation
- ***Transcendence***—appreciation of beauty and excellence; gratitude; hope; humor; and religiousness and spirituality

AP Photo/Pat Rogue

Building strengths In their work for Habitat for Humanity, former U.S. President Jimmy Carter and First Lady Rosalynn Carter model strengths related to humanity and justice.

Mental health workers have used these categories to get their clients to consider what makes for a good life—a life of engagement, meaning, and purpose—and to identify their own signature strengths. Researchers have studied the development of each strength and its associations with health and well-being. Consultants have assisted organizations in identifying and enhancing their collective strengths (Niemiec, 2009).

Some critics have faulted the manual for casting too wide a net. As the number of disorder categories has swelled (from 60 in the 1950s DSM to 400 today), so has the number of adults who meet the criteria for at least one of them—26 percent in any year, according to the U.S. National Institute of Mental Health (2008), and 46 percent at some time in their lives (Kessler et al., 2005). The number of children diagnosed with psychological disorders has also mushroomed, tripling to 6 million children since the early 1990s, according to some reports (Carey, 2006). Today's adolescent mood swings are more often taken to be bipolar disorder. Temper tantrums, arguing, touchiness, and spitefulness are more often taken to be oppositional defiant disorder.

Psychologists Christopher Peterson and Martin Seligman (2004) have noted the usefulness of the DSM-IV-TR in ordering and defining dysfunctions. Would it not also be useful, they ask, to have a companion catalog of the thinking-feeling-action tendencies that contribute to the *good* life, for self and others? As a complement to the DSM, they therefore have offered a diagnostic manual of human strengths (see Close-Up: The "un-DSM": A Diagnostic Manual of Human Strengths).

DSM-IV-TR the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, updated as a 2000 "text revision"; a widely used system for classifying psychological disorders.

Labeling Psychological Disorders

32-4: Why do some psychologists criticize the use of diagnostic labels?

Let us remember the *benefits* of diagnostic labels. Mental health professionals use labels to communicate about their cases, to comprehend the underlying causes, and to discern effective treatment programs.

But the DSM has critics who register a fundamental complaint about these diagnostic labels—that they are at best arbitrary and at worst value judgments masquerading as science. Once we label a person, we view that person differently

"What's the use of their having names," the Gnat said, "if they won't answer to them?"
"No use to *them*," said Alice; "but it's useful to the people that name them, I suppose."

—Lewis Carroll, *Through the Looking-Glass*, 1871

"One of the unpardonable sins, in the eyes of most people, is for a man to go about unlabeled. The world regards such a person as the police do an unmuzzled dog, not under proper control."

—T. H. Huxley, *Evolution and Ethics*, 1893

(Farina, 1982). Labels can bias perceptions and change reality. When teachers are told certain students are "gifted," when students expect someone to be "hostile," or when interviewers check to see whether someone is "extraverted," they may act in ways that elicit the very behavior expected (Snyder, 1984). Labels can serve as self-fulfilling prophecies.

In a now-classic study, David Rosenhan (1973) and seven others went to hospital admissions offices, complaining of "hearing voices" saying *empty, hollow,* and *thud*. Apart from this complaint and giving false names and occupations, they answered questions truthfully. All eight normal people were misdiagnosed with disorders. Should we be surprised? As one psychiatrist noted, if someone swallows blood, goes to an emergency room, and spits it up, should we fault the doctor for diagnosing a bleeding ulcer? Surely not. But what followed the diagnosis in the Rosenhan study was startling. Until being released an average of 19 days later, the "patients" exhibited no further symptoms. Yet after analyzing their (quite normal) life histories, clinicians were able to "discover" the causes of their disorders, such as reacting with mixed emotions about a parent. Even the routine behavior of taking notes was misinterpreted as a symptom. A label can, as Rosenhan discovered, have "a life and an influence of its own."

Surveys in Europe and North America have demonstrated the stigmatizing power of labels (Page, 1977). Getting a job or finding a place to rent can be a challenge for those known to be just released from prison—or a mental hospital. But as we are coming to understand that many psychological disorders are diseases of the brain, not failures of character, the stigma seems to be lifting (Solomon, 1996). Public figures are feeling freer to "come out" and speak with candor about their struggles with disorders. And the more contact people have with individuals with disorders, the more accepting their attitudes are (Kolodziej & Johnson, 1996).

OCD advocate Comedian and TV host Howie Mandel knows the reality of obsessive-compulsive disorder. He has used humor to deal with his own challenges and to help others understand the disorder. Mandel also suffers a germ phobia that prompted him to shave his head to "feel cleaner."

Nevertheless, stereotypes linger in media portrayals of psychological disorders. Some are reasonably accurate and sympathetic. But too often people with disorders are portrayed as objects of humor or ridicule *(As Good as It Gets)*, as homicidal maniacs (Hannibal Lecter in *Silence of the Lambs*), or as freaks (Nairn, 2007). Apart from the few who experience threatening delusions and hallucinated voices that command a violent act, mental disorders seldom lead to violence (Harris & Lurigio, 2007). In real life, people with disorders are more likely to be the victims of violence, rather than the perpetrators (Marley & Bulia, 2001). Indeed, reported the U.S. Surgeon General's Office (1999, p. 7), "There is very little risk of violence or harm to a stranger from casual contact with an individual who has a mental disorder." (Although most people with psychological disorders are not violent, those who are create a moral dilemma for society. For more on this topic, see Thinking Critically About: Insanity and Responsibility.)

Does a full Moon trigger "madness" in some people? James Rotton and I. W. Kelly (1985) examined data from 37 studies that related lunar phase to crime, homicides, crisis calls, and mental hospital admissions. Their conclusion: There is virtually no evidence of "Moon madness." Nor does lunar phase correlate with suicides, assaults, emergency room visits, or traffic disasters (Martin et al., 1992; Raison et al., 1999).

Rates of Psychological Disorders

32-5: How many people have, or have had, a psychological disorder?

Who is most vulnerable to psychological disorders? At what times of life? To answer such questions, various countries have conducted lengthy structured interviews with representative samples of thousands of their citizens. After asking hundreds of questions that probed for symptoms—"Has there ever been a period of two weeks or more when you felt like you wanted to die?"—the researchers have estimated the current, prior-year, and lifetime prevalence of various disorders.

Thinking Critically About:

Insanity and Responsibility

"My brain . . . my genes . . . my bad upbringing made me do it." Such defenses were anticipated by Shakespeare's *Hamlet*. If I wrong someone when not myself, he explained, "then Hamlet does it not, Hamlet denies it. Who does it then? His madness." Such is the essence of a legal insanity defense, created in 1843 after a deluded Scotsman tried to shoot the prime minister (who he thought was persecuting him) but killed an assistant by mistake. Like U.S. President Ronald Reagan's near-assassin, John Hinckley, Scotsman Daniel M'Naughten was sent to a mental hospital rather than to prison.

In both cases, the public was outraged. "Hinckley Insane, Public Mad," declared one headline. And they were mad again when a deranged Jeffrey Dahmer in 1991 admitted murdering 15 young men and eating parts of their bodies. They were mad in 1998 when 15-year-old Kip Kinkel, driven by "those voices in my head," killed his parents and 2 fellow Springfield, Oregon, students and wounded 25 others. And they were mad in 2002 when Andrea Yates, after being taken off her antipsychotic medication, was tried in Texas for drowning her five children. All of these people were sent to jails, not hospitals, following their arrests (though later, after another trial, Yates was instead hospitalized).

AP Photo

Jail or hospital? Two weeks after being taken off antipsychotic medication by her psychiatrist, Andrea Yates drowned her five children, ages 7, 5, 3, 2, and 6 months, in her bathtub, apparently believing she was sparing them "the fires of hell." Although Yates was irrational and had lost contact with reality, one jury rejected the insanity defense, believing she still could have discerned right from wrong. On retrial, a second jury found her not guilty by reason of insanity.

Most people with psychological disorders are not violent. But what should society do with those who are? A 1999 U.S. Justice Department study found that about 16 percent of U.S. jail and prison inmates had severe mental disorders. This is roughly 100,000 more than the 183,000 psychiatric inpatients in all types of U.S. hospitals (Bureau of the Census, 2004; Butterfield, 1999). Many people who have been executed or are now on death row have been motivated by delusional voices or limited by intellectual disability (formerly called mental retardation). The State of Arkansas forcibly medicated one murderer with schizophrenia, Charles Singleton, with antipsychotic drugs—in order to make him mentally competent, so that he could then be put to death.

Which of Yates' two juries made the right decision? The first, which decided that people who commit such rare but terrible crimes should be held responsible? Or the second, which decided to blame the "madness" that clouds their vision? As we come to better understand the biological and environmental basis for all human behavior, from generosity to vandalism, when should we—and should we not—hold people accountable for their actions?

How many people have, or have had, a psychological disorder? More than most of us suppose:

- The U.S. National Institute of Mental Health (2008, based on Kessler et al., 2005) estimates that 26 percent of adult Americans "suffer from a diagnosable mental disorder in a given year" (**TABLE 32.2**).
- National population surveys reveal differing annual rates in Australia (16 percent), Germany (31 percent), and the Netherlands (23 percent) (Baumeister & Härter, 2007).
- A twenty-first-century World Health Organization (2004) study—based on 90-minute interviews of 60,463 people—estimated the number of prior-year mental disorders in 20 countries. As **FIGURE 32.2** on the next page displays, the lowest rate of reported mental disorders was in Shanghai, the highest rate in the United States. Moreover, immigrants to the United States from Mexico, Africa, and Asia average better mental health than their native-born U.S. counterparts (Breslau et al., 2007). For example, compared with people who have recently immigrated from Mexico, Mexican-Americans born in the United States are at greater risk of mental disorder.

Who is most vulnerable to mental disorders? As we have seen, the answer varies with the disorder. One predictor of mental disorder,

TABLE 32.2 Percentage of Americans Reporting Selected Psychological Disorders in the Past Year

Psychological Disorder	Percentage
Generalized anxiety	3.1
Social phobia	6.8
Phobia of specific object or situation	8.7
Mood disorder	9.5
Obsessive-compulsive disorder	1.0
Schizophrenia	1.1
Post-traumatic stress disorder (PTSD)	3.5
Attention-deficit hyperactivity disorder (ADHD)	4.1
Any mental disorder	26.2

Source: National Institute of Mental Health, 2008.

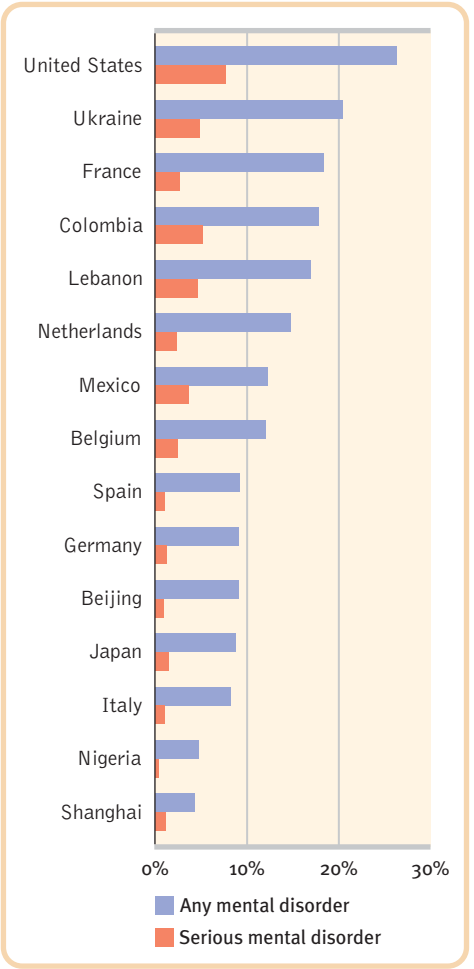


FIGURE 32.2 Prior-year prevalence of disorders in selected areas From World Health Organization (2004b) interviews in 20 countries.

poverty, crosses ethnic and gender lines. The incidence of serious psychological disorders is doubly high among those below the poverty line (Centers for Disease Control, 1992). Like so many other correlations, the poverty-disorder association raises a chicken-and-egg question: Does poverty cause disorders? Or do disorders cause poverty? It is both, though the answer varies with the disorder. Schizophrenia understandably leads to poverty. Yet the stresses and demoralization of poverty can also precipitate disorders, especially depression in women and substance abuse in men (Dohrenwend et al., 1992). In one natural experiment on the poverty-pathology link, researchers tracked rates of behavior problems in North Carolina Native American children as economic development enabled a dramatic reduction in their community's poverty rate. As the study began, children of poverty exhibited more deviant and aggressive behaviors. After four years, children whose families had moved above the poverty line exhibited a 40 percent decrease in the behavior problems, while those who continued in their previous positions below or above the poverty line exhibited no change (Costello et al., 2003).

At what times of life do disorders strike? Usually by early adulthood. "Over 75 percent of our sample with any disorder had experienced its first symptoms by age 24," reported Lee Robins and Darrel Regier (1991, p. 331). The symptoms of antisocial personality disorder and of phobias are among the earliest to appear, at a median age of 8 and 10, respectively. Symptoms of alcohol dependency, obsessive-compulsive disorder, bipolar disorder, and schizophrenia appear at a median age near 20. Major depression often hits somewhat later, at a median age of 25. Such findings make clear the need for research and treatment to help the growing number of people, especially teenagers and young adults, who suffer the bewilderment and pain of a psychological disorder.

Although mindful of the pain, we can also be encouraged by the many successful people—including Leonardo da Vinci, Isaac Newton, and Leo Tolstoy—who pursued brilliant careers while enduring psychological difficulties. So have 18 U.S. presidents, including the periodically depressed Abraham Lincoln, according to one psychiatric analysis of their biographies (Davidson et al., 2006). The bewilderment, fear, and sorrow caused by psychological disorders are real. But hope, too, is real, as our understanding of these disorders continues to grow.

For some people, recurring depression during winter's dark months constitutes a seasonal affective disorder. *For others, winter darkness means more blue moods. When asked "Have you cried today?" Americans answered "Yes" more often in the winter.*

***Percentage answering* yes**

	Men	*Women*
August	*4%*	*7%*
December	*8%*	*21%*

Source: Time/CNN *survey, 1994.*

Mood Disorders

32-6: What are mood disorders, and what forms do they take?

The emotional extremes of **mood disorders** take two principal forms: (1) *major depressive disorder,* with its prolonged hopelessness and lethargy, and (2) *bipolar disorder* (formerly called *manic-depressive disorder*), in which a person alternates between depression and *mania,* an overexcited, hyperactive state.

Major Depressive Disorder

Joy, contentment, sadness, and despair are different points on a continuum, points at which any of us may be found at any given moment. If you are like most college students, at some time during this year—more likely the dark months of winter than the bright days of summer—you will probably experience a few of depression's symptoms. You may feel deeply discouraged about the future, dissatisfied with your

life, or socially isolated. You may lack the energy to get things done or even to force yourself out of bed; be unable to concentrate, eat, or sleep normally; or even wonder if you would be better off dead. Perhaps academic success came easily to you in high school, and now you find that disappointing grades jeopardize your goals. Maybe social stresses, such as feeling you don't belong or experiencing the end of a romance, have plunged you into despair. And maybe brooding has at times only worsened your self-torment. You are not alone. In one survey of 90,000 American college and university students, 44 percent reported that on one or more occasions within the last school year, they had felt "so depressed it was difficult to function" (ACHA, 2006).

Depression has been called the "common cold" of psychological disorders—an expression that effectively describes its pervasiveness but not its seriousness. Although phobias are more common, depression is the number-one reason people seek mental health services. At some point during their lifetime, 12 percent of Canadian adults and 13 percent of U.S. adults have experienced a depressive disorder (Hasin et al., 2005; Patten et al., 2006). Moreover, depression is the leading cause of disability worldwide (WHO, 2002). In any given year, a depressive episode plagues 5.8 percent of men and 9.5 percent of women, reports the World Health Organization.

"My life had come to a sudden stop. I was able to breathe, to eat, to drink, to sleep. I could not, indeed, help doing so; but there was no real life in me."

—Leo Tolstoy, *My Confession*, 1887

As anxiety is a response to the threat of future loss, depressed mood is often a response to past and current loss. To feel bad in reaction to profoundly sad events is to be in touch with reality. In such times, depression is like a car's low–oil-pressure light—a signal that warns us to stop and take protective measures. Recall that, biologically speaking, life's purpose is not happiness but survival and reproduction. Coughing, vomiting, and various forms of pain protect the body from dangerous toxins. Similarly, depression is a sort of psychic hibernation: It slows us down, defuses aggression, and restrains risk taking (Allen & Badcock, 2003). To grind temporarily to a halt and ruminate, as depressed people do, is to reassess one's life when feeling threatened and to redirect energy in more promising ways (Watkins, 2008). There is sense to suffering.

"If someone offered you a pill that would make you permanently happy, you would be well advised to run fast and run far. Emotion is a compass that tells us what to do, and a compass that is perpetually stuck on NORTH is worthless."

—Daniel Gilbert, "The Science of Happiness," 2006

But prolonged, this response can become seriously maladaptive. The difference between a blue mood after bad news and a mood disorder is like the difference between gasping for breath after a hard run and being chronically short of breath.

Major depressive disorder occurs when at least five signs of depression (including lethargy, feelings of worthlessness, or loss of interest in family, friends, and activities) last two or more weeks and are not caused by drugs or a medical condition. To sense what major depression feels like, suggest some clinicians, imagine combining the anguish of grief with the sluggishness of jet lag.

Bipolar Disorder

With or without therapy, episodes of major depression usually end, and people temporarily or permanently return to a more normal state. However, some people rebound to, or sometimes start with, the opposite emotional extreme—the euphoric, hyperactive, wildly optimistic state of **mania.** If depression is living in slow motion, mania is fast forward. Alternating between depression and mania signals **bipolar disorder.**

Adolescent mood swings, from rage to bubbly, can, when prolonged, produce a bipolar diagnosis. Between 1994 and 2003, U.S. National Center for Health Statistics annual physician surveys revealed an astonishing 40-fold increase in diagnoses of bipolar disorder in those 19 and under—from an estimated 20,000 to 800,000 (Carey, 2007; Moreno et al., 2007). The new popularity of the diagnosis, given in two-thirds of the cases to boys, has been a boon to companies whose drugs are prescribed to lessen mood swings.

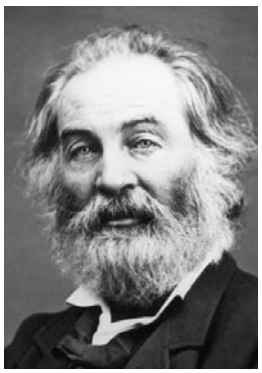
During the manic phase, people with bipolar disorder are typically overtalkative, overactive, and elated (though easily irritated if crossed); have little need for sleep; and show fewer sexual inhibitions. Speech is loud, flighty, and hard to interrupt. They find advice irritating, yet they need protection from their own poor judgment, which may lead to reckless spending or unsafe sex.

mood disorders psychological disorders characterized by emotional extremes. See *major depressive disorder*, *mania*, and *bipolar disorder.*

major depressive disorder a mood disorder in which a person experiences, in the absence of drugs or a medical condition, two or more weeks of significantly depressed moods, feelings of worthlessness, and diminished interest or pleasure in most activities.

mania a mood disorder marked by a hyperactive, wildly optimistic state.

bipolar disorder a mood disorder in which the person alternates between the hopelessness and lethargy of depression and the overexcited state of mania. (Formerly called *manic-depressive disorder.*)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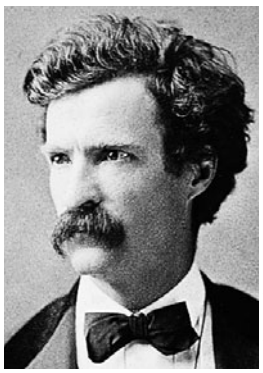
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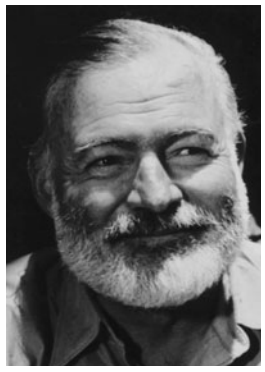

Earl Theissen/Hulton Getty Pictures Library

Creativity and bipolar disorder History has given us many creative artists, composers, and writers with bipolar disorder, including (left to right) Walt Whitman, Virginia Woolf, Samuel Clemens (Mark Twain), and Ernest Hemingway.

In milder forms, mania's energy and free-flowing thinking does fuel creativity. George Frideric Handel (1685–1759), who may have suffered from a mild form of bipolar disorder, composed his nearly four-hour-long *Messiah* during three weeks of intense, creative energy (Keynes, 1980). Robert Schumann composed 51 musical works during two years of mania (1840 and 1849) and none during 1844, when he was severely depressed (Slater & Meyer, 1959). Those who rely on precision and logic, such as architects, designers, and journalists, are less likely to have bipolar disorder than are those who rely on emotional expression and vivid imagery (Ludwig, 1995). Composers, artists, poets, novelists, and entertainers seem especially prone (Jamison, 1993, 1995; Kaufman & Baer, 2002; Ludwig, 1995).

"All the people in history, literature, art, whom I most admire: Mozart, Shakespeare, Homer, El Greco, St. John, Chekhov, Gregory of Nyssa, Dostoevsky, Emily Brontë: not one of them would qualify for a mental-health certificate."

—Madeleine L'Engle, *A Circle of Quiet*, 1972

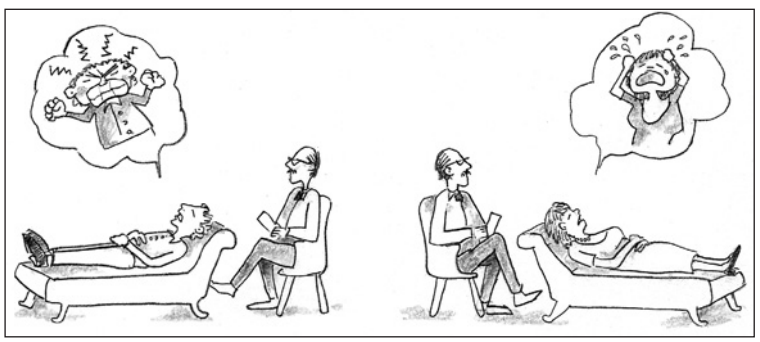
It is as true of emotions as of everything else: What goes up comes down. Before long, the elated mood either returns to normal or plunges into a depression. Though bipolar disorder is much less common than major depressive disorder, it is often more dysfunctional, claiming twice as many lost workdays yearly (Kessler et al., 2006). Among adults, it afflicts men and women about equally.

Understanding Mood Disorders

32-7: What causes mood disorders, and what might explain the Western world's rising incidence of depression among young people?

In thousands of studies, psychologists have been accumulating evidence to help explain mood disorders and suggest more effective ways to treat and prevent them. Researcher Peter Lewinsohn and his colleagues (1985, 1998, 2003) have summarized the facts that any theory of depression must explain, including the following:

- ***Many behavioral and cognitive changes accompany depression.*** People trapped in a depressed mood are inactive and feel unmotivated. They are sensitive to negative happenings, more often recall negative information, and expect negative outcomes (my team will lose, my grades will fall, my love will fail). When the mood lifts, these behavioral and cognitive accompaniments disappear. Nearly half the time, people also exhibit symptoms of another disorder, such as anxiety or substance abuse.
- ***Depression is widespread.*** Its commonality suggests that its causes, too, must be common.
- ***Compared with men, women are nearly twice as vulnerable to major depression*** (**FIGURE 32.3**). This gender gap begins in adolescence; preadolescent girls are not more depression-prone than boys (Hyde et al., 2008). The factors that put women at risk for depression (genetic predispositions, child abuse, low self-esteem, marital problems, and so forth) similarly put men at risk (Kendler et al., 2006). Yet women are more vulnerable to disorders involving internalized states, such


Paula Niedenthal

The emotional lives of men and women?

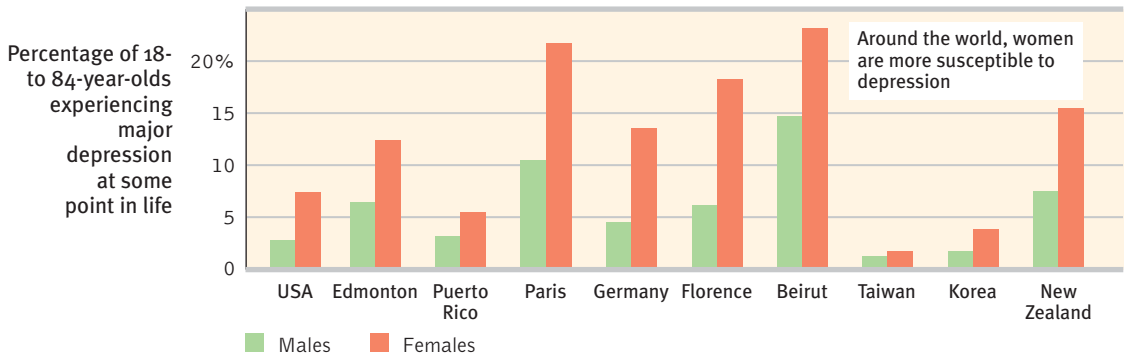


FIGURE 32.3 Gender and major depression
Interviews with 38,000 adults in 10 countries confirm what many smaller studies have found: Women's risk of major depression is nearly double that of men's. Lifetime risk of depression also varies by culture—from 1.5 percent in Taiwan to 19 percent in Beirut. (Data from Weissman et al., 1996.)

as depression, anxiety, and inhibited sexual desire. Men's disorders tend to be more external—alcohol abuse, antisocial conduct, lack of impulse control. When women get sad, they often get sadder than men do. When men get mad, they often get madder than women do.

- ***Most major depressive episodes self-terminate.*** Therapy tends to speed recovery, yet most people suffering major depression eventually return to normal even without professional help. The plague of depression comes and, a few weeks or months later, it goes, though it sometimes recurs (Burcusa & Iacono, 2007). About 50 percent of those who recover from depression will experience another episode within two years. Recovery is more likely to be permanent the later the first episode strikes, the longer the person stays well, the fewer the previous episodes, the less stress experienced, and the more social support received (Belsher & Costello, 1988; Fergusson & Woodward, 2002; Kendler et al., 2001).
- ***Stressful events related to work, marriage, and close relationships often precede depression.*** A family member's death, a job loss, a marital crisis, or a physical assault increase one's risk of depression. If stress-related anxiety is a "crackling, menacing brushfire," notes biologist Robert Sapolsky (2003), "depression is a suffocating heavy blanket thrown on top of it." One long-term study (Kendler, 1998) tracked rates of depression in 2000 people. The risk of depression ranged from less than 1 percent among those who had experienced no stressful life event in the preceding month to 24 percent among those who had experienced three such events in that month.
- ***With each new generation, depression is striking earlier (now often in the late teens) and affecting more people.*** This is true in Canada, the United States, England, France, Germany, Italy, Lebanon, New Zealand, Puerto Rico, and Taiwan (Collishaw et al., 2007; Cross-National Collaborative Group, 1992; Twenge et al., 2008). In one study, 12 percent of Australian adolescents reported symptoms of depression (Sawyer et al., 2000). Most hid it from their parents; almost 90 percent of those parents perceived their depressed teen as *not* suffering depression. In North America, today's young adults are three times more likely than their grandparents to report having recently—or ever—suffered depression (despite the grandparents' many more years of being at risk). The increase appears partly authentic, but it may also reflect today's young adults' greater willingness to disclose depression.

"I see depression as the plague of the modern era."
—Lewis Judd, former chief, National Institute of Mental Health, 2000

Researchers may accept these facts without agreeing how best to explain them. For example, proponents of Sigmund Freud's psychoanalytic theory (or the more modern psychodynamic approach) have an idea: Depression often occurs when significant losses, such as the breakup of a current romantic relationship, evoke feelings associated with losses experienced in childhood (the intimate relationship with one's mother, for example). Alternatively, these theorists may view depression as unresolved anger toward one's parents, turned inward against oneself.

"Could bad cognitions be the hex, instead of conflicts over sex?"
—Psychiatrist Robert L. Spitzer et al. (1982)

Most contemporary researchers propose biological and cognitive explanations of depression, often combined in a biopsychosocial perspective.

Close-Up:

Suicide

"But life, being weary of these worldly bars, Never lacks power to dismiss itself."

—William Shakespeare, *Julius Caesar,* 1599

Each year nearly 1 million despairing people worldwide will elect a permanent solution to what might have been a temporary problem (WHO, 2008). Comparing the suicide rates of different groups, researchers have found

- ***national differences:*** Britain's, Italy's, and Spain's suicide rates are little more than half those of Canada, Australia, and the United States. Austria's and Finland's are about double (WHO, 2008). Within Europe, the most suicide-prone people (Lithuanians) have been 14 times more likely to kill themselves than the least (Greeks).
- ***racial differences:*** Within the United States, Whites are nearly twice as likely as Blacks to kill themselves (NIMH, 2002).
- ***gender differences:*** Women are much more likely than men to attempt suicide (WHO, 2008). But men are two to four times more likely (depending on the country) to succeed (**FIGURE 32.4**). Men use more lethal methods, such as firing a bullet into the head, the method of choice in 6 of 10 U.S. suicides.
- ***age differences and trends:*** In late adulthood, rates increase, dramatically so among men (Figure 32.4). In the last half of the twentieth century, the global rate of annual suicide deaths rose from 10 to 18 per 100,000 (WHO, 2008).
- ***other group differences:*** Suicide rates are much higher among the rich, the nonreligious, and those who are single, widowed, or divorced (Hoyer & Lund, 1993; Stack, 1992; Stengel, 1981). Gay and lesbian youth much more often suffer distress and attempt suicide than do their heterosexual peers (Goldfried, 2001). Among 1.3 million Swedish military conscripts at age 18, the thinner men were more likely than their rounder age-mates to later commit suicide (Magnusson et al., 2006).

The risk of suicide is at least five times greater for those who have been depressed than for the general population (Bostwick & Pankratz, 2000). People seldom commit suicide while in the depths of depression, when energy and initiative are lacking. It is when they begin to rebound and become capable of following through that the risk increases. Compared with people who suffer no disorder, those with alcohol dependency are roughly 100 times more likely to commit suicide; some 3 percent of them do (Murphy & Wetzel, 1990; Sher, 2006). Even among people who have attempted suicide, those who abuse alcohol are five times more likely than others to kill themselves eventually (Beck & Steer, 1989). Teenage suicides are often linked with drug and alcohol abuse; the final act may follow a traumatic event, such as a romantic breakup or a guilt-provoking antisocial act (Fowler et al., 1986; Kolata, 1986). Because suicide is so often an impulsive act, environmental barriers (such as jump barriers on high bridges and the unavailability of loaded guns) can reduce suicides (Anderson, 2008). Although common sense might suggest that a determined person would simply find another way to complete the act, such restrictions give time for self-destructive impulses to subside.

Social suggestion can act as a trigger. Following highly publicized suicides in

The Biological Perspective

Most recent mental health research dollars have funded explorations of biological influences on mood disorders. Areas of interest have been genetic predispositions, brain activity, and biochemical imbalances.

Genetic Influences We have long known that mood disorders run in families. As one researcher noted, emotions are "postcards from our genes" (Plotkin, 1994). The risk of major depression and bipolar disorder increases if you have a parent or sibling with the disorder (Sullivan et al., 2000). If one identical twin is diagnosed with major depressive disorder, the chances are about 1 in 2 that at some time the other twin will be, too. If one identical twin has bipolar disorder, the chances are 7 in 10 that the other twin will at some point be diagnosed similarly. Among fraternal twins, the corresponding odds are just under 2 in 10 (Tsuang & Faraone, 1990). The greater similarity among identical twins holds even among twins reared apart (DiLalla et al., 1996). Summarizing the major twin studies, Kenneth Kendler and his co-researchers (2006) estimate that the heritability of major depression is 35 to 40 percent.

Moreover, adopted people with mood disorders often have close biological relatives who have mood disorders, become dependent on alcohol, or commit suicide (Wender et al., 1986). (See Close-Up: Suicide.)

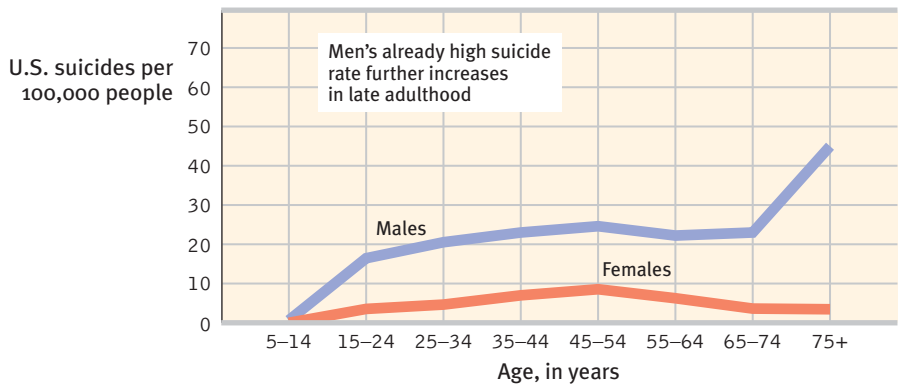


FIGURE 32.4 Suicide rates by gender and age Worldwide suicide rates are higher among males than among females. The highest rates of all are found among older men. (From *Statistical Abstract,* 2008.)

real life or in TV programs, known suicides increase. So do fatal auto and private airplane "accidents." One six-year study tracked suicide cases among all 1.2 million people who lived in metropolitan Stockholm at any time during the 1990s (Hedström et al., 2008). Men exposed to a co-worker's suicide were 3.5 times more likely to kill themselves than were nonexposed men.

Suicide is not necessarily an act of hostility or revenge. The elderly sometimes choose death as an alternative to current or future suffering. During the recent economic crisis, calls for help increased—from 42,406 calls to the National Suicide Prevention Lifeline[1] in April 2008, to 51,465 in April 2009.

People of all ages may view suicide as a way of switching off unendurable pain and relieving a perceived burden on family members. "People desire death when two fundamental needs are frustrated to the point of extinction," notes Thomas Joiner (2006, p. 47): "The need to belong with or connect to others, and the need to feel effective with or to influence others."

In retrospect, families and friends may recall signs that they believe should have forewarned them—verbal hints, giving possessions away, or withdrawal and preoccupation with death. But few who talk or think of suicide (a number that includes one-third of all adolescents and college students) actually attempt it, and only about 1 in 25 who make the attempt will complete the act (AAS, 2009). But about 30,000 do succeed, one-third of whom have tried to kill themselves previously. Most discussed it beforehand. So, if a friend talks suicide to you, it's important to listen and to direct the person to professional help. Anyone who threatens suicide is at least sending a signal of feeling desperate or despondent.

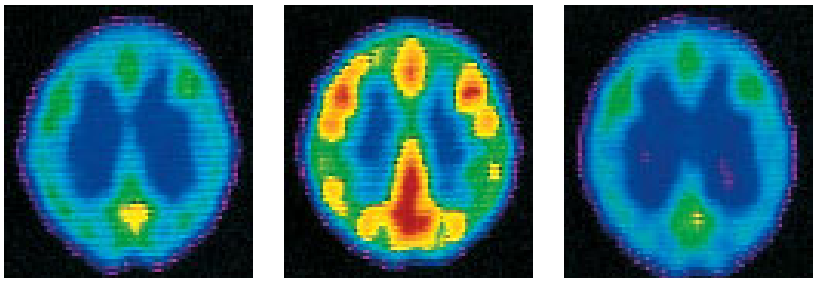
[1] 1-800-273-TALK (in USA)

To tease out the genes that put people at risk for depression, some researchers have turned to *linkage analysis*. After finding families in which the disorder appears across several generations, geneticists examine DNA from affected and unaffected family members, looking for differences. Linkage analysis points us to a chromosome neighborhood, note behavior genetics researchers Robert Plomin and Peter McGuffin (2003); "a house-to-house search is then needed to find the culprit gene." Such studies are reinforcing the view that depression is a complex condition. Many genes probably work together, producing a mosaic of small effects that interact with other factors to put some people at greater risk.

The Depressed Brain Using modern technology, researchers are also gaining insight into brain activity during depressed and manic states, and into the effects of certain neurotransmitters


Jerry Irwin Photography

Gene-hunters' pursuit of bipolar-DNA links Linkage studies seek to identify aberrant genes in family members suffering a disorder. These Pennsylvania Amish family members—an isolated population sharing a common life-style and some vulnerability to bipolar disorder—have volunteered for such studies.



Depressed state (May 17) | **Manic state** (May 18) | **Depressed state** (May 27)

FIGURE 32.5 The ups and downs of bipolar disorder These top-facing PET scans show that brain energy consumption rises and falls with the patient's emotional switches. Red areas are where the brain rapidly consumes glucose.

during these states. Many studies have found less activity in the brain during slowed-down depressive states, and more activity during periods of mania (**FIGURE 32.5**). The left frontal lobe, which is active during positive emotions, is likely to be inactive during depressed states (Davidson et al., 2002). In one study of people with severe depression, MRI scans found their frontal lobes 7 percent smaller than normal (Coffey et al., 1993). Other studies show that the *hippocampus,* the memory-processing center linked with the brain's emotional circuitry, is vulnerable to stress-related damage.

At least two neurotransmitter systems play a role in mood disorders. The first, *norepinephrine,* which increases arousal and boosts mood, is scarce during depression and overabundant during mania. (Drugs that alleviate mania reduce norepinephrine.) Most people with a history of depression also have a history of habitual smoking. This may indicate an attempt to self-medicate with inhaled nicotine, which can temporarily increase norepinephrine and boost mood (HMHL, 2002).

The second neurotransmitter, *serotonin,* is also scarce during depression. Some genes now under scrutiny provide codes for a protein that controls serotonin activity (Plomin & McGuffin, 2003). A widely publicized study of New Zealand young adults seemed to identify a serotonin-controlling gene that, in combination with significant stress, formed a recipe for depression (Caspi et al., 2003; Moffitt et al., 2006). Alas, other recent studies failed to replicate the finding (Risch et al., 2009). But stay tuned: Science grows by fits and starts.

Drugs that relieve depression tend to increase norepinephrine or serotonin supplies by blocking either their reuptake (as Prozac, Zoloft, and Paxil do with serotonin) or their chemical breakdown. Repetitive physical exercise, such as jogging, reduces depression as it increases serotonin (Ilardi et al., 2007; Jacobs, 1994). Boosting serotonin may promote recovery from depression by stimulating hippocampus neuron growth (Airan et al., 2007; Jacobs et al., 2000).

The Social-Cognitive Perspective

Depression is a whole-body disorder resulting from the interaction of many factors (**FIGURE 32.6**). Biological influences contribute to depression but don't fully explain it. The social-cognitive perspective explores the roles of thinking and acting.

Depressed people view life through dark glasses. Their intensely negative assumptions about themselves, their situation, and their future lead them to magnify bad experiences and minimize good ones. Listen to Norman, a Canadian college professor, recalling his depression:

> I [despaired] of ever being human again. I honestly felt subhuman, lower than the lowest vermin. Furthermore, I was self-deprecatory and could not understand why anyone would want to associate with me, let alone love me. . . . I was positive that I was a fraud and a phony and that I didn't deserve my Ph.D. I didn't deserve to have tenure; I didn't deserve to be a Full Professor. . . . I didn't deserve the research grants I had been awarded; I couldn't understand how I had written books and journal articles. . . . I must have conned a lot of people. (Endler, 1982, pp. 45–49)

Research reveals how s*elf-defeating beliefs* and a *negative explanatory style* feed depression's vicious cycle.

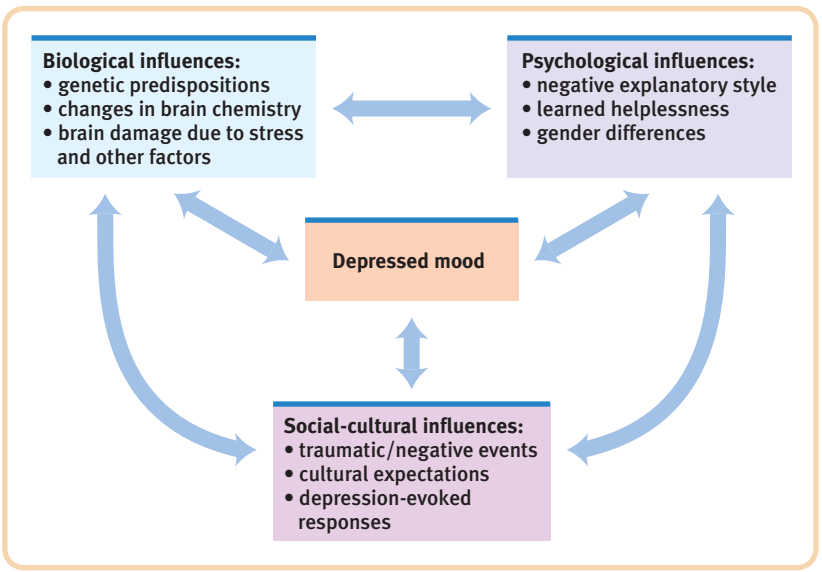


FIGURE 32.6 Biopsychosocial approach to depression Seriously depressed moods result from a combination of interacting factors. Altering any one component can alter the others.

Negative Thoughts and Negative Moods Interact Self-defeating beliefs may arise from *learned helplessness*. Both dogs and humans act depressed, passive, and withdrawn after experiencing uncontrollable painful events. Learned helplessness is more common in women than in men, and women may respond more strongly to stress (Hankin & Abramson, 2001; Mazure et al., 2002; Nolen-Hoeksema, 2001, 2003). For example, 38 percent of women and 17 percent of men entering American colleges and universities report feeling "frequently overwhelmed by all I have to do" (Pryor et al., 2006). (Men report spending more of their time in "light anxiety" activities such as sports, TV watching, and partying, possibly avoiding activities that might make them feel overwhelmed.) This may help explain why, beginning in their early teens, women are nearly twice as vulnerable to depression (Kessler, 2001). Susan Nolen-Hoeksema (2003) believes women's higher risk of depression may also be related to what she describes as their tendency to *overthink*, to ruminate. Women often have vivid recall for both wonderful and horrid experiences; men more vaguely recall such experiences (Seidlitz & Diener, 1998). The gender difference in emotional memory may feed women's greater rumination over negative events and explain why fewer men than women report being frequently overwhelmed on entering college.

But why do life's unavoidable failures lead some people—women or men—and not others to become depressed? The answer lies partly in their *explanatory style*—who or what they blame for their failures. Think how you might feel if you failed a test. If you can externalize the blame ("What an unfair test!"), you are more likely to feel angry. But if you blame yourself, you probably will feel stupid and depressed.

So it is with depressed people, who tend to explain bad events in terms that are *stable* ("It's going to last forever"), *global* ("It's going to affect everything I do"), and *internal* ("It's all my fault") (**FIGURE 32.7** on the next page). Depression-prone people respond to bad events in an especially self-focused, self-blaming way (Mor & Winquist, 2002; Pyszczynski et al., 1991; Wood et al., 1990a,b). Their self-esteem fluctuates more rapidly up with boosts and down with threats (Butler et al., 1994).

The result of these pessimistic, overgeneralized, self-blaming attributions may be a depressing sense of hopelessness (Abramson et al., 1989; Panzarella et al., 2006). As Martin Seligman has noted, "A recipe for severe depression is preexisting pessimism encountering failure" (1991, p. 78). What then might we expect of new college students who are not depressed but do exhibit a pessimistic explanatory style? Lauren Alloy and her collaborators (1999) monitored Temple University and University of Wisconsin students every 6 weeks for 2.5 years. Among those identified as having a pessimistic thinking style, 17 percent had a first episode of


Michael Marsland

Susan Nolen-Hoeksema "This epidemic of morbid meditation is a disease that women suffer much more than men. Women can ruminate about anything and everything—our appearance, our families, our career, our health." (*Women Who Think Too Much: How to Break Free of Overthinking and Reclaim Your Life,* 2003)

"I have learned to accept my mistakes by referring them to a personal history which was not of my making."
—B. F. Skinner (1983)

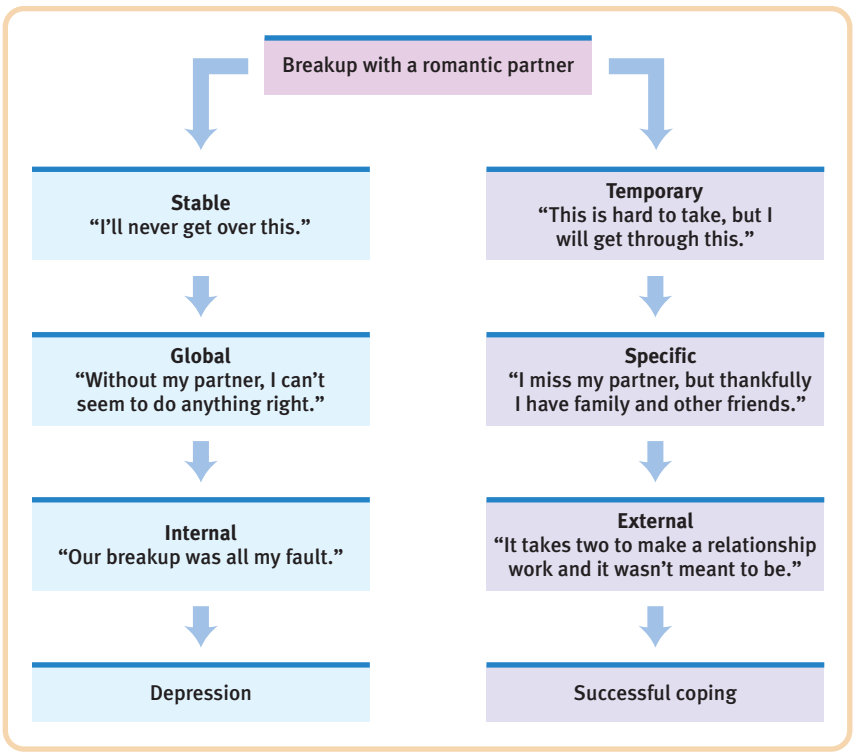


FIGURE 32.7 Explanatory style and depression

major depression, as did only 1 percent of those who began college with an optimistic thinking style. Follow-up research has found that students who exhibit optimism as they begin college develop more social support, which contributes to a lowered risk of depression (Brissette et al., 2002).

From 1985 to 2004, Americans indeed reported fewer close relationships with coworkers, extended family, and neighbors, and thus had fewer people with whom they could discuss meaningful matters. The number of people with no confidantes increased from 10 to 25 percent (McPherson et al., 2006).

Seligman (1991, 1995) contends that depression is common among young Westerners because the rise of individualism and the decline of commitment to religion and family have forced young people to take personal responsibility for failure or rejection. In non-Western cultures, where close-knit relationships and cooperation are the norm, major depression is less common and less tied to self-blame over personal failure (WHO, 2004). In Japan, for example, depressed people instead tend to report feeling shame over letting others down (Draguns, 1990a).

There is, however, a chicken-and-egg problem with the social-cognitive explanation of depression. Self-defeating beliefs, negative attributions, and self-blame surely do support depression. Peter Barnett and Ian Gotlib (1988) have noted that such cognitions *coincide* with a depressed mood and are *indicators* of depression. But do they *cause* depression, any more than a speedometer's reading of 70 mph causes a car's speed? Before or after being depressed, people's thoughts are less negative. Perhaps this is because, in a phenomenon known as *state-dependent memory,* a depressed mood triggers negative thoughts. If you temporarily put people in a bad or sad mood, their memories, judgments, and expectations suddenly become more pessimistic.

Might Charlie Brown be helped by an optimism-training program?

Depression's Vicious Cycle Depression, as we have seen, is often brought on by stressful experiences—losing a job, getting divorced or rejected, suffering physical trauma—by anything that disrupts our sense of who we are and why we are worthy human beings. This disruption in turn leads to brooding, which amplifies negative feelings. But being withdrawn, self-focused, and complaining can by itself elicit rejection (Furr & Funder, 1998; Gotlib & Hammen, 1992). In one study, researchers Stephen Strack and James Coyne (1983) noted that "depressed persons induced hostility, depression, and anxiety in others and got rejected. Their guesses that they were not accepted were not a matter of cognitive distortion." Indeed, people in the throes of depression are at high risk for divorce, job loss, and other stressful life events. Weary of the person's fatigue, hopeless attitude, and lethargy, a spouse may threaten to leave or a boss may begin to question the person's competence. The losses and stress only serve to compound the original depression. Rejection and depression feed each other. Misery may love another's company, but company does not love another's misery.

We can now assemble some of the pieces of the depression puzzle (**FIGURE 32.8**): (1) Negative, stressful events interpreted through (2) a ruminating, pessimistic explanatory style create (3) a hopeless, depressed state that (4) hampers the way the person thinks and acts. This, in turn, fuels (1) negative stressful experiences such as rejection.

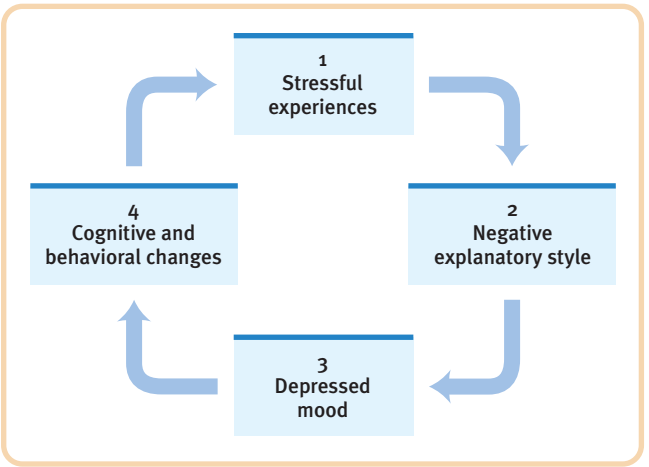
It is a cycle we can all recognize. Bad moods feed on themselves: When we *feel* down, we *think* negatively and remember bad experiences. On the brighter side, we can break the cycle of depression at any of these points—by moving to a different environment, by reversing our self-blame and negative attributions, by turning our attention outward, or by engaging in more pleasant activities and more competent behavior.

Winston Churchill called depression a "black dog" that periodically hounded him. Poet Emily Dickinson was so afraid of bursting into tears in public that she spent much of her adult life in seclusion (Patterson, 1951). As these lives remind us, people can and do struggle through depression. Most regain their capacity to love, to work, and even to succeed at the highest levels.

"Man never reasons so much and becomes so introspective as when he suffers, since he is anxious to get at the cause of his sufferings."

—Luigi Pirandello, *Six Characters in Search of an Author*, 1922

FIGURE 32.8 The vicious cycle of depressed thinking Cognitive therapists attempt to break this cycle by changing the way depressed people process events. Psychiatrists attempt to alter with medication the biological roots of persistently depressed moods.



Basic Concepts and Mood Disorders

Module Review

32-1: How should we draw the line between normality and disorder? *Psychological disorders* are deviant, distressful, and dysfunctional patterns of thoughts, feelings, and actions. The definition of deviant varies with context, culture, and time. For example, some children who might have been judged rambunctious a few decades ago now are being diagnosed with *attention-deficit hyperactivity disorder.*

32-2: What perspectives can help us understand psychological disorders? The *medical model* assumes that psychological disorders are mental illnesses that can be diagnosed on the basis of their symptoms and cured or treated through therapy, sometimes in a hospital. The biopsychosocial approach assumes that disorders arise from genetic predispositions and physiological states; inner psychological dynamics; and social-cultural circumstances.

32-3: How and why do clinicians classify psychological disorders? The fourth edition (text revised) of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR)* provides diagnostic guidelines and categories that aid mental health professionals by providing a common language and shared concepts for communication and research. Most U.S. health insurance organizations require DSM-IV-TR diagnoses before they will pay for therapy.

32-4: Why do some psychologists criticize the use of diagnostic labels? Labels can create preconceptions that bias our perceptions of a person's past and present behavior. The insanity defense raises moral and ethical questions about how a society should treat people who have disorders and have committed crimes.

32-5: How many people have, or have had, a psychological disorder? About 26 percent of adult Americans experience mental disorders annually, according to one recent estimate. Mental health surveys provide varying estimates of the rates of psychological disorders in many countries. Poverty is a predictor of mental illness. Conditions and experiences associated with poverty contribute to the development of mental disorders, but some mental disorders, such as schizophrenia, can drive people into poverty.

32-6: What are mood disorders, and what forms do they take? *Mood disorders* are characterized by emotional extremes. A person with *major depressive disorder* experiences two or more weeks of seriously depressed moods, feelings of worthlessness, and diminished interest and pleasure in most activities. These feelings are not caused by drugs or a medical condition. People with the less common condition of *bipolar disorder* experience not only depression but also *mania*, episodes of hyperactive and wildly optimistic impulsive behavior.

32-7: What causes mood disorders, and what might explain the Western world's rising incidence of depression among young people? The biological perspective on depression focuses on genetic predispositions, abnormalities in brain structures and functions, and neurotransmitter imbalances. The social-cognitive perspective examines the influence of self-defeating beliefs, learned helplessness, negative attributions, and stressful experiences. The biopsychosocial approach considers the interaction of these and other influences. Increased rates of depression among young Westerners may be due to the rise of individualism and the decline of commitment to religion and family, but this is a correlational finding, so the cause-effect relationship is not yet clear.

Rehearse It!

1. Although some psychological disorders are culture-bound, others are universal. For example, in every known culture some people have
   a. bulimia nervosa.
   b. anorexia nervosa.
   c. schizophrenia.
   d. susto.

2. If a lawyer washes his hands 100 times a day for no apparent reason and has no time left to meet with his clients, the hand washing will probably be labeled disordered because it is, among other things,
   a. distressing and dysfunctional.
   b. not explained by the medical model.
   c. harmful to others.
   d. untreatable.

3. A therapist says that psychological disorders are sicknesses and people with these disorders should be treated as patients in a hospital. This therapist believes in the
   a. social-cultural perspective.
   b. psychological model.
   c. medical model.
   d. diagnostic model.

4. Many psychologists reject the "disorders-as-illness" view and contend that other factors may also be involved—for example, the person's bad habits and poor social skills. This view represents the _____ approach.
   a. medical
   b. positive psychology
   c. biopsychosocial
   d. diagnostic labels

5. One study found that psychologists using the DSM-IV agreed on a diagnosis for more than 80 percent of patients. The DSM-IV's reliability stems in part from its reliance on
   a. structured-interview procedures.
   b. in-depth histories of the patients.
   c. input from patients' family and friends.
   d. the theories of Pinel, Freud, and others.

6. One predictor of psychiatric disorders that crosses ethnic and gender lines is
   a. age.
   b. education.
   c. poverty.
   d. religious faith.

7. Most psychological disorders strike by early adulthood. The symptoms of _____ appear around age 10; _____ tends to appear later, around age 25.
   a. schizophrenia; bipolar disorder
   b. bipolar disorder; schizophrenia
   c. major depression; phobias
   d. phobias; major depression

8. The disorder that is so common it has been called the "common cold" of psychological disorders is
   a. mania.
   b. depression.
   c. bipolar disorder.
   d. suicide.

9. Although bipolar disorder is as maladaptive as depression, it is much less common and it affects
   a. more women than men.
   b. more men than women.
   c. women and men equally.
   d. primarily scientists and doctors.

10. Depression affects many people, often following a stressful event, such as divorce or job change. The rate of depression is
    a. increasing among young people.
    b. decreasing among young people.
    c. increasing among elderly women.
    d. decreasing among elderly women.

11. Depression can often be alleviated by drugs that increase supplies of the neurotransmitters
    a. acetylcholine and dopamine.
    b. glycine and GABA.
    c. endorphin and glutamate.
    d. norepinephrine and serotonin.

12. Psychologists who emphasize the importance of negative perceptions, beliefs, and thoughts in depression are working within the _____ perspective.
    a. psychoanalytic
    b. biological
    c. behavioral
    d. social-cognitive

Answers: 1. c, 2. a, 3. c, 4. c, 5. a, 6. c, 7. d, 8. b, 9. c, 10. a, 11. d, 12. d.

Terms and Concepts to Remember

psychological disorder, p. 473
attention-deficit hyperactivity disorder (ADHD), p. 474
medical model, p. 475
DSM-IV-TR, p. 476
mood disorders, p. 480
major depressive disorder, p. 481
mania, p. 481
bipolar disorder, p. 481

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. A full-figured body is the traditional cultural ideal for women in the South Pacific island of Fiji. After the introduction of American TV programs to the island in 1995, however, eating disorder diagnoses increased rapidly. How can the biopsychosocial approach explain this phenomenon?
2. When women get sad, they often get sadder than men do. When men get mad, they often get madder than women do. How does this correspond to gender differences in psychological disorders?
3. What does it mean to say that depression is the "common cold" of psychological disorders?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

33

Schizophrenia

33-1: What patterns of thinking, perceiving, feeling, and behaving characterize schizophrenia?

If depression is the common cold of psychological disorders, chronic schizophrenia is the cancer. Nearly 1 in 100 people will develop schizophrenia, joining the estimated 24 million across the world who suffer one of humanity's most dreaded disorders (WHO, 2008). Schizophrenia is a disease of the brain exhibited in symptoms of the mind.

Symptoms of Schizophrenia

Literally translated, **schizophrenia** means "split mind." It refers not to a multiple-personality split but rather to a split from reality that shows itself in disorganized thinking, disturbed perceptions, and inappropriate emotions and actions. As such, it is the chief example of a **psychotic disorder,** a disorder marked by irrationality and lost contact with reality.

Disorganized Thinking

Imagine trying to communicate with Maxine, a young woman whose thoughts spill out in no logical order. Her biographer, Susan Sheehan (1982, p. 25), observed her saying aloud to no one in particular, "This morning, when I was at Hillside [Hospital], I was making a movie. I was surrounded by movie stars. . . . I'm Mary Poppins. Is this room painted blue to get me upset? My grandmother died four weeks after my eighteenth birthday."

As this strange monologue illustrates, the thinking of a person with schizophrenia is fragmented, bizarre, and often distorted by false beliefs called **delusions** ("I'm Mary Poppins"). Those with *paranoid* tendencies are particularly prone to delusions of persecution. Even within sentences, jumbled ideas may create what is called *word salad*. One young man begged for "a little more allegro in the treatment," and suggested that "liberationary movement with a view to the widening of the horizon" will "ergo extort some wit in lectures."

Disorganized thoughts may result from a breakdown in *selective attention,* the normal ability to give undivided attention to one set of sensory stimuli while filtering out others. For someone with schizophrenia, irrelevant, minute stimuli, such as the grooves on a brick or the inflections of a voice, may distract attention from a bigger event. As one former patient recalled, "What had happened to me . . . was a breakdown in the filter, and a hodge-podge of unrelated stimuli were distracting me from things which should have had my undivided attention" (MacDonald, 1960, p. 218). This selective-attention difficulty is but one of dozens of cognitive differences associated with schizophrenia (Reichenberg & Harvey, 2007).

Disturbed Perceptions

A person with schizophrenia may have *hallucinations* (sensory experiences without sensory stimulation), seeing, feeling, tasting, or smelling things that are not there. One of this book's reviewers recalls a psychiatric ward experience with two patients: One *believed* he was Jesus Christ (a delusion), while the other *saw* Jesus (a hallucination). Most often, however, hallucinations are auditory, frequently voices making insulting remarks or giving orders. The voices may tell the patient that she is bad or that she must burn herself with a cigarette lighter. Imagine your own reaction if a dream broke into your waking consciousness. When the unreal seems real, the resulting perceptions are at best bizarre, at worst terrifying.

"When someone asks me to explain schizophrenia I tell them, you know how sometimes in your dreams you are in them yourself and some of them feel like real nightmares? My schizophrenia was like I was walking through a dream. But everything around me was real. At times, today's world seems so boring and I wonder if I would like to step back into the schizophrenic dream, but then I remember all the scary and horrifying experiences."

—Stuart Emmons, with Craig Geisler, Kalman J. Kaplan, and Martin Harrow, *Living With Schizophrenia,* 1997

Inappropriate Emotions and Actions

The emotions of schizophrenia are often utterly inappropriate, split off from reality. Maxine laughed after recalling her grandmother's death. On other occasions, she cried when others laughed, or became angry for no apparent reason. Others with schizophrenia lapse into an emotionless state of *flat affect.*

Motor behavior may also be inappropriate. Some perform senseless, compulsive acts, such as continually rocking or rubbing an arm. Others, who exhibit *catatonia,* may remain motionless for hours and then become agitated.

As you can imagine, such disorganized thinking, disturbed perceptions, and inappropriate emotions and actions profoundly disrupt social relationships and make it difficult to hold a job. Given a supportive environment, some eventually recover to enjoy a normal life or experience bouts of schizophrenia only intermittently. Others remain in their private inner world, withdrawn and isolated throughout much of their lives.

schizophrenia a group of severe disorders characterized by disorganized and delusional thinking, disturbed perceptions, and inappropriate emotions and actions.

psychotic disorder a psychological disorder in which a person loses contact with reality, experiencing irrational ideas and distorted perceptions.

delusions false beliefs, often of persecution or grandeur, that may accompany psychotic disorders.

Onset and Development of Schizophrenia

Schizophrenia typically strikes as young people are maturing into adulthood. It knows no national boundaries, and it affects both males and females—though men tend to be struck earlier, more severely, and slightly more often (Aleman et al., 2003; Picchioni & Murray, 2007). Studies of Swedish and Danish male populations reveal that thin young men, and those who were not breast-fed, are more vulnerable (Sørensen et al., 2005, 2006; Zammit et al., 2007).

Schizophrenia patients with *positive symptoms* may experience hallucinations, talk in disorganized and deluded ways, and exhibit inappropriate laughter, tears, or rage. Those with *negative symptoms* have toneless voices, expressionless faces, or mute and rigid bodies. Thus, positive symptoms are the *presence* of inappropriate behaviors, and negative symptoms are the *absence* of appropriate behaviors.

For some, schizophrenia will appear suddenly, seemingly as a reaction to stress. For others, as was the case with Maxine, schizophrenia develops gradually, emerging from a long history of social inadequacy (which helps explain why those predisposed to schizophrenia often end up in the lower socioeconomic levels, or even homeless).

One rule holds true around the world: When schizophrenia is a slow-developing process (called *chronic,* or *process, schizophrenia*), recovery is doubtful (WHO, 1979, 2009). Those with chronic schizophrenia often exhibit the persistent and incapacitating negative symptom of social withdrawal (Kirkpatrick et al., 2006). Men, whose schizophrenia develops on average four years earlier than women's, more often exhibit negative symptoms and chronic schizophrenia (Räsänen et al., 2000).

August Natterer, *Witch's Head.* The Prinzhorn Collection, University of Heidelberg

L. Berthold, *Untitled,* the Prinzhorn Collection, University of Heidelberg.
Photos of paintings by Krannert Museum, University of Illinois at Urbana-Champaign

Art by people diagnosed with schizophrenia Commenting on the kind of artwork shown here, poet and art critic John Ashbery wrote: "The lure of the work is strong, but so is the terror of the unanswerable riddles it proposes."

When previously well-adjusted people develop schizophrenia rapidly (called *acute*, or *reactive*, *schizophrenia*) following particular life stresses, recovery is much more likely. They more often have the positive symptoms that are more likely to respond to drug therapy (Fenton & McGlashan, 1991, 1994; Fowles, 1992).

Understanding Schizophrenia

33-2: What causes schizophrenia?

We have thus far described schizophrenia as if it were a single disorder. Actually, it is a cluster of disorders. The subtypes share some common features, but they also have some distinguishing symptoms (**TABLE 33.1**). Schizophrenia is not only the most dreaded psychological disorder but also one of the most heavily researched. Because it is a cluster of disorders, its varied symptoms could have more than one cause. Most of the new research studies link these disorders with brain abnormalities and genetic predispositions.

TABLE 33.1 Subtypes of Schizophrenia

Paranoid	Preoccupation with delusions or hallucinations, often with themes of persecution or grandiosity
Disorganized	Disorganized speech or behavior, or flat or inappropriate emotion
Catatonic	Immobility (or excessive, purposeless movement), extreme negativism, and/or parrotlike repeating of another's speech or movements
Undifferentiated	Many and varied symptoms
Residual	Withdrawal, after hallucinations and delusions have disappeared

Brain Abnormalities

Might imbalances in brain chemistry underlie schizophrenia? Scientists have long known that strange behavior can have strange chemical causes. The saying "mad as a hatter" refers to the psychological deterioration of British hatmakers whose brains, it was later discovered, were slowly poisoned as they moistened the brims of mercury-laden felt hats with their lips (Smith, 1983). Research on neurotransmitters, including studies on the mechanism by which chemicals such as LSD produce hallucinations, hint that schizophrenia symptoms might have a biochemical key.

Dopamine Overactivity

Researchers discovered one such key when they examined schizophrenia patients' brains after death and found an excess of receptors for *dopamine*—a sixfold excess for the so-called D4 dopamine receptor (Seeman et al., 1993; Wong et al., 1986). They speculate that such a high level may intensify brain signals in schizophrenia, creating positive symptoms such as hallucinations and paranoia. As we might therefore expect, drugs that block dopamine receptors often lessen these symptoms; drugs that increase dopamine levels, such as amphetamines and cocaine, sometimes intensify them (Swerdlow & Koob, 1987). Dopamine overactivity may underlie patients' overreactions to irrelevant external and internal stimuli.

About 60 percent of schizophrenia patients smoke, often heavily. Nicotine apparently stimulates certain brain receptors, which helps focus attention (Javitt & Coyle, 2004).

Abnormal Brain Activity and Anatomy

Modern brain-scanning techniques reveal that many people with chronic schizophrenia have abnormal activity in multiple brain areas. Some have abnormally low activity in the frontal lobes, which are critical for reasoning, planning, and problem solving (Morey et al., 2005; Pettegrew et al., 1993; Resnick, 1992). People diagnosed with schizophrenia also display a noticeable decline in the brain waves that reflect synchronized neural firing in the frontal lobes (Spencer et al., 2004; Symond

et al., 2005). Out-of-sync neurons may disrupt the integrated functioning of neural networks, possibly contributing to schizophrenia symptoms.

One study took PET scans of brain activity while people were hallucinating (Silbersweig et al., 1995). When participants heard a voice or saw something, their brain became vigorously active in several core regions, including the thalamus, a structure deep in the brain that filters incoming sensory signals and transmits them to the cortex. Another PET scan study of people with paranoia found increased activity in the amygdala, a fear-processing center (Epstein et al., 1998).

Many studies have found enlarged, fluid-filled areas and a corresponding shrinkage of cerebral tissue in people with schizophrenia (Wright et al., 2000). Some studies have even found such abnormalities in the brains of people who would *later* develop this disorder, and in their close relatives (Boos et al., 2007; Job et al., 2006). The greater the shrinkage, the more severe the thought disorder (Collinson et al., 2003; Nelson et al., 1998; Shenton, 1992). One smaller-than-normal area is the cortex. Another is the thalamus, which may explain why people with schizophrenia have difficulty filtering sensory input and focusing attention (Andreasen et al., 1994). The bottom line of various studies is that schizophrenia involves not one isolated brain abnormality but problems with several brain regions and their interconnections (Andreasen, 1997, 2001).

Naturally, scientists wonder what causes these abnormalities. Some suspect a mishap during prenatal development or delivery. Two known risk factors for schizophrenia are low birth weight and oxygen deprivation during delivery (Buka et al., 1999; Zornberg et al., 2000). Famine may also increase risks. People conceived during the peak of the Dutch wartime famine later displayed a doubled rate of schizophrenia, as did those conceived during the famine of 1959 to 1961 in eastern China (St. Clair et al., 2005; Susser et al., 1996).

Maternal Virus During Midpregnancy

Consider another possible culprit: a midpregnancy viral infection that impairs fetal brain development (Patterson, 2007). Can you imagine some ways to test this fetal-virus idea? Scientists have asked the following:

- *Are people at increased risk of schizophrenia if, during the middle of their fetal development, their country experienced a flu epidemic?* The repeated answer is *yes* (Mednick et al., 1994; Murray et al., 1992; Wright et al., 1995).
- *Are people born in densely populated areas, where viral diseases spread more readily, at greater risk for schizophrenia?* The answer, confirmed in a study of 1.75 million Danes, is *yes* (Jablensky, 1999; Mortensen, 1999).
- *Are those born during the winter and spring months—after the fall-winter flu season—also at increased risk?* The answer is again *yes,* at 5 to 8 percent increased risk (Torrey et al., 1997, 2002).
- *In the Southern Hemisphere, where the seasons are the reverse of the Northern Hemisphere, are the months of above-average schizophrenia births similarly reversed?* Again, the answer is *yes,* though somewhat less so. In Australia, for example, people born between August and October are at greater risk—*unless* they migrated from the Northern Hemisphere, in which case their risk is greater if they were born between January and March (McGrath et al., 1995, 1999).
- *Are mothers who report being sick with influenza during pregnancy more likely to bear children who develop schizophrenia?* In one study of nearly 8000 women, the answer was *yes*. The schizophrenia risk increased from the customary 1 percent to about 2 percent—but only when infections occurred during the second trimester (Brown et al., 2000).
- *Does blood drawn from pregnant women whose offspring develop schizophrenia show higher-than-normal levels of antibodies that suggest a viral infection?* In one study of 27 women whose children later developed schizophrenia, the answer was *yes* (Buka et al., 2001). And the answer was again *yes* in a huge California study, which collected blood samples from some 20,000 pregnant women during the 1950s and 1960s. Some children born of those pregnancies were later

Studying the neurophysiology of schizophrenia Psychiatrist E. Fuller Torrey is collecting the brains of hundreds of those who died as young adults and suffered disorders such as schizophrenia and bipolar disorder. Torrey is making tissue samples available to researchers worldwide.

Chris Usher

diagnosed with schizophrenia. When antibodies in the mother's blood indicated she had been exposed to influenza during the first half of the pregnancy, the child's risk of developing schizophrenia tripled. Flu during the second half of the pregnancy produced no such increase (Brown et al., 2004).

These converging lines of evidence suggest that fetal-virus infections play a contributing role in the development of schizophrenia. They also strengthen the recommendation that "women who will be more than three months pregnant during the flu season" have a flu shot (CDC, 2003).

Why might a second-trimester maternal flu bout put fetuses at risk? Is it the virus itself? The mother's immune response to it? Medications taken? (Wyatt et al., 2001). Does the infection weaken the brain's supportive glial cells, leading to reduced synaptic connections (Moises et al., 2002)? In time, answers may become available.

Genetic Factors

Fetal-virus infections do appear to increase the odds that a child will develop schizophrenia. But this theory cannot tell us why only 2 percent of women who catch the flu during their second trimester of pregnancy bear children who develop schizophrenia. Might people also inherit a predisposition to this disorder? The evidence strongly suggests that, *yes*, some do. The nearly 1-in-100 odds of any person's being diagnosed with schizophrenia become about 1 in 10 among those whose sibling or parent has the disorder, and close to 1 in 2 if the affected sibling is an identical twin (**FIGURE 33.1**). And, although only a dozen or so such cases are on record, the co-twin of an identical twin with schizophrenia retains that 1-in-2 chance when the twins are reared apart (Plomin et al., 1997).

Nevertheless, the fact remains: Some identical twins, despite their shared genes, do not share a schizophrenia diagnosis (**FIGURE 33.2**). This difference tells us that genes are not the whole story.

Remember that identical twins also share a prenatal environment. About two-thirds also share a placenta and the blood it supplies; the other one-third have two single placentas, as do fraternal twins. If an identical twin has schizophrenia, the co-twin's chances of being similarly afflicted are 6 in 10 if they shared a placenta. If they had separate placentas, the chances are only 1 in 10 (Davis et al., 1995a,b; Phelps et al., 1997). Twins who share a placenta are more likely to experience the same prenatal viruses. So it is possible that shared germs as well as shared genes produce identical twin similarities.

Adoption studies, however, confirm that the genetic link is real (Gottesman, 1991). Children adopted by someone who develops schizophrenia seldom "catch" the disorder. Rather, adopted children have an elevated risk if a biological parent is diagnosed with schizophrenia.

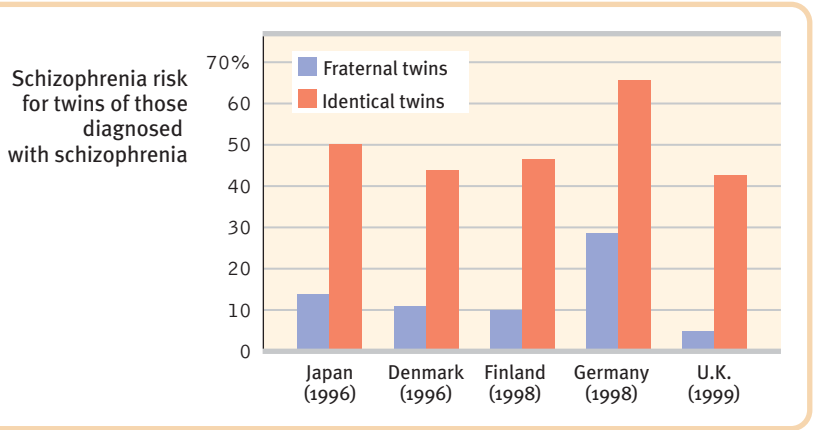
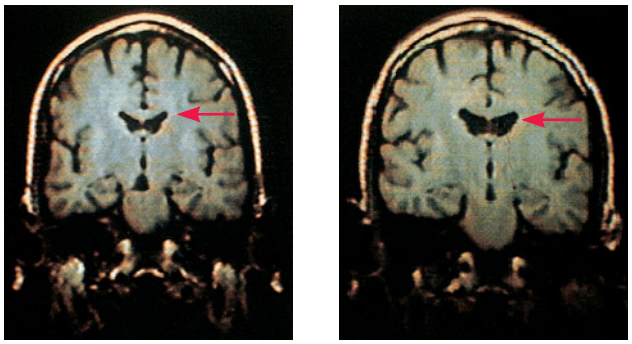


FIGURE 33.1 Risk of developing schizophrenia The lifetime risk of developing schizophrenia varies with one's genetic relatedness to someone having this disorder. Across countries, barely more than 1 in 10 fraternal twins, but some 5 in 10 identical twins, share a schizophrenia diagnosis. (Adapted from Gottesman, 2001.)



Both photos: Courtesy of Daniel R. Weinberger, M.D., NIH-NIMH/NSC

No schizophrenia Schizophrenia

FIGURE 33.2 Different but identical twins When twins differ, only the one afflicted with schizophrenia typically has enlarged, fluid-filled cranial cavities (right) (Suddath et al., 1990). The difference between the twins implies some nongenetic factor, such as a virus, is also at work.

With the genetic factor established, researchers are now sleuthing specific genes that, in some combination, might predispose schizophrenia-inducing brain abnormalities (Marx, 2007; Millar et al., 2005; Williams et al., 2007). (It is not our genes but our brains that directly control our behavior.) Some of these genes influence the effects of dopamine and other neurotransmitters in the brain. Others affect the production of *myelin*, a fatty substance that coats the axons of some nerve cells and lets impulses travel at high speed through neural networks.

Although the genetic contribution to schizophrenia is beyond question, the genetic formula is not as straightforward as the inheritance of eye color. A complex cluster of disorders such as those found in schizophrenia is surely influenced by multiple genes with small effects, but identifying these genes has proven difficult (McClellan et al., 2007; Sanders et al., 2008; Walsh et al., 2008). And even within this context, other factors—such as the prenatal viral infections, nutritional deprivation, and oxygen deprivation at birth mentioned earlier—may somehow help to "turn on" the genes that predispose some of us to this disease. As we have so often seen, nature and nurture interact. Neither hand claps alone.

Our knowledge of human genetics and of genetic influences on maladies such as schizophrenia is exploding, thanks partly to millions of new U.S. National Institute of Mental Health dollars focused on solving the schizophrenia riddle. In 2007, one privately funded new research center announced its ambitious aim: "To unambiguously diagnose patients with psychiatric disorders based on their DNA sequence in 10 years' time" (Holden, 2007). So, can scientists develop genetic tests that reveal who is at risk? If so, will people in the future subject their embryos to genetic testing (and gene repair or abortion) if they are at risk for this or some other psychological or physical malady? Might they take their egg and sperm to a genetics lab for screening before combining them to produce an embryo? Or will children be tested for genetic risks and given appropriate preventive treatments? In this brave new twenty-first-century world, such questions await answers.

The Genain quadruplets The odds of any four people picked at random all being diagnosed with schizophrenia are 1 in 100 million. But genetically identical sisters Nora, Iris, Myra, and Hester Genain all have the disease. Two of the sisters have more severe forms of the disorder than the others, suggesting the influence of environmental as well as biological factors.

Courtesy of Genain family

Psychological Factors

If prenatal viruses and genetic predispositions do not, by themselves, cause schizophrenia, neither do family or social factors alone. Psychologists who once attributed schizophrenia to cold and capricious "refrigerator mothers" have long since abandoned this idea. It remains true, as Susan Nicol and Irving Gottesman (1983) noted almost three decades ago, that "no environmental causes have been discovered that will invariably, or even with moderate probability, produce schizophrenia in persons who are not related to" a person with schizophrenia.

Schizophrenia

Module Review

33-1: What patterns of thinking, perceiving, feeling, and behaving characterize schizophrenia? *Schizophrenia* typically strikes during late adolescence, affects men very slightly more than women, and seems to occur in all cultures. Symptoms include disorganized and delusional thinking, disturbed perceptions, and inappropriate emotions and actions. *Delusions* are false beliefs; hallucinations are sensory experiences without sensory stimulation. Symptoms may be positive (the presence of inappropriate behaviors) or negative (the absence of appropriate behaviors). Chronic schizophrenia emerges gradually (and the outlook for recovery is dim). Acute or reactive schizophrenia appears suddenly (and prospects for recovery are brighter).

33-2: What causes schizophrenia? Schizophrenia is a cluster of disorders. Dopamine may intensify the positive symptoms of schizophrenia, and people with schizophrenia have increased receptors for this neurotransmitter. Brain abnormalities include enlarged, fluid-filled cerebral cavities and corresponding decreases in the cortex. Brain scans reveal abnormal activity in the frontal lobes, thalamus, and amygdala. Malfunctions in multiple brain regions and their connections apparently interact to produce symptoms. A mid-pregnancy viral infection may be a causal factor. Twin and adoption studies also point to a genetic predisposition that interacts with environmental factors to produce schizophrenia.

Rehearse It!

1. People with schizophrenia may hear voices urging self-destruction. Hearing voices in the absence of any auditory stimulation is an example of a(n)
   a. flat emotion.
   b. inappropriate emotion.
   c. word salad.
   d. hallucination.
2. Schizophrenia is actually a cluster of disorders characterized by positive or negative symptoms. A person with positive symptoms is most likely to experience
   a. catatonia.
   b. delusions.
   c. withdrawal.
   d. flat emotion.
3. Chances for recovery from schizophrenia are best when
   a. onset is sudden, in response to stress.
   b. deterioration occurs gradually, during childhood.
   c. no environmental causes can be identified.
   d. there is a detectable brain abnormality.

Answers: 1. d, 2. b, 3. a.

Terms and Concepts to Remember

schizophrenia, p. 492 psychotic disorder, p. 492 delusions, p. 492

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. Victor exclaimed, "The weather has been so schizophrenic lately: It's hot one day and freezing the next!" Is this an accurate analogy? Why or why not?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE 34

Other Disorders

Anxiety Disorders

34-1: What are anxiety disorders, and how do they differ from ordinary worries and fears?

Anxiety is part of life. Speaking in front of a class, peering down from a ledge, or waiting to play in a big game, any one of us might feel anxious. At times we may feel enough anxiety to avoid making eye contact or talking with someone—"shyness," we call it. Fortunately for most of us, our uneasiness is not intense and persistent. If it becomes so, we may have one of the **anxiety disorders,** marked by distressing, persistent anxiety or dysfunctional anxiety-reducing behaviors. Let's consider these five:

- *Generalized anxiety disorder,* in which a person is unexplainably and continually tense and uneasy
- *Panic disorder,* in which a person experiences sudden episodes of intense dread
- *Phobias,* in which a person feels irrationally and intensely afraid of a specific object or situation
- *Obsessive-compulsive disorder,* in which a person is troubled by repetitive thoughts or actions
- *Post-traumatic stress disorder,* in which a person has lingering memories, nightmares, and other symptoms for weeks after a severely threatening, uncontrollable event

In its own way, each anxiety disorder harms quality of life (Olatunji et al., 2007).

Generalized Anxiety Disorder

For the past two years, Tom, a 27-year-old electrician, has been bothered by dizziness, sweating palms, heart palpitations, and ringing in his ears. He feels edgy and sometimes finds himself shaking. With reasonable success, he hides his symptoms from his family and co-workers. But he allows himself few other social contacts, and occasionally he has to leave work. His family doctor and a neurologist can find no physical problem.

Tom's unfocused, out-of-control, negative feelings suggest **generalized anxiety disorder.** The symptoms of this disorder are commonplace; their persistence is not. People with this condition (two-thirds are women) worry continually, and they are often jittery, agitated, and sleep-deprived. Concentration is difficult as attention switches from worry to worry, and their tension and apprehension may leak out through furrowed brows, twitching eyelids, trembling, perspiration, or fidgeting.

One of the worst characteristics of this disorder is that the person cannot identify, and therefore cannot deal with or avoid, its cause. To use Sigmund Freud's term, the anxiety is *free-floating.* Generalized anxiety disorder is often accompanied by depressed mood, but even without depression it tends to be disabling (Hunt et al., 2004; Moffitt et al., 2007b). Moreover, it may lead to physical problems, such as high blood pressure.

Many people with generalized anxiety disorder were maltreated and inhibited as children (Moffitt et al., 2007a). As time passes, however, emotions tend to mellow, and by age 50, generalized anxiety disorder becomes rare (Rubio & López-Ibor, 2007).

Panic Disorder

Panic disorder is an anxiety tornado. It strikes suddenly, wreaks havoc, and disappears. For the 1 person in 75 with this disorder, anxiety suddenly escalates into a terrifying *panic attack*—a minutes-long episode of intense fear that something horrible is about to happen. Heart palpitations, shortness of breath, choking sensations, trembling, or dizziness typically accompany the panic, which may be misperceived

anxiety disorders psychological disorders characterized by distressing, persistent anxiety or maladaptive behaviors that reduce anxiety.

generalized anxiety disorder an anxiety disorder in which a person is continually tense, apprehensive, and in a state of autonomic nervous system arousal.

panic disorder an anxiety disorder marked by unpredictable minutes-long episodes of intense dread in which a person experiences terror and accompanying chest pain, choking, or other frightening sensations.

as a heart attack or other serious physical ailment. Smokers have at least a doubled risk of panic disorder (Zvolensky & Bernstein, 2005). Because nicotine is a stimulant, lighting up doesn't lighten up.

One woman recalled suddenly feeling "hot and as though I couldn't breathe. My heart was racing and I started to sweat and tremble and I was sure I was going to faint. Then my fingers started to feel numb and tingly and things seemed unreal. It was so bad I wondered if I was dying and asked my husband to take me to the emergency room. By the time we got there (about 10 minutes) the worst of the attack was over and I just felt washed out" (Greist et al., 1986).

Phobias

Phobias are anxiety disorders in which an irrational fear causes the person to avoid some object, activity, or situation. Many people accept their phobias and live with them, but others are incapacitated by their efforts to avoid the feared situation. Marilyn, an otherwise healthy and happy 28-year-old, so fears thunderstorms that she feels anxious as soon as a weather forecaster mentions possible storms later in the week. If her husband is away and a storm is forecast, she may stay with a close relative. During a storm, she hides from windows and buries her head to avoid seeing the lightning.

Other *specific phobias* may focus on animals, insects, heights, blood, or close spaces (**FIGURE 34.1**). People avoid the stimulus that arouses the fear, hiding during thunderstorms or avoiding high places.

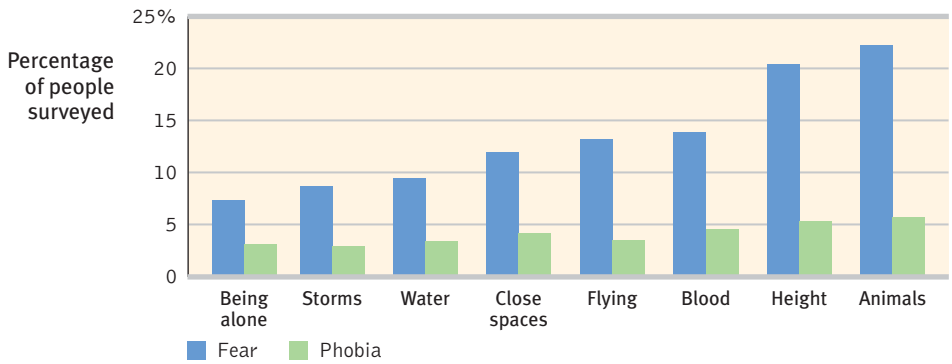


FIGURE 34.1 Some common and uncommon specific fears This national interview study identified the commonality of various specific fears. A strong fear becomes a phobia if it provokes a compelling but irrational desire to avoid the dreaded object or situation. (From Curtis et al., 1998.)

Not all phobias have such specific triggers. *Social phobia* is shyness taken to an extreme. Those with a social phobia, an intense fear of being scrutinized by others, avoid potentially embarrassing social situations, such as speaking up, eating out, or going to parties—or will sweat, tremble, or have diarrhea when doing so.

People who have experienced several panic attacks may come to fear the fear itself and avoid situations where the panic has struck before. If the fear is intense enough, it may become *agoraphobia,* fear or avoidance of situations in which escape might be difficult or help unavailable when panic strikes. Given such fear, people may avoid being outside the home, in a crowd, on a bus, or on an elevator.

After spending five years sailing the world, Charles Darwin began suffering panic attacks at age 28. He moved to the country, avoided social gatherings, and traveled only in his wife's company. But the relative seclusion did free him to focus on developing his evolutionary theory. "Even ill health," he reflected, "has saved me from the distraction of society and its amusements" (quoted in Ma, 1997).

phobia an anxiety disorder marked by a persistent, irrational fear and avoidance of a specific object, activity, or situation.

obsessive-compulsive disorder (OCD) an anxiety disorder characterized by unwanted repetitive thoughts (obsessions) and/or actions (compulsions).

post-traumatic stress disorder (PTSD) an anxiety disorder characterized by haunting memories, nightmares, social withdrawal, jumpy anxiety, and/or insomnia that lingers for four weeks or more after a traumatic experience.

Obsessive-Compulsive Disorder

As with generalized anxiety and phobias, we can see aspects of our own behavior in **obsessive-compulsive disorder (OCD).** We may at times be obsessed with senseless or offensive thoughts that will not go away. Or we may engage in compulsive

behaviors, rigidly checking, ordering, and cleaning before guests arrive, or lining up books and pencils "just so" before studying.

Obsessive thoughts and compulsive behaviors cross the fine line between normality and disorder when they persistently interfere with everyday living and cause the person distress. Checking to see that you locked the door is normal; checking 10 times is not. Washing your hands is normal; washing so often that your skin becomes raw is not. (**TABLE 34.1** offers more examples.) At some time during their lives, often during their late teens or twenties, 2 to 3 percent of people cross that line from normal preoccupations and fussiness to debilitating disorder (Karno et al., 1988). The obsessive thoughts become so haunting, the compulsive rituals so senselessly time-consuming, that effective functioning becomes impossible.

OCD is more common among teens and young adults than among older people (Samuels & Nestadt, 1997). A 40-year follow-up study of 144 Swedish people diagnosed with the disorder found that, for most, the obsessions and compulsions had gradually lessened, though only 1 in 5 had completely recovered (Skoog & Skoog, 1999).

TABLE 34.1 Common Obsessions and Compulsions Among Children and Adolescents With Obsessive-Compulsive Disorder

Thought or Behavior	Percentage Reporting Symptom
Obsessions (repetitive thoughts)	
Concern with dirt, germs, or toxins	40
Something terrible happening (fire, death, illness)	24
Symmetry, order, or exactness	17
Compulsions (repetitive behaviors)	
Excessive hand washing, bathing, tooth brushing, or grooming	85
Repeating rituals (in/out of a door, up/down from a chair)	51
Checking doors, locks, appliances, car brakes, homework	46

Source: Adapted from Rapoport, 1989.

Post-Traumatic Stress Disorder

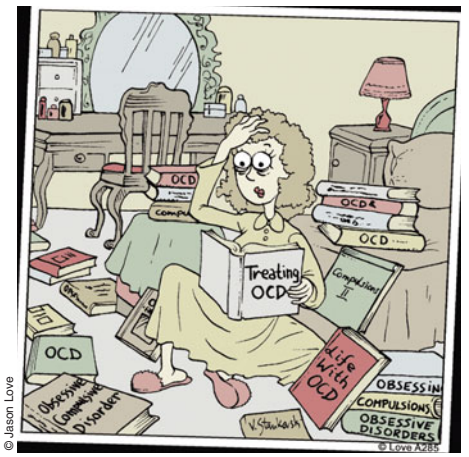
As an Army infantry scout during the Iraq war, Jesse "saw the murder of children, women. It was just horrible for anyone to experience." After calling in a helicopter strike on one house where he had seen ammunition crates carried in, he heard the screams of children from within. "I didn't know there were kids there," he recalls. Back home in Texas, he suffered "real bad flashbacks" (Welch, 2005).

Our memories exist in part to protect us in the future. So there is biological wisdom in not being able to forget our most emotional or traumatic experiences—our greatest embarrassments, our worst accidents, our most horrid experiences. But sometimes, for some of us, the unforgettable takes over our lives. The complaints of battled-scarred veterans such as Jesse—recurring haunting memories and nightmares, a numbed social withdrawal, jumpy anxiety, and/or insomnia—are typical of what once was called "shellshock" or "battle fatigue" and now is called **post-traumatic stress disorder (PTSD)** (Hoge et al., 2004; Kessler, 2000).

PTSD symptoms have also been reported by survivors of accidents, disasters, and violent and sexual assaults (including an estimated two-thirds of prostitutes) (Brewin et al., 1999; Farley et al., 1998; Taylor et al., 1998). A month after the 9/11 terrorist attacks, a survey of Manhattan residents indicated that 8.5 percent were suffering PTSD, most as a result of the attack (Galea et al., 2002). Among those living near the World Trade Center, 20 percent reported such telltale signs as nightmares, severe anxiety, and fear of public places (Susser et al., 2002).

To pin down the frequency of this disorder, the U.S. Centers for Disease Control (1988) compared 7000 Vietnam combat veterans with 7000 noncombat veterans who served during the same years. On average, according to a recent reanalysis, 19 percent of all Vietnam veterans reported PTSD symptoms. The rate varied from 10 percent among those who had never seen combat to 32 percent among those who

Snapshots



© Jason Love

Obsessing about obsessive-compulsive disorder.

Gender and anxiety: Eight months after 9/11, more U.S. women (34 percent) than men (19 percent) told Gallup (2002) they were still less willing than before 9/11 to go into skyscrapers or fly on planes. In early 2003, more women (57 percent) than men (36 percent) were "somewhat worried" about becoming a terrorist victim (Jones, 2003).

Bringing the war home
Many war veterans, such as this sergeant at a Veteran's Administration hospital, have recently been treated for post-traumatic stress disorder.

AP Photo/Lawrence Journal-World, Thad Allender

had experienced heavy combat (Dohrenwend et al., 2006). Similar variations in rates have been found among people who have experienced a natural disaster or have been kidnapped, held captive, tortured, or raped (Brewin et al., 2000; Brody, 2000; Kessler, 2000; Stone, 2005).

The toll seems at least as high for veterans of the Iraq war, where 1 in 6 U.S. combat infantry personnel has reported symptoms of PTSD, depression, or severe anxiety in the months after returning home (Hoge et al., 2006, 2007). In one study of 103,788 veterans returning from Iraq and Afghanistan, 1 in 4 was diagnosed with a psychological disorder, most frequently PTSD (Seal et al., 2007).

So what determines whether a person develops PTSD after a traumatic event? Research indicates that the greater one's emotional distress during a trauma, the higher the risk for post-traumatic symptoms (Ozer et al., 2003). Among New Yorkers who witnessed the 9/11 attacks, PTSD was doubled for survivors who were inside rather than outside the World Trade Center (Bonanno et al., 2006). And the more frequent an assault experience, the more adverse the long-term outcome tends to be (Golding, 1999).

A sensitive limbic system seems to increase vulnerability, by flooding the body with stress hormones again and again as images of the traumatic experience erupt into consciousness (Kosslyn, 2005; Ozer & Weiss, 2004). Genes may also play a role. Some combat-exposed men have identical twins who did not experience combat. But these nonexposed co-twins tend to share their brother's risk for cognitive difficulties, such as unfocused attention. Such findings suggest that some PTSD symptoms may actually be genetically predisposed (Gilbertson et al., 2006).

Some psychologists believe that PTSD has been overdiagnosed, due partly to a broadening definition of *trauma* (which originally meant direct exposure to threatened death or serious injury, as during combat or rape [McNally, 2003]). Well-intentioned attempts to help people avoid PTSD by reliving the trauma may exacerbate their emotions. "Debriefing" survivors right after a trauma by getting them to revisit the experience and vent emotions has actually proven generally ineffective and may pathologize normal stress reactions (Devilly et al., 2006; McNally et al., 2003; Rose et al., 2003; Wakefield & Spitzer, 2002).

Other researchers are interested in the impressive *survivor resiliency* of those who do *not* develop PTSD (Bonanno, 2004, 2005). About half of adults experience at least one traumatic event in their lifetime, but only about 1 in 10 women and 1 in 20 men develop PTSD (Olff et al., 2007; Ozer & Weiss, 2004; Tolin & Foa, 2006). More than 9 in 10 New Yorkers, although stunned and grief-stricken by 9/11, did *not* respond pathologically. By the following January, the stress symptoms of the rest had mostly subsided (Galea et al., 2002). Similarly, most combat-stressed veterans and most political dissidents who survive dozens of episodes of torture do not later exhibit PTSD (Mineka & Zinbarg, 1996).

Psychologist Peter Suedfeld (1998, 2000; Cassel & Suedfeld, 2006), who as a boy survived the Holocaust under deprived conditions while his mother died in Auschwitz, has documented the resilience of Holocaust survivors, most of whom lived productive lives. "It is not always true that 'What doesn't kill you makes you stronger,' but it is often true," he reports. And "what doesn't kill you may reveal to you just how strong you really are."

Indeed, suffering can lead to "benefit finding" (Helgeson et al., 2006), what Richard Tedeschi and Lawrence Calhoun (2004) call **post-traumatic growth.** Tedeschi and Calhoun have found that the struggle with challenging crises, such as facing cancer, often leads people later to report an increased appreciation for life, more meaningful relationships, increased personal strength, changed priorities, and a richer spiritual life. This idea—that suffering has transformative power—is also found in Judaism, Christianity, Hinduism, Buddhism, and Islam. Out of even our worst experiences some good can come. Like the body, the mind has great recuperative powers.

"'Tis an ill wind that blows no good."
—English proverb

Understanding Anxiety Disorders

34-2: What produces the thoughts and feelings that mark anxiety disorders?

Anxiety is both a feeling and a cognition, a doubt-laden appraisal of one's safety or social skill. How do these anxious feelings and cognitions arise? Freud's psychoanalytic theory proposed that, beginning in childhood, people *repress* intolerable impulses, ideas, and feelings and that this submerged mental energy sometimes produces mystifying symptoms, such as anxiety. Today's psychologists have turned to two contemporary perspectives—learning and biological.

post-traumatic growth positive psychological changes as a result of struggling with extremely challenging circumstances and life crises.

The Learning Perspective

Fear Conditioning When bad events happen unpredictably and uncontrollably, anxiety often develops (Field, 2006; Mineka & Zinbarg, 2006). Decades of research on conditioning show that dogs learn to fear neutral stimuli associated with shock and that infants come to fear furry objects associated with frightening noises. Using classical conditioning, researchers have also created chronically anxious, ulcer-prone rats by giving them unpredictable electric shocks (Schwartz, 1984). Like assault victims who report feeling anxious when returning to the scene of the crime, the rats become apprehensive in their lab environment. This link between conditioned fear and general anxiety helps explain why anxious people are hyperattentive to possible threats, and how panic-prone people come to associate anxiety with certain cues (Bar-Haim et al., 2007; Bouton et al., 2001). In one survey, 58 percent of those with social phobia experienced their disorder after a traumatic event (Ost & Hugdahl, 1981).

Two specific learning processes can contribute to such anxiety. The first is *stimulus generalization.* My car was once struck by another whose driver missed a stop sign. For months afterward, I felt a twinge of unease when any car approached from a side street. The second learning process, *reinforcement,* helps maintain our phobias and compulsions after they arise. Avoiding or escaping the feared situation reduces anxiety, thus reinforcing the phobic behavior. Feeling anxious during a thunderstorm, Marilyn may have fled to a relative's home and been reinforced by feeling calmer (Antony et al., 1992). Compulsive behaviors operate similarly. If washing your hands relieves your feelings of anxiety, you may wash your hands again when those feelings return.

An emotional high Fearing heights is certainly an adaptive response. The biological perspective helps us understand why most people would be terrified in this situation, and why some individuals—like this construction worker—seem relatively free of that fear.

John Coletti/Stock, Boston

Observational Learning We may also learn fear through observational learning—by observing others' fears. As Susan Mineka (1985) demonstrated, wild monkeys transmit their fear of snakes to their watchful offspring. Human parents similarly transmit fears to their children. Moreover, just observing someone receiving a mild electric shock after a conditioned stimulus produces fear learning similar to that produced by direct experience (Olsson & Phelps, 2004).

The Biological Perspective

There is, however, more to anxiety than conditioning and observational learning. The biological perspective can help us understand why few people develop lasting phobias after suffering traumas, why we learn some fears more readily, and why some individuals are more vulnerable.

Natural Selection We humans seem biologically prepared to fear threats faced by our ancestors. Our phobias focus on such specific fears: spiders, snakes, and other animals; close spaces and heights; storms and darkness. (Those fearless about these occasional threats were less likely to survive and leave descendants.) Preschool children more speedily detect snakes in a scene than they do flowers, caterpillars, or frogs (LoBue & DeLoache, 2008). And even in Britain, with only one poisonous snake species, people often fear snakes. It is easy to condition and hard to extinguish fears of such stimuli (Davey, 1995; Öhman, 1986).

Our *modern* fears can also have an evolutionary explanation. For example, a fear of flying may come from our biological predisposition to fear confinement and heights. Moreover, consider what people tend *not* to learn to fear. World War II air raids produced remarkably few lasting phobias. As the air blitzes continued, the British, Japanese, and German populations became not more panicked, but rather more indifferent to planes outside their immediate neighborhoods (Mineka & Zinbarg, 1996). Evolution has not prepared us to fear bombs dropping from the sky.

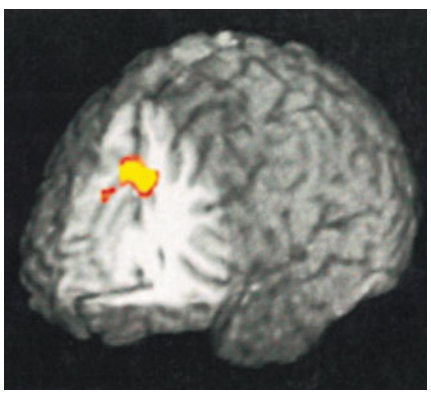
Just as our phobias focus on dangers faced by our ancestors, our compulsive acts typically exaggerate behaviors that contributed to our species' survival. Grooming gone wild becomes hair pulling. Washing up becomes ritual hand washing. Checking territorial boundaries becomes rechecking an already locked door (Rapoport, 1989).

Genes Pair a traumatic event with a sensitive, high-strung temperament and the result may be a new phobia. Genes matter.

Among monkeys, fearfulness runs in families. Individual monkeys react more strongly to stress if their close biological relatives are anxiously reactive (Suomi, 1986). Some humans, too, seem more predisposed than others to anxiety. Vulnerability to anxiety disorder rises when an afflicted relative is an identical twin (Hettema et al., 2001; Kendler et al., 1992, 1999, 2002a,b). Identical twins also may develop similar phobias, even when raised separately (Carey, 1990; Eckert et al., 1981). One pair of 35-year-old female identical twins independently became so afraid of water that each would wade in the ocean backward and only up to the knees.

Researchers sleuthing specific genes that put people at risk have identified 17 that appear to be expressed with typical anxiety disorder symptoms (Hovatta et al., 2005). Another team found genes associated specifically with OCD (Hu et al., 2006). Genes influence disorders by regulating neurotransmitters. One anxiety gene affects brain levels of serotonin, which influences sleep and mood (Canli, 2008). Other genes regulate the neurotransmitter glutamate (Lafleur et al., 2006; Welch et al., 2007). With too much glutamate, the brain's alarm centers become overactive.

The Brain Generalized anxiety, panic attacks, PTSD, and even obsessions and compulsions are manifested biologically as an overarousal of brain areas involved in impulse control and habitual behaviors. When the disordered brain detects that something is amiss, it seems to generate a mental hiccup of repeating thoughts or actions (Gehring et al., 2000). Brain scans of people with OCD reveal elevated activity in specific brain areas during behaviors such as compulsive hand washing, checking, ordering, or hoarding (Mataix-Cols et al., 2004, 2005). As **FIGURE 34.2** shows, the *anterior cingulate cortex*, a brain region that monitors our actions and checks for errors, seems especially likely to be hyperactive in those with OCD (Ursu et al., 2003). Fear-learning experiences that traumatize the brain can also create fear circuits within the amygdala (Etkin & Wager, 2007; Kolassa & Elbert, 2007; Maren, 2007). Some antidepressant drugs dampen this fear-circuit activity and its associated obsessive-compulsive behavior.



S. Ursu, V. A. Stenger, M. K. Shear, M. R. Jones, & C. S. Carter (2003). Overactive action monitoring in obsessive-compulsive disorder. *Psychological Science, 14,* 347–353.

FIGURE 34.2 An obsessive-compulsive brain Neuroscientist Stefan Ursu and his colleagues (2003) used functional magnetic resonance imaging (fMRI) scans to compare the brains of those with and without OCD as they engaged in a challenging cognitive task. The fMRI scans showed elevated activity in the anterior cingulate cortex in the brain's frontal area of those with OCD.

The biological perspective cannot by itself explain all aspects of anxiety disorders, such as the sharp increase in the anxiety levels of both children and college students over the last half-century, which appears to be related to fraying social support accompanying family breakup (Twenge, 2006). It is nevertheless clear that biology underlies anxiety.

Somatoform Disorders

34-3: What are somatoform disorders?

Among the most common problems bringing people into doctors' offices are "medically unexplained illnesses" (Johnson, 2008). Ellen becomes dizzy and nauseated in the late afternoon—shortly before she expects her husband home. Neither her primary care physician nor the neurologist he sent her to could identify a physical cause. They suspect her symptoms have an unconscious psychological origin, possibly triggered by her mixed feelings about her husband. In **somatoform disorders,** such as Ellen's, the distressing symptoms take a somatic (bodily) form without apparent physical causes. One person may have a variety of complaints—vomiting, dizziness, blurred vision, difficulty in swallowing. Another may experience severe and prolonged pain.

Culture has a big effect on people's physical complaints and how they explain them (Kirmayer & Sartorius, 2007). In China, psychological explanations of anxiety and depression are socially less acceptable than in many Western countries. People express the emotional aspects of distress less often, and they appear more sensitive to—and more willing to report—the physical symptoms of their distress (Ryder et al., 2008). Mr. Wu, a 36-year-old technician in Hunan, illustrates one of China's most common psychological disorders (Spitzer & Skodol, 2000). He finds work difficult because of his insomnia, fatigue, weakness, and headaches. Chinese herbs and Western medicines provide no relief. To his Chinese clinician, who treats the bodily symptoms, Mr. Wu seems not so much depressed as exhausted.

Even to people in the West, somatic symptoms are familiar. To a lesser extent, we have all experienced inexplicable physical symptoms under stress. It is little comfort to be told that the problem is "all in your head." Although the symptoms may be psychological in origin, they are nevertheless genuinely felt.

One type of somatoform disorder, more common in Freud's day than in ours, is **conversion disorder,** so called because anxiety presumably is converted into a physical symptom, such as unexplained paralysis, blindness, or an inability to swallow. (Freud's effort to treat and understand psychological disorders stemmed from his puzzlement over ailments that had no physiological basis.) In each case, the physical symptoms would be real, although no physiological basis could be found.

As you can imagine, somatoform disorders send people not to a psychologist or psychiatrist but to a physician. This is especially true of those who experience **hypochondriasis.** In this relatively common somatoform disorder, people interpret normal sensations (a stomach cramp today, a headache tomorrow) as symptoms of a dreaded disease. Sympathy or temporary relief from everyday demands may reinforce such complaints. No amount of reassurance by any physician convinces the patient not to worry. So the patient moves on to another physician, seeking and receiving more medical attention—but failing to confront the disorder's psychological root.

somatoform disorder psychological disorder in which the symptoms take a somatic (bodily) form without apparent physical cause. (See *conversion disorder* and *hypochondriasis.*)

conversion disorder a rare somatoform disorder in which a person experiences very specific genuine physical symptoms for which no physiological basis can be found.

hypochondriasis a somatoform disorder in which a person interprets normal physical sensations as symptoms of a disease.

dissociative disorders disorders in which conscious awareness becomes separated (dissociated) from previous memories, thoughts, and feelings.

Dissociative Disorders

34-4: What are dissociative disorders, and why are they controversial?

Among the most bewildering disorders are the rare **dissociative disorders.** These are disorders of consciousness, in which a person appears to experience a sudden loss of memory or change in identity, often in response to an overwhelmingly stressful situation. One Vietnam veteran who was haunted by his comrades' deaths, and who had left his World Trade Center office shortly before the 9/11 attack, disappeared en route to work one day and was discovered six months later in a Chicago homeless shelter, reportedly with no memory of his identity or family (Stone, 2006). In such cases, the person's conscious awareness is said to *dissociate* (become separated) from painful memories, thoughts, and feelings. (Note that this

Multiple personalities Chris Sizemore's story, *The Three Faces of Eve,* gave early visibility to what is now called *dissociative identity disorder.*

Lois Bernstein/Gamma Liaison

dissociative identity disorder (DID) a rare dissociative disorder in which a person exhibits two or more distinct and alternating personalities. Formerly called *multiple personality disorder.*

personality disorders psychological disorders characterized by inflexible and enduring behavior patterns that impair social functioning.

antisocial personality disorder a personality disorder in which the person (usually a man) exhibits a lack of conscience for wrongdoing, even toward friends and family members. May be aggressive and ruthless or a clever con artist.

explanation presumes the existence of repressed memories, which have been questioned by memory researchers.)

Dissociation itself is not so rare. Now and then, many people may have a sense of being unreal, of being separated from their body, of watching themselves as if in a movie. Sometimes we may say, "I was not myself at the time." Perhaps you can recall getting in your car and driving to some unintended location while your mind was preoccupied elsewhere. Facing trauma, such detachment may actually protect a person from being overwhelmed by emotion.

Dissociative Identity Disorder

A massive dissociation of self from ordinary consciousness characterizes those with **dissociative identity disorder** (**DID;** formerly called *multiple personality disorder*), in which two or more distinct identities are said to alternately control the person's behavior. Each personality has its own voice and mannerisms. Thus, the person may be prim and proper one moment, loud and flirtatious the next. Typically, the original personality denies any awareness of the other(s).

Understanding Dissociative Identity Disorder

"Pretense may become reality."
—Chinese proverb

Skeptics question whether DID is a genuine disorder or an extension of our normal capacity for personality shifts. Nicholas Spanos (1986, 1994, 1996) asked college students to pretend they were accused murderers being examined by a psychiatrist. Given a hypnotic treatment that "called forth" a second personality, most spontaneously expressed such. This discovery made Spanos wonder: Are dissociative identities simply a more extreme version of our capacity to vary the "selves" we present—as when we display a goofy, loud self while hanging out with friends, and a subdued, respectful self around grandparents? Are clinicians who discover multiple personalities merely triggering role-playing by fantasy-prone people? Do these patients, like actors who commonly report "losing themselves" in their roles, then convince themselves of the authenticity of their own role enactments?

Skeptics also find it suspicious that the disorder is so localized in time and space. Between 1930 and 1960, the number of DID diagnoses in North America was 2 per decade. In the 1980s, when the DSM contained the first formal code for this disorder, the number of reported cases had exploded to more than 20,000 (McHugh, 1995a). The average number of displayed personalities also mushroomed—from 3 to 12 per patient (Goff & Simms, 1993). Outside North America, the disorder is much less prevalent, although in other cultures some people are said to be "possessed" by an alien spirit (Aldridge-Morris, 1989; Kluft, 1991). In Britain, DID—which some consider "a wacky American fad" (Cohen, 1995)—is rare. In India and Japan, it is essentially nonexistent.

Such findings, skeptics say, point to a cultural phenomenon—a disorder created by therapists in a particular social context (Merskey, 1992). Patients do not enter therapy saying "Allow me to introduce myselves." Rather, note skeptics, some therapists—often practitioners of hypnosis (Goff, 1993; Piper, 1998)—go fishing for multiple personalities: "Have you ever felt like another part of you does things you can't control? Does this part of you have a name? Can I talk to the angry part of you?" Once patients permit a therapist to talk, by name, "to the part of you that says those angry things" they have begun acting out the fantasy. The result may be a real phenomenon, which vulnerable patients may experience as another self.

Other psychologists disagree, finding support for DID as a genuine disorder in the distinct brain and body states associated with differing personalities (Putnam, 1991). Handedness, for example, sometimes switches with personality (Henninger, 1992). Ophthalmologists have detected shifting visual acuity and eye-muscle balance as patients switched personalities, changes that did not occur among control group members trying to simulate DID (Miller et al., 1991).

"Would it be possible to speak with the personality that pays the bills?"

Researchers and clinicians from psychoanalytic and learning perspectives do, however, agree that DID symptoms are ways of dealing with anxiety. Psychoanalysts see them as defenses against the anxiety caused by the eruption of unacceptable impulses; a wanton second personality enables the discharge of forbidden impulses. Learning theorists see dissociative disorders as behaviors reinforced by anxiety reduction.

Other clinicians include dissociative disorders under the umbrella of posttraumatic disorders—a natural, protective response to "histories of childhood trauma" (Putnam, 1995; Spiegel, 2008). Many DID patients recall suffering physical, sexual, or emotional abuse as children (Gleaves, 1996; Lilienfeld et al., 1999). In one study of 12 murderers diagnosed with DID, 11 had suffered severe, torturous child abuse (Lewis et al., 1997). One was set afire by his parents. Another was used in child pornography and was scarred from being made to sit on a stove burner. Some critics wonder, however, whether vivid imagination or therapist suggestions contribute to such recollections (Kihlstrom, 2005).

So the debate continues. On one side are those who believe multiple personalities are the desperate efforts of the traumatized to detach from a horrific existence. On the other are the skeptics who think DID is a condition contrived by fantasy-prone, emotionally vulnerable people, and constructed out of the therapist-patient interaction. If the skeptics' view wins, predicted psychiatrist Paul McHugh (1995b), "this epidemic will end in the way that the witch craze ended in Salem. The [multiple personality phenomenon] will be seen as manufactured."

"Though this be madness, yet there is method in 't."

—William Shakespeare, *Hamlet,* 1600

Personality Disorders

34-5: What characteristics are typical of personality disorders?

Personality disorders are disruptive, inflexible, and enduring behavior patterns that impair people's social functioning. One cluster of these disorders expresses eccentric behaviors, such as the emotionless disengagement of *schizoid personality disorder*. A second cluster expresses anxiety, such as a fearful sensitivity to rejection that predisposes the withdrawn *avoidant personality disorder.* A third cluster exhibits dramatic or impulsive behaviors, such as the attention-getting *histrionic personality disorder* and the self-focused and self-inflating *narcissistic personality disorder*. The personality disorders categories are not sharply distinguished, however, and likely will be reworked in the next DSM revision (Clark, 2007; Widiger & Trull, 2007).

Antisocial Personality Disorder

The most troubling and heavily researched personality disorder is the **antisocial personality disorder.** The person (formerly called a *sociopath* or a *psychopath*) is typically a male whose lack of conscience becomes plain before age 15, as he begins to lie, steal, fight, or display unrestrained sexual behavior (Cale & Lilienfeld, 2002). About half of such children become antisocial adults—unable to keep a job, irresponsible as a spouse and parent, and assaultive or otherwise criminal (Farrington, 1991). When the antisocial personality combines a keen intelligence with amorality, the result may be a charming and clever con artist—or worse.

Despite their antisocial behavior, many criminals do not fit the description of antisocial personality disorder. Why? Because they actually show responsible concern for their friends and family members.

EPA/Jeff Tuttle/Landov

Antisocial personality? Dennis Rader, known as the "BTK killer" in Kansas, was convicted in 2005 of killing 10 people over a 30-year span. Rader exhibited the extreme lack of conscience that marks antisocial personality disorder.

"Thursday is out. I have jury duty."

Many criminals, like this one, exhibit a sense of conscience and responsibility in other areas of their life, and thus do **not** exhibit antisocial personality disorder.

Antisocial personalities feel and fear little, and in extreme cases, the results can be horrifyingly tragic. Henry Lee Lucas confessed that during his 32 years of crime, he had bludgeoned, suffocated, stabbed, shot, or mutilated some 360 women, men, and children—the first (a woman) at age 13. During the last 6 years of his reign of terror, Lucas teamed with Elwood Toole, who reportedly slaughtered about 50 people he "didn't think was worth living anyhow." It ended when Lucas confessed to stabbing and dismembering his 15-year-old common-law wife, who was Toole's niece.

The antisocial personality expresses little regret over violating others' rights. "Once I've done a crime, I just forget it," said Lucas. Toole was equally matter-of-fact: "I think of killing like smoking a cigarette, like another habit" (Darrach & Norris, 1984).

Understanding Antisocial Personality Disorder

Antisocial personality disorder is woven of both biological and psychological strands. No single gene codes for a complex behavior such as crime, but twin and adoption studies reveal that biological relatives of those with antisocial and unemotional tendencies are at increased risk for antisocial behavior (Larsson et al., 2007; Livesley & Jang, 2008). The genetic vulnerability of people with antisocial and unemotional tendencies appears as a fearless approach to life. Awaiting aversive events, such as electric shocks or loud noises, they show little autonomic nervous system arousal (Hare, 1975; van Goozen et al., 2007). Even as youngsters, before committing any crime, they react with lower levels of stress hormones than do others their age (**FIGURE 34.3**).

Some studies have detected the early signs of antisocial behavior in children as young as ages 3 to 6 (Caspi et al., 1996; Tremblay et al., 1994). Boys who later became aggressive or antisocial adolescents tended, as young children, to have been impulsive, uninhibited, and unconcerned with social rewards, and they showed low levels of anxiety. If channeled in more productive directions, such fearlessness may lead to courageous heroism, adventurism, or star-level athleticism (Poulton & Milne, 2002). The genes that put people at risk for antisocial behavior also put people at risk for dependence on alcohol and other drugs, which helps explain why these disorders often appear in combination (Dick, 2007).

Genetic influences help wire the brain. Adrian Raine (1999, 2005) compared PET scans of 41 murderers' brains with those from people of similar age and sex. The scans showed reduced activity in the murderers' frontal lobes, an area of the cortex that helps control impulses (see **FIGURE 34.4**). This reduction was especially apparent in those who murdered impulsively. Violent repeat offenders had 11 percent less frontal lobe tissue than normal (Raine et al., 2000). This helps explain why people with antisocial personality disorder exhibit marked deficits in frontal lobe cognitive functions, such as planning, organization, and inhibition (Morgan & Lilienfeld, 2000). Compared with people who feel and display empathy, their brains also respond less to facial displays of others' distress (Deeley et al., 2006).

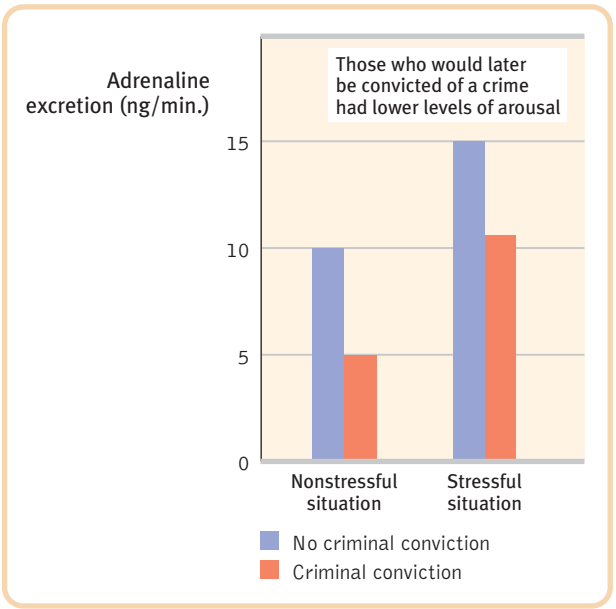


FIGURE 34.3 Cold-blooded arousability and risk of crime Levels of the stress hormone adrenaline were measured in two groups of 13-year-old Swedish boys. In both stressful and nonstressful situations, those who would later be convicted of a crime (as 18- to 26-year-olds) showed relatively low arousal. (From Magnusson, 1990.)

Genetics alone is hardly the whole story of antisocial crime, however.

Relative to 1960, the average American in 1995 (before an ensuing crime decline) was twice as likely to be murdered, four times as likely to report being raped, four times as likely to report being robbed, and five times as likely to report being assaulted (FBI, *Uniform Crime Reports*). Violent crime was also surging in other Western nations. Yet the human gene pool had hardly changed. Or consider the British social experiment begun in 1787, exiling 160,000 criminals to Australia. The descendants of these exiles, carrying their ancestors' supposed "criminal genes," helped create a civilized democracy whose crime rate is similar to Britain's. Genetic predispositions do put some individuals more at risk for antisocial conduct than others; biological as well as environmental influences explain why 5 to 6 percent of offenders commit 50 to 60 percent of crimes (Lyman, 1996). But we must look to social-cultural factors to explain variations in violent crime over time.

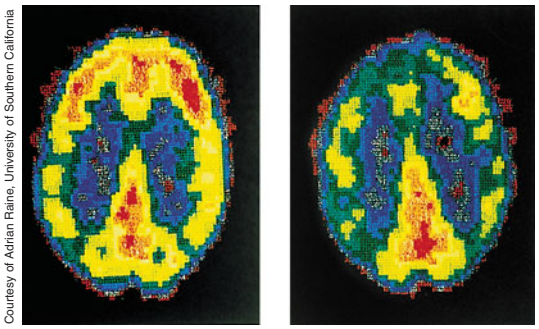


FIGURE 34.4 Murderous minds
These top-facing PET scans illustrate reduced activation (less red and yellow) in a murderer's frontal cortex—a brain area that helps brake impulsive, aggressive behavior. (From Raine, 1999.)

REVIEWING

Other Disorders

Module Review

34-1: What are anxiety disorders, and how do they differ from ordinary worries and fears? Anxiety is classified as a psychological disorder only when it becomes distressing or persistent, or is characterized by maladaptive behaviors intended to reduce it. People with *generalized anxiety disorder* feel persistently and uncontrollably tense and apprehensive, for no apparent reason. In *panic disorder,* anxiety escalates into periodic episodes of intense dread. Those with a *phobia* may be irrationally afraid of an object or situation. Persistent and repetitive thoughts (obsessions) and actions (compulsions) characterize *obsessive-compulsive disorder*. Symptoms of *post-traumatic stress disorder* include four or more weeks of haunting memories, nightmares, social withdrawal, jumpy anxiety, and sleep problems following some traumatic and uncontrollable event.

34-2: What produces the thoughts and feelings that mark anxiety disorders? Freud viewed *anxiety disorders* as the manifestation of mental energy associated with the discharge of repressed impulses. Psychologists working from the learning perspective view anxiety disorders as a product of fear conditioning, stimulus generalization, reinforcement of fearful behaviors, and observational learning of others' fear. Those working from the biological perspective consider the role that fears of life-threatening animals, objects, or situations played in natural selection and evolution; the genetic inheritance of a high level of emotional reactivity; and abnormal responses in the brain's fear circuits.

34-3: What are somatoform disorders? *Somatoform disorders* present a somatic (bodily) symptom—some physiologically unexplained but genuinely felt ailment. With *conversion disorder,* anxiety appears converted to a physical symptom that has no reasonable physiological basis. *Hypochondriasis* is the more common interpretation of normal sensations as a dreaded disorder.

34-4: What are dissociative disorders, and why are they controversial? *Dissociative disorders* are conditions in which conscious awareness seems to become separated from previous memories, thoughts, and feelings. Skeptics note that *dissociative identity disorder (DID),* formerly known as multiple personality disorder, was rarely found before the late twentieth century or outside North America, and that it may reflect role-playing by people who are vulnerable to therapists' suggestions. Others view DID symptoms as ways of handling anxiety.

34-5: What characteristics are typical of personality disorders? *Personality disorders* are enduring, maladaptive patterns of behavior that impair social functioning. *Antisocial personality disorder* is characterized by a lack of conscience and, sometimes, by aggressive and fearless behavior. Genetic predispositions may interact with environment to produce the altered brain activity associated with this disorder.

Rehearse It!

1. An episode of intense dread, accompanied by trembling, dizziness, chest pains, or choking sensations and by feelings of terror, is called
   a. a specific phobia.
   b. compulsion.
   c. a panic attack.
   d. an obsessive fear.

2. Anxiety that takes the form of an irrational and maladaptive fear of a specific object or situation is called
   a. a phobia.
   b. a panic attack.
   c. generalized anxiety.
   d. an obsessive-compulsive disorder.

3. Marina became consumed with the need to clean the entire house and refused to participate in any other activities. A therapist Marina consulted diagnosed her as having
   a. obsessive-compulsive disorder.
   b. generalized anxiety disorder.
   c. a phobia.
   d. a panic attack.

4. Rats subjected to unpredictable shocks in the laboratory become chronically anxious. To the learning researcher this suggests that anxiety is a response to
   a. a phobia.
   b. biological factors.
   c. a genetic predisposition.
   d. fear conditioning.

5. The learning perspective proposes that phobias are
   a. the result of individual genetic makeup.
   b. a way of repressing unacceptable impulses.
   c. conditioned fears.
   d. a symptom of having been abused as a child.

6. One relatively common disorder is
   a. conversion disorder.
   b. hypochondriasis.
   c. dissociative identity disorder.
   d. multiple personality disorder.

7. Dissociative identity disorder is relatively rare. This disorder is controversial because
   a. criminals have used it as a defense.
   b. it was reported frequently in the 1920s but rarely today.
   c. it is almost never reported outside North America.
   d. its symptoms are nearly identical to those of obsessive-compulsive disorder.

8. A personality disorder, such as antisocial personality, is characterized by
   a. depression.
   b. hallucinations.
   c. enduring and inflexible behavior patterns that impair social functioning.
   d. an elevated level of autonomic nervous system arousal.

9. Pet scans of murderers' brains have revealed
   a. higher-than-normal activation in the frontal lobes.
   b. lower-than-normal activation in the frontal lobes.
   c. more frontal lobe tissue than normal.
   d. no differences in brain structures or activity.

Answers: 1. c, 2. a, 3. a, 4. d, 5. c, 6. b, 7. c, 8. c, 9. b.

Terms and Concepts to Remember

anxiety disorders, p. 499
generalized anxiety disorder, p. 499
panic disorder, p. 499
phobia, p. 500
obsessive-compulsive disorder (OCD), p. 500
post-traumatic stress disorder (PTSD), p. 501
post-traumatic growth, p. 502
somatoform disorder, p. 505
conversion disorder, p. 505
hypochondriasis, p. 505
dissociative disorders, p. 505
dissociative identity disorder (DID), p. 506
personality disorders, p. 507
antisocial personality disorder, p. 507

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. Anna is embarrassed that it takes her several minutes to parallel park her car. She usually gets out of the car once or twice to inspect her distance both from the curb and from the cars nearby. Should she worry about having a psychological disorder?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Therapy

Therapy

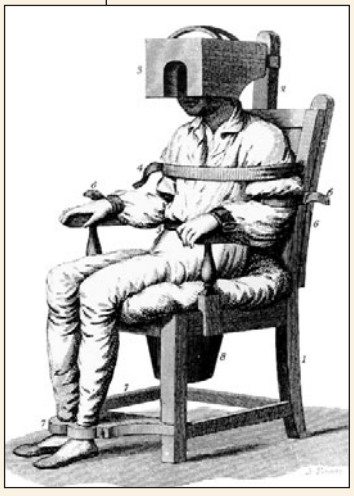
We have treated psychological disorders with a bewildering array of harsh and gentle methods: by cutting holes in the head and by giving warm baths and massages; by restraining, bleeding, or "beating the devil" out of people and by placing them in sunny, serene environments; by administering drugs and electric shocks and by talking—talking about childhood experiences, about current feelings, about maladaptive thoughts and behaviors.

The transition from brutal to gentler treatments occurred thanks to the efforts of reformers such as Philippe Pinel in France and Dorothea Dix in the United States, Canada, and Scotland. Both advocated constructing mental hospitals to offer more humane methods of treatment. But times have once again changed, and the introduction of therapeutic drugs and community-based treatment programs has largely emptied mental health hospitals since the mid-1950s.

Culver Pictures

Dorothea Dix (1802–1887) "I . . . call your attention to the state of the Insane Persons confined within this Commonwealth, in cages."

Today's favored treatments depend on both the disorder and the therapist's viewpoint. Learning-related disorders, such as phobias, are likely candidates for *psychotherapy* (Module 35), in which a trained therapist uses psychological techniques to assist someone seeking to overcome difficulties or achieve personal growth. Biologically influenced disorders, such as schizophrenia, will often be treated with *biomedical therapy* (Module 36), a prescribed medication or medical procedure that acts directly on the patient's nervous system.



The Granger Collection

The history of treatment As William Hogarth's (1697–1764) painting of London's St. Mary of Bethlehem hospital (commonly called Bedlam), visitors to eighteenth-century mental hospitals paid to gawk at patients, as though they were viewing zoo animals. Benjamin Rush (1746–1813), a founder of the movement for more humane treatment of the mentally ill, designed the chair on the left "for the benefit of maniacal patients." He believed the restraints would help them regain their sensibilities.

MODULE 35

The Psychological Therapies

Among the dozens of types of **psychotherapy,** we will look at only the most influential. Each is built on one or more of psychology's major theories: psychoanalytic, humanistic, behavioral, and cognitive. Most of these techniques can be used one-on-one or in groups.

Depending on the client and the problem, some therapists—particularly the many using a biopsychosocial approach—draw from a variety of techniques. Many patients receive drug therapy in combination with psychotherapy. Half of all psychotherapists describe themselves as taking an **eclectic approach,** using a blend of therapies (Beitman et al., 1989; Castonguay & Goldfried, 1994). *Psychotherapy integration* attempts to combine a selection of assorted techniques into a single, coherent system.

Psychoanalysis

35-1: What are the aims and methods of psychoanalysis, and how have they been adapted in psychodynamic therapy?

Sigmund Freud's **psychoanalysis** was the first of the psychological therapies. Few clinicians today practice therapy as Freud did, but his work deserves discussion as part of the foundation for treating psychological disorders.

Aims

Psychoanalytic theory presumes that healthier, less anxious living becomes possible when people release the energy they had previously devoted to id-ego-superego conflicts. Freud's therapy aimed to bring patients' repressed feelings into conscious awareness, giving them *insight* into the origins of their disorders and helping them take responsibility for their own growth.

"You say, 'Off with her head' but what I'm hearing is, 'I feel neglected.'"

Methods

Psychoanalysis is historical reconstruction. Psychoanalytic theory emphasizes the formative power of childhood experiences, and thus aims to excavate the past in the hope of unmasking the present. After discarding hypnosis as an unreliable excavator, Freud turned to *free association*.

Imagine yourself as a patient using free association. First, you relax, perhaps by lying on a couch. As the psychoanalyst sits out of your line of vision, you say aloud whatever comes to your mind—at one moment a childhood memory, at another a dream or recent experience. It sounds easy, but soon you notice how often you edit your thoughts as you speak. You pause momentarily before uttering an embarrassing thought. You omit what seems trivial, irrelevant, or shameful. Sometimes your mind goes blank or you clutch, unable to remember important details. You may joke or change the subject to something less threatening.

To the analyst, these blocks in the flow of your free associations indicate **resistance.** They hint that anxiety lurks and you are defending against sensitive material. The analyst will note your resistances and then provide insight into their meaning. If offered at the right moment, this **interpretation**—of, say, your not wanting to talk about your mother—may illuminate the underlying wishes, feelings, and conflicts

psychotherapy treatment involving psychological techniques; consists of interactions between a trained therapist and someone seeking to overcome psychological difficulties or achieve personal growth.

eclectic approach an approach to psychotherapy that, depending on the client's problems, uses techniques from various forms of therapy.

psychoanalysis Sigmund Freud's therapeutic technique. Freud believed the patient's free associations, resistances, dreams, and transferences—and the therapist's interpretations of them—release previously repressed feelings, allowing the patient to gain self-insight.

resistance in psychoanalysis, the blocking from consciousness of anxiety-laden material.

interpretation in psychoanalysis, the analyst's noting supposed dream meanings, resistances, and other significant behaviors and events in order to promote insight.

"Your problems make my fee seem insignificant."

you are avoiding. The analyst may also offer an explanation of how this resistance fits with other pieces of your psychological puzzle, including those based on analysis of your dream content.

Over many such sessions, you may find yourself experiencing strong positive or negative feelings for your analyst. The analyst may suggest you are **transferring** feelings, such as dependency or mingled love and anger, that you experienced in earlier relationships with family members or other important people. By exposing such feelings, you may gain insight into your current relationships, not just those of your past childhood.

"I haven't seen my analyst in 200 years. He was a strict Freudian. If I'd been going all this time, I'd probably almost be cured by now."

—Woody Allen, after awakening from suspended animation in the movie *Sleeper*

Relatively few U.S. therapists now offer traditional psychoanalysis. Its underlying theory is not supported by scientific research. Analysts' interpretations cannot be proven or disproven. And psychoanalysis takes time and money, often years of several expensive sessions each week. Some of these problems have been addressed in a contemporary psychodynamic perspective that has evolved from psychoanalysis.

Psychodynamic Therapy

"Look, making you happy is out of the question, but I can give you a compelling narrative for your misery."

Influenced by Freud, **psychodynamic therapists** try to help people understand their current symptoms by focusing on themes across important relationships, including childhood experiences and the therapist relationship. In face-to-face meetings (rather than on a couch, with the therapist out of their line of vision), patients explore and gain perspective on defended-against thoughts and feelings. But these meetings take place once a week (rather than several times weekly) for only a few weeks or months (rather than several years).

No brief excerpt can exemplify the way psychodynamic therapy interprets a patient's conflict. But the following interaction between therapist David Malan (1978, pp. 133–134) and a depressed patient illustrates the goal of enabling self-insight by looking for common, recurring themes, especially in relationships.

Malan: *I get the feeling that you're the sort of person who needs to keep active. If you don't keep active, then something goes wrong. Is that true?*

Patient: *Yes.*

Malan: *I get a second feeling about you and that is that you must, underneath all this, have an awful lot of very strong and upsetting feelings. Somehow they're there but you aren't really quite in touch with them. Isn't this right? I feel you've been like that as long as you can remember.*

Face-to-face therapy In this type of therapy session, the couch has disappeared. But the influence of psychoanalytic theory may not have, especially if the therapist probes for the origin of the patient's symptoms by seeking information from the patient's childhood.

Patient: *For quite a few years, whenever I really sat down and thought about it I got depressed, so I tried not to think about it.*

Malan: *You see, you've established a pattern, haven't you? You're even like that here with me, because in spite of the fact that you're in some trouble and you feel that the bottom is falling out of your world, the way you're telling me this is just as if there wasn't anything wrong.*

Notice how Malan interpreted the woman's earlier remarks (when she did most of the talking) and suggested that her relationship with him reveals a characteristic pattern of behavior? He was suggesting insights into her problems.

Humanistic Therapies

35-2: What are the basic themes of humanistic therapy, such as Rogers' client-centered approach?

Psychoanalytic and humanistic therapies are often referred to as **insight therapies** because both attempt to help troubled people by reducing inner conflicts and increasing self-understanding. Humanistic therapists aim to boost people's inherent potential for self-fulfillment by helping them grow in self-awareness and self-acceptance. Humanistic therapists differ from psychoanalysts in other ways as well. They focus on

- the *present* and *future* more than the past. They explore feelings as they occur, rather than delving into the childhood origins of the feelings.
- *conscious* rather than unconscious thoughts.
- taking immediate *responsibility* for one's feelings and actions, rather than uncovering hidden determinants.
- promoting growth instead of curing illness. Thus, those in therapy became *clients* rather than *patients* (a change many therapists have since adopted).

Carl Rogers (1902–1987) developed the widely used humanistic technique he called **client-centered therapy.** In this *nondirective therapy,* the therapist listens to the person's conscious self-perceptions without judging, interpreting, or directing the client toward certain insights.

Believing that most people already possess the resources for growth, Rogers (1961, 1980) encouraged therapists to exhibit *genuineness, acceptance,* and *empathy*. When therapists drop their facades and genuinely express their true feelings, when they enable their clients to feel unconditionally accepted, and when they empathically sense and reflect their clients' feelings, the clients may deepen their self-understanding and self-acceptance (Hill & Nakayama, 2000). As Rogers (1980, p. 10) explained,

> Hearing has consequences. When I truly hear a person and the meanings that are important to him at that moment, hearing not simply his words, but him, and when I let him know that I have heard his own private personal meanings, many things happen. There is first of all a grateful look. He feels released. He wants to tell me more about his world. He surges forth in a new sense of freedom. He becomes more open to the process of change. . . . Almost always, when a person realizes he has been deeply heard, his eyes moisten. I think in some real sense he is weeping for joy. It is as though he were saying, "Thank God, somebody heard me. Someone knows what it's like to be me."

"Hearing" refers to Rogers' technique of **active listening**—echoing, restating, and seeking clarification of what the person expresses (verbally or nonverbally) and acknowledging the expressed feelings. Rogers believed that the therapist's most important contribution is to accept and understand the client. Given a nonjudgmental, grace-filled environment that provides **unconditional positive regard,** people may accept even their worst traits and feel valued and whole.

Active listening is now an accepted part of therapeutic counseling practices in many schools, colleges, and clinics. The counselor listens attentively and interrupts

transference in psychoanalysis, the patient's transfer to the analyst of emotions linked with other relationships (such as love or hatred for a parent).

psychodynamic therapy therapy deriving from the psychoanalytic tradition that views individuals as responding to unconscious forces and childhood experiences, and that seeks to enhance self-insight.

insight therapies a variety of therapies that aim to improve psychological functioning by increasing the client's awareness of underlying motives and defenses.

client-centered therapy a humanistic therapy, developed by Carl Rogers, in which the therapist uses techniques such as active listening within a genuine, accepting, empathic environment to facilitate clients' growth. (Also called *person-centered therapy.*)

active listening empathic listening in which the listener echoes, restates, and clarifies. A feature of Rogers' client-centered therapy.

unconditional positive regard a caring, accepting, nonjudgmental attitude, which Carl Rogers believed would help clients to develop self-awareness and self-acceptance.

"We have two ears and one mouth that we may listen the more and talk the less."

—Zeno, 335–263 B.C.E., *Diogenes Laertius*

Michael Rougier/*Life* Magazine © Time Warner, Inc.

Active listening Carl Rogers (right) empathized with a client during this group therapy session.

only to restate and confirm feelings, to accept what is being expressed, or to seek clarification. The following brief excerpt between Rogers and a male client illustrates how he sought to provide a psychological mirror that would help clients see themselves more clearly.

Rogers: *Feeling that now, hm? That you're just no good to yourself, no good to anybody. Never will be any good to anybody. Just that you're completely worthless, huh?—Those really are lousy feelings. Just feel that you're no good at all, hm?*

Client: *Yeah.* (Muttering in low, discouraged voice) *That's what this guy I went to town with just the other day told me.*

Rogers: *This guy that you went to town with really told you that you were no good? Is that what you're saying? Did I get that right?*

Client: *M-hm.*

Rogers: *I guess the meaning of that if I get it right is that here's somebody that—meant something to you and what does he think of you? Why, he's told you that he thinks you're no good at all. And that just really knocks the props out from under you.* (Client weeps quietly.) *It just brings the tears.* (Silence of 20 seconds)

Client: (Rather defiantly) *I don't care though.*

Rogers: *You tell yourself you don't care at all, but somehow I guess some part of you cares because some part of you weeps over it.*

(Meador & Rogers, 1984, p. 167)

* * *

To listen more actively in your own relationships, try this:

1. Paraphrase. *Rather than saying "I know how you feel," check your understandings by summarizing the speaker's words in your own words.*
2. Invite clarification. *"What might be an example of that?" may encourage the speaker to say more.*
3. Reflect feelings. *"It sounds frustrating" might mirror what you're sensing from the speaker's body language and intensity.*

The insight therapies assume that many psychological problems diminish as self-awareness grows. Their influence has waned, although aspects of their approaches can be found in some contemporary approaches to therapy. But now, rather than delving deeply below the surface looking for inner causes, twenty-first-century therapists tend to view maladaptive symptoms as learned behaviors that can be replaced by new and more constructive responses.

Behavior Therapies

35-3: What are the assumptions and techniques of the behavior therapies?

Behavior therapists doubt the healing power of self-awareness. (You can become aware of why you are highly anxious during exams and still be anxious.) They assume that problem behaviors *are* the problems, and the application of learning principles can eliminate them.

behavior therapy therapy that applies learning principles to the elimination of unwanted behaviors.

counterconditioning a behavior therapy procedure that uses classical conditioning to evoke new responses to stimuli that are triggering unwanted behaviors; includes *exposure therapies* and *aversive conditioning.*

exposure therapies behavioral techniques, such as systematic desensitization, that treat anxieties by exposing people (in imagination or actuality) to the things they fear and avoid.

systematic desensitization a type of exposure therapy that associates a pleasant relaxed state with gradually increasing anxiety-triggering stimuli. Commonly used to treat phobias.

Classical Conditioning Techniques

One cluster of behavior therapies derives from principles developed in Ivan Pavlov's early twentieth-century conditioning experiments. As Pavlov and others showed, we learn various behaviors and emotions through classical conditioning. Could maladaptive symptoms be examples of conditioned responses? If so, might reconditioning be a solution? Learning theorist O. H. Mowrer thought so and developed a successful conditioning therapy for chronic bed-wetters. The child sleeps on a liquid-sensitive pad connected to an alarm. Moisture on the pad triggers the alarm, waking the child. With sufficient repetition, this association of urinary relaxation with waking up stops the bed-wetting in three out of four cases, boosting the child's self-image at the same time (Christophersen & Edwards, 1992; Houts et al., 1994).

What might a psychoanalyst say about Mowrer's therapy for bed-wetting? How might a behavior therapist reply?

Other psychologists wondered, might one unlearn an aversion to certain stimuli by undergoing another round of conditioning to replace the fear response? In **counterconditioning,** the therapist pairs the trigger stimulus with a new response that is incompatible with fear. They use two specific counterconditioning techniques—*exposure therapy* and *aversive conditioning*—to replace unwanted responses.

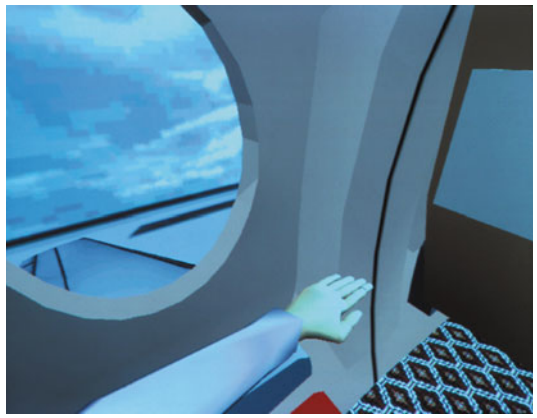
Exposure Therapies

Picture this scene reported in 1924 by behaviorist psychologist Mary Cover Jones: Three-year-old Peter is petrified of rabbits and other furry objects. Jones plans to replace Peter's fear of rabbits with a conditioned response incompatible with fear. Her strategy is to associate the fear-evoking rabbit with the pleasurable, relaxed response associated with eating.

As Peter begins his midafternoon snack, Jones introduces a caged rabbit on the other side of the huge room. Peter, eagerly munching away on his crackers and drinking his milk, hardly notices. On succeeding days, she gradually moves the rabbit closer and closer. Within two months, Peter is tolerating the rabbit in his lap, even stroking it while he eats. Moreover, his fear of other furry objects subsides as well, having been *countered,* or replaced, by a relaxed state that cannot coexist with fear (Fisher, 1984; Jones, 1924).

Unfortunately, Jones' story of Peter and the rabbit did not become part of psychology's lore for more than 30 years, when psychiatrist Joseph Wolpe (1958; Wolpe & Plaud, 1997) refined her techniques into what are now the most widely used types of behavior therapies: **exposure therapies.** As people can habituate to the sound of a train passing their new apartment, so, with repeated exposure, can they become less anxiously responsive to things that once petrified them (Deacon & Abramowitz, 2004).

One widely used exposure therapy is **systematic desensitization.** If you can repeatedly relax when facing anxiety-provoking stimuli, you can gradually eliminate your anxiety. (You cannot be simultaneously anxious and relaxed.) The trick is to proceed gradually. Let's see how this might work. Imagine yourself with a common phobia—fear of public speaking. A behavior therapist might first ask for your help in constructing a hierarchy of anxiety-triggering speaking situations, ranging perhaps from the mildly anxiety-provoking situation of speaking up in a small group of friends, to the panic-provoking situation of addressing a large audience. Using *progressive relaxation,* the therapist would train you to relax one muscle group after another, until you achieve a drowsy state of complete relaxation and comfort. Then the therapist would ask you to imagine, with your eyes closed, a mildly anxiety-arousing situation: You are having coffee with a group of friends and are trying to decide whether to speak up. If imagining the scene causes you to feel any anxiety, you would signal your tension by raising your finger, and the therapist would instruct you to switch off the mental image and go back to deep relaxation. This imagined scene is repeatedly paired with relaxation until you feel no trace of anxiety.



Bob Mahoney /The Image Works

Bob Mahoney /The Image Works

FIGURE 35.1 Virtual reality exposure therapy Virtual reality technology exposes people to vivid simulations of feared stimuli. The head-mounted display unit projects a three-dimensional, lifelike series of scenes. As the client's head turns, motion sensors adjust the scene. People who fear flying can peer out a "window," feel vibrations, and hear the engine roar as the plane taxis down the runway and takes off.

The therapist would progress up the constructed anxiety hierarchy, using the relaxed state to desensitize you to each imagined situation. After several sessions, you move to actual situations, beginning with relatively easy tasks and gradually moving to more anxiety-filled ones. Conquering your anxiety in an actual situation, not just in your imagination, raises your self-confidence (Foa & Kozak, 1986; Williams, 1987). Eventually, you may even become a confident public speaker.

When an anxiety-arousing situation is too expensive, difficult, or embarrassing to re-create, *virtual reality exposure therapy* may offer an alternative (**FIGURE 35.1**). Experiments led by several research teams have treated many different people with many different fears—flying, heights, particular animals, and public speaking (Gregg & Tarrier, 2007; Powers & Emmelkamp, 2008; Rothbaum, 2006). Those experiencing virtual reality exposure therapy have had greater relief from their fears—in real life—than have those in control groups.

Aversive Conditioning

In systematic desensitization, the goal is substituting a positive (relaxed) response for a negative (fearful) response to a *harmless* stimulus. **Aversive conditioning** is the reverse of systematic desensitization—its goal is to substitute a negative (aversive) response for a positive response to a *harmful* stimulus. The procedure is simple: It associates the unwanted behavior with unpleasant feelings. To treat nail biting, one can paint the fingernails with a nasty-tasting nail polish (Baskind, 1997). To treat alcohol dependency, an aversion therapist offers the client appealing drinks laced with a drug that produces severe nausea. By linking alcohol with violent nausea, the therapist seeks to transform the person's reaction to alcohol from positive to negative (**FIGURE 35.2**).

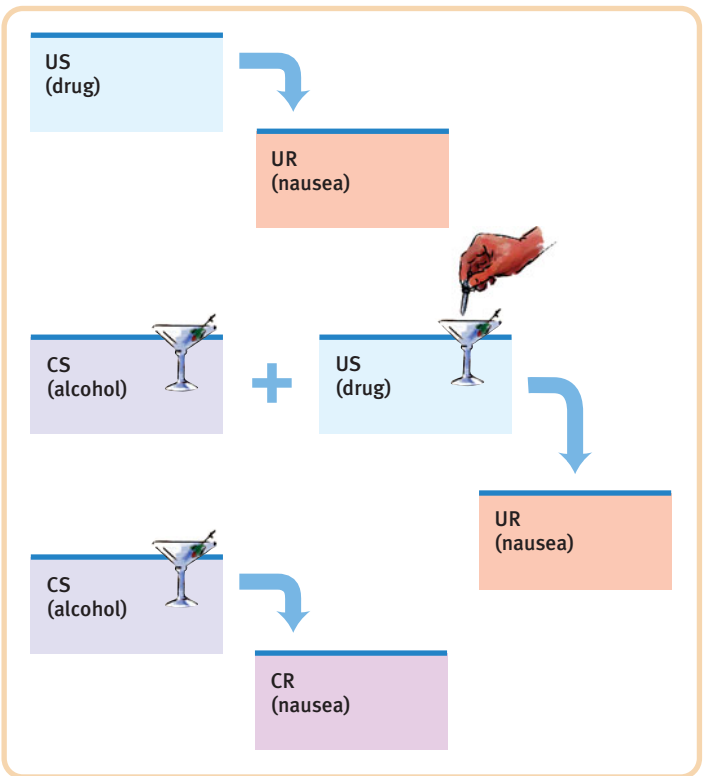


FIGURE 35.2 Aversion therapy for alcohol dependency After repeatedly imbibing an alcoholic drink mixed with a drug that produces severe nausea, some people with a history of alcohol abuse develop at least a temporary conditioned aversion to alcohol.

Does aversive conditioning work? In the short run it may. Arthur Wiens and Carol Menustik (1983) studied 685 patients with alcohol dependency who completed an aversion therapy program at a Portland, Oregon, hospital. One year later, after returning for several booster treatments of alcohol-sickness pairings, 63 percent were still successfully abstaining. But after three years, only 33 percent had remained abstinent.

The problem is that, in therapy as in research, cognition influences conditioning. People know that outside the therapist's office they can drink without fear of nausea. Their ability to discriminate between the aversive conditioning situation and all other situations can limit the treatment's effectiveness. Thus, therapists often use aversive conditioning in combination with other treatments.

Operant Conditioning

aversive conditioning a type of counter-conditioning that associates an unpleasant state (such as nausea) with an unwanted behavior (such as drinking alcohol).

token economy an operant conditioning procedure in which people earn a token of some sort for exhibiting a desired behavior and can later exchange the tokens for various privileges or treats.

The work of B. F. Skinner and others teaches us a basic principle of operant conditioning: Voluntary behaviors are strongly influenced by their consequences. Knowing this, behavior therapists can practice *behavior modification*—reinforcing desired behaviors and withholding reinforcement for, or punishing, undesired behaviors. Using operant conditioning, children with an intellectual disability have been taught to care for themselves. Socially withdrawn children with autism have learned to interact. People with schizophrenia have been helped to behave more rationally in their hospital ward. In such cases, therapists use positive reinforcers to shape behavior in a step-by-step manner, rewarding closer and closer approximations of the desired behavior.

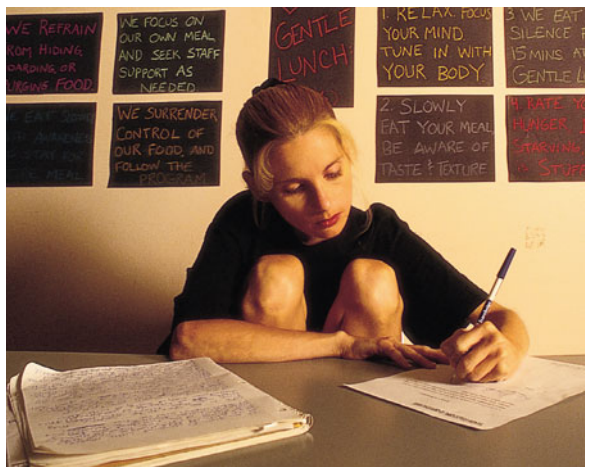
In extreme cases, treatment must be intensive. One study worked with 19 withdrawn, uncommunicative 3-year-olds with autism. Each participated in a 2-year program in which their parents spent 40 hours a week attempting to shape their behavior (Lovaas, 1987). The combination of positively reinforcing desired behaviors, and ignoring or punishing aggressive and self-abusive behaviors, worked wonders for some. By first grade, 9 of the 19 children were functioning successfully in school and exhibiting normal intelligence. In a group of 40 comparable children not undergoing this treatment (which involves sustained effort), only one showed similar improvement.

Rewards used to modify behavior vary. For some people, the reinforcing power of attention or praise is sufficient. Others require concrete rewards, such as food. In institutional settings, therapists may create a **token economy.** When people display appropriate behavior, such as getting out of bed, washing, dressing, eating, talking coherently, cleaning up their rooms, or playing cooperatively, they receive a token or plastic coin as a positive reinforcer. Later, they can exchange their accumulated tokens for various rewards, such as candy, TV time, trips to town, or better living quarters. Token economies have been successfully applied in various settings (homes, classrooms, hospitals, institutions for the delinquent) and among members of various populations (including disturbed children and people with schizophrenia and other mental disabilities).

Critics of behavior modification express two concerns. The first is practical: *How durable are the behaviors?* Will people become so dependent on extrinsic rewards that the appropriate behaviors will stop when the reinforcers stop, as may happen when they leave the institution? Proponents of behavior modification believe the behaviors will endure if therapists wean patients from the tokens by shifting them toward other rewards, such as social approval, more typical of life outside the institution. They also point out that the appropriate behaviors themselves can be intrinsically rewarding. For example, as a withdrawn person becomes more socially competent, the intrinsic satisfactions of social interaction may help the person maintain the behavior.

The second concern is ethical: *Is it right for one human to control another's behavior?* To critics, the whole process of depriving people of something they desire and deciding which behaviors to reinforce has an authoritarian taint. Advocates reply that some patients request the therapy. Moreover, control already exists; rewards and punishers are already maintaining destructive behavior patterns. So why not reinforce adaptive behavior instead? Treatment with positive rewards is more humane than being institutionalized or punished, they argue, and the right to effective treatment and an improved life justifies temporary deprivation.

Cognitive therapy for eating disorders aided by journaling Cognitive therapists guide people toward new ways of explaining their good and bad experiences. By recording each day's positive events and how one enabled them, for example, people may become more mindful of their self-control.



Lara Jo Regan/Gamma Liaison

Cognitive Therapies

35-4: What are the goals and techniques of the cognitive therapies?

We have seen how behavior therapists treat specific fears and problem behaviors. But how do they deal with major depression? Or with generalized anxiety, in which anxiety has no focus and developing a hierarchy of anxiety-triggering situations is difficult? Behavior therapists treating these less clearly defined psychological problems have had help from the same *cognitive revolution* that has profoundly changed other areas of psychology during the last five decades.

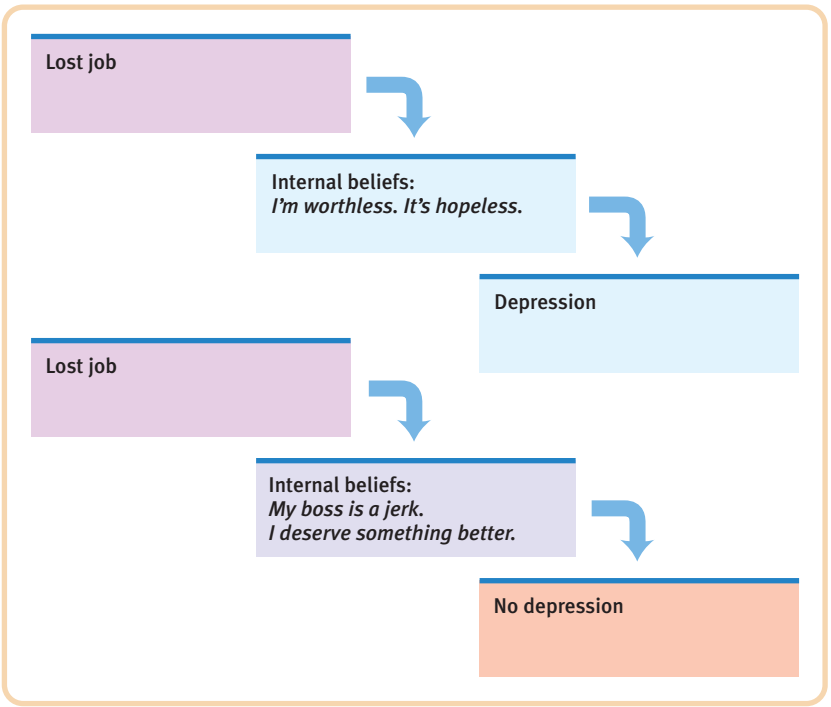


FIGURE 35.3 A cognitive perspective on psychological disorders The person's emotional reactions are produced not directly by the event but by the person's thoughts in response to the event.

"Life does not consist mainly, or even largely, of facts and happenings. It consists mainly of the storm of thoughts that are forever blowing through one's mind."

—Mark Twain, 1835–1910

The **cognitive therapies** assume that our thinking colors our feelings (**FIGURE 35.3**). Between the event and our response lies the mind. Self-blaming and overgeneralized explanations of bad events are often an integral part of the vicious cycle of depression. The depressed person interprets a suggestion as criticism, disagreement as dislike, praise as flattery, friendliness as pity. Ruminating on such thoughts sustains the bad mood. If such thinking patterns can be learned, then surely they can be replaced. Cognitive therapists therefore try in various ways to teach people new, more constructive ways of thinking.

cognitive therapy therapy that teaches people new, more adaptive ways of thinking and acting; based on the assumption that thoughts intervene between events and our emotional reactions.

Beck's Therapy for Depression

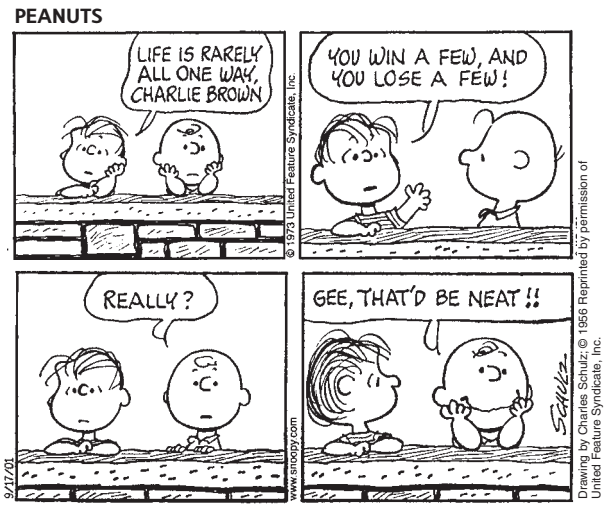
If people are miserable, they can be helped to change their minds. As therapist Aaron Beck applied his training in Freudian techniques to the dreams of depressed people, he found recurring negative themes of loss, rejection, and abandonment that extended into their waking thoughts. Beck and his colleagues (1979) came to believe that cognitive therapy could reverse people's *catastrophizing* beliefs about themselves, their situations, and their futures. Such negativity even extends into therapy, as clients recall and rehearse their failings and worst impulses (Kelly, 2000). Gentle questioning seeks to reveal irrational thinking and then to persuade people to remove the dark glasses through which they view life (Beck et al., 1979, pp. 145–146):

Client: *I agree with the descriptions of me but I guess I don't agree that the way I think makes me depressed.*
Beck: *How do you understand it?*
Client: *I get depressed when things go wrong. Like when I fail a test.*
Beck: *How can failing a test make you depressed?*
Client: *Well, if I fail I'll never get into law school.*
Beck: *So failing the test means a lot to you. But if failing a test could drive people into clinical depression, wouldn't you expect everyone who failed the test to have a depression? . . . Did everyone who failed get depressed enough to require treatment?*
Client: *No, but it depends on how important the test was to the person.*
Beck: *Right, and who decides the importance?*
Client: *I do.*

Beck: *And so, what we have to examine is your way of viewing the test (or the way that you think about the test) and how it affects your chances of getting into law school. Do you agree?*
Client: *Right.*
Beck: *Do you agree that the way you interpret the results of the test will affect you? You might feel depressed, you might have trouble sleeping, not feel like eating, and you might even wonder if you should drop out of the course.*
Client: *I have been thinking that I wasn't going to make it. Yes, I agree.*
Beck: *Now what did failing mean?*
Client: (tearful) *That I couldn't get into law school.*
Beck: *And what does that mean to you?*
Client: *That I'm just not smart enough.*
Beck: *Anything else?*
Client: *That I can never be happy.*
Beck: *And how do these thoughts make you feel?*
Client: *Very unhappy.*
Beck: *So it is the meaning of failing a test that makes you very unhappy. In fact, believing that you can never be happy is a powerful factor in producing unhappiness. So, you get yourself into a trap—by definition, failure to get into law school equals "I can never be happy."*

cognitive-behavioral therapy a popular integrated therapy that combines cognitive therapy (changing self-defeating thinking) with behavior therapy (changing behavior).

We often think in words. Therefore, getting people to change what they say to themselves is an effective way to change their thinking. Perhaps you can identify with the anxious students who before an exam make matters worse with self-defeating thoughts: "This exam's probably going to be impossible. All these other students seem so relaxed and confident. I wish I were better prepared. Anyhow, I'm so nervous I'll forget everything." To change such negative self-talk, Donald Meichenbaum (1977, 1985) has offered *stress inoculation training:* teaching people to restructure their thinking in stressful situations. Sometimes it may be enough simply to say more positive things to oneself: "Relax. The exam may be hard, but it will be hard for everyone else, too. I studied harder than most people. Besides, I don't need a perfect score to get a good grade." After being trained to dispute their negative thoughts, depression-prone children and college students exhibit a halved rate of future depression (Seligman, 2002). To a great extent, it *is* the thought that counts.



Cognitive-Behavioral Therapy

The widely practiced **cognitive-behavioral therapy** aims not only to alter the way people think (*cognitive* therapy), but also to alter the way they act (*behavior* therapy). It seeks to make people aware of their irrational negative thinking, to replace it with new ways of thinking, *and to practice* the more positive approach in everyday settings.

"The trouble with most therapy is that it helps you to feel better. But you don't get better. You have to back it up with action, action, action."
—Therapist Albert Ellis (1913–2007)

Many studies confirm cognitive-behavioral therapy's effectiveness for those suffering anxiety or depression (Covin et al., 2008; Mitte, 2005; Norton & Price, 2007). Anxiety and mood disorders share a common problem: emotion regulation. An effective treatment program for these emotional disorders trains people both to replace their catastrophizing thinking with more realistic appraisals, and to practice behaviors that are incompatible with their problem (Moses & Barlow, 2006). A person with a fear of social situations, for example, might learn new ways of thinking, but also practice approaching people.

In one study, people with obsessive-compulsive behaviors learned to relabel their compulsive thoughts (Schwartz et al., 1996). Feeling the urge to wash their hands again, they would tell themselves, "I'm having a compulsive urge," and attribute it to their brain's abnormal activity, as previously viewed in their PET scans. Instead of giving in to the urge, they would then spend 15 minutes in an enjoyable, alternative

family therapy therapy that treats the family as a system. Views an individual's unwanted behaviors as influenced by, or directed at, other family members.

behavior, such as practicing an instrument, taking a walk, or gardening. This helped "unstick" the brain by shifting attention and engaging other brain areas. For two or three months, the weekly therapy sessions continued, with relabeling and refocusing practice at home. By the study's end, most participants' symptoms had diminished and their PET scans revealed normalized brain activity. Behavioral practice plus cognitive relabeling equaled relief.

Group and Family Therapies

35-5: What are the aims and benefits of group and family therapy?

Except for traditional psychoanalysis, most therapies may also occur in small groups. Group therapy can save therapists' time and clients' money, and it often is no less effective than individual therapy (Fuhriman & Burlingame, 1994). It does not provide the same degree of therapist involvement with each client, but the social context of the sessions offers other unique benefits. Up to 90 minutes a week, the therapist guides the interactions of 6 to 10 people as they confront issues and react to one another. It can be a relief to find that others, despite their apparent composure, have problems similar to yours and share your troublesome feelings. Group members can also give and receive feedback on new ways of behaving. Hearing that you look poised, even though you feel anxious and self-conscious, can be very reassuring. Hearing how and why your behavior distresses others can help you learn new behaviors.

Therapists frequently suggest group therapy for people who are having family conflicts. **Family therapy** assumes that no person is an island, that we live and grow in relation to others. Two opposing tendencies—working to find an identity outside our family, yet needing to connect with family members emotionally—can create stress for the individual and the family. Thus, therapists tend to view families as systems, in which each person's actions trigger reactions from others. To break that pattern, the therapist often attempts to guide family members toward positive relationships and improved communication. This type of therapy often acts as a preventive mental health strategy.

* * *

For a synopsis of the main forms of psychotherapy we've been discussing, see **TABLE 35.1**.

Michael Newman/PhotoEdit

Family therapy The therapist helps family members understand how their ways of relating to one another create problems. The treatment's emphasis is not on changing the individuals but on changing their relationships and interactions.

TABLE 35.1 Comparison of a Sample of Major Psychotherapies

Therapy	Assumed Problem	Therapy Aims	Method
Psychodynamic	Unconscious forces and childhood experiences	Reduced anxiety through self-insight	Analysis and interpretation
Client-centered	Barriers to self-understanding and self-acceptance	Personal growth through self-insight	Active listening and unconditional positive regard
Behavior	Maladaptive behavior	Extinction and relearning	Counterconditioning, exposure, desensitization, aversive conditioning, and operant conditioning
Cognitive	Negative, self-defeating thinking	Healthier thinking and self-talk	Reveal and reverse self-blaming
Family	Stressful relationships	Relationship healing	Understanding family social system; exploring roles; improving communication

Evaluating Psychotherapies

Advice columnists frequently urge their troubled letter writers to get professional help: "Don't give up. Find a therapist who can help you. Make an appointment." Statistics show that many Americans share this confidence in psychotherapy's effectiveness. In 2004, for example, 7.4 percent of Americans reported "undergoing counseling for mental or emotional problems," a 25 percent increase since 1991 (Smith, 2005). With such an enormous outlay of time as well as money, effort, and hope, it is important to ask: Are the millions of people worldwide justified in placing such hope in psychotherapy?

Is Psychotherapy Effective?

35-6: Does psychotherapy work? Who decides?

The question, though simply put, is not simply answered. Measuring therapy's effectiveness is not like taking your body's temperature to see if your fever has gone away. If you and I were to undergo psychotherapy, how would we assess its effectiveness? By how we feel about our progress? How our friends and family feel about it? How our therapist feels about it? How our behavior has changed?

Clients' Perceptions

If clients' testimonials were the only measuring stick, we could strongly affirm the effectiveness of psychotherapy. When 2900 *Consumer Reports* readers (1995; Kotkin et al., 1996; Seligman, 1995) related their experiences with mental health professionals, 89 percent said they were at least "fairly well satisfied." Among those who recalled feeling *fair* or *very poor* when beginning therapy, 9 in 10 now were feeling *very good, good,* or at least *so-so*. We have their word for it—and who should know better?

We should not dismiss these testimonials lightly. But for several reasons, client testimonials do not persuade psychotherapy's skeptics:

- ***People often enter therapy in crisis.*** When, with the normal ebb and flow of events, the crisis passes, people may attribute their improvement to the therapy.
- ***Clients may need to believe the therapy was worth the effort.*** To admit investing time and money in something ineffective is like admitting to having one's car serviced repeatedly by a mechanic who never fixes it. Self-justification is a powerful human motive.
- ***Clients generally speak kindly of their therapists.*** Even if the problems remain, say the critics, clients "work hard to find something positive to say. The therapist had been very understanding, the client had gained a new perspective, he learned to communicate better, his mind was eased, anything at all so as not to have to say treatment was a failure" (Zilbergeld, 1983, p. 117).

Clinicians' Perceptions

Do clinicians' perceptions give us any more reason to celebrate? Case studies of successful treatment abound. The problem is that clients justify entering psychotherapy by emphasizing their unhappiness, justify leaving by emphasizing their well-being, and stay in touch only if satisfied. Therapists treasure compliments from clients as they say good-bye or later express their gratitude, but they hear little from clients who experience only temporary relief and seek out new therapists for their recurring problems. Thus, the same person—with the same recurring anxieties, depression, or marital difficulty—may be a "success" story in several therapists' files.

Because people enter therapy when they are extremely unhappy, and usually leave when they are less extremely unhappy, most therapists, like most clients, testify to therapy's success—regardless of the treatment.

Outcome Research

How, then, can we objectively measure the effectiveness of psychotherapy? How can we determine what types of people and problems are best helped, and by what type of psychotherapy? In search of answers, psychologists have turned to controlled research studies.

In the 1800s, the field of medicine faced a similar challenge. Physicians, skeptical of many of the fashionable treatments (bleeding, purging, infusions of plant and metal substances), began to realize that many patients got better on their own, without these treatments, and that others died in spite of them. Sorting fact from superstition required following patients with and without a particular treatment. Typhoid fever patients, for example, often improved after being bled, convincing most physicians that the treatment worked. Not until a control group was given mere bed rest—and 70 percent were observed to improve after five weeks of fever—did physicians learn, to their shock, that the bleeding was worthless (Thomas, 1992).

In the twentieth century, psychology, with its many diverse therapy options, faced a similar challenge. British psychologist Hans Eysenck (1952) launched a spirited debate when he summarized 24 studies of psychotherapy outcomes and found that two-thirds of those receiving psychotherapy for nonpsychotic disorders improved markedly. To this day, no one disputes that optimistic estimate.

"Fortunately, [psycho]analysis is not the only way to resolve inner conflicts. Life itself still remains a very effective therapist."

—Karen Horney, *Our Inner Conflicts*, 1945

Why, then, are we still debating psychotherapy's effectiveness? Because Eysenck also reported similar improvement among *untreated* persons, such as those who were on waiting lists. With or without psychotherapy, he said, roughly two-thirds improved noticeably. Time was a great healer.

Eysenck's sample was small, but later summaries have analyzed hundreds of studies (Kopta et al., 1999; Shadish et al., 2000). Many of these studies were *randomized clinical trials*, in which researchers randomly assign people on a waiting list to therapy or to no therapy, and later evaluate everyone, using tests and the reports of people who don't know whether therapy was given. The first statistical summary, of some 475 psychotherapy outcome studies (Smith et al., 1977, 1980), showed that the average therapy client ends up better off than 80 percent of the untreated individuals on waiting lists. The claim is modest—by definition, about 50 percent of untreated people also are better off than the average untreated person. Nevertheless, Mary Lee Smith and her colleagues exulted that "psychotherapy benefits people of all ages as reliably as schooling educates them, medicine cures them, or business turns a profit" (p. 183). Later summaries echoed the results: *Those not undergoing therapy often improve, but those undergoing therapy are more likely to improve*.

Is psychotherapy also cost-effective? Again, the answer is *yes*. When people seek psychological treatment, their search for other medical treatment drops—by 16 percent in one summary of 91 studies (Chiles et al., 1999). Given the staggering annual cost of psychological disorders and substance abuse—including crime, accidents, lost work, and treatment—this is a good investment, much like money spent on prenatal and well-baby care. Both *reduce* long-term costs. Boosting employees' psychological well-being, for example, can lower medical costs, improve work efficiency, and diminish absenteeism.

But note that the claim—that psychotherapy, *on average,* is somewhat effective—refers to no one therapy in particular. It is like reassuring lung-cancer patients that "on average," medical treatment of health problems is effective. What people want to know is the effectiveness of a *particular* treatment for their *specific* problem.

The Relative Effectiveness of Different Therapies

35-7: Are some therapies more effective than others?

The statistical summaries and surveys have failed to pinpoint any one type of therapy as generally superior (Smith et al., 1977, 1980). So, was the dodo bird in *Alice in Wonderland* right: "Everyone has won and all must have prizes"? Not quite. Some forms of therapy do get prizes for particular problems.

"Whatever differences in treatment efficacy exist, they appear to be extremely small, at best."
—Bruce Wampold et al. (1997)

Behavioral conditioning therapies, for example, have achieved especially favorable results with specific behavior problems, such as bed-wetting, phobias, compulsions, marital problems, and sexual disorders (Bowers & Clum, 1988; Hunsley & DiGiulio, 2002; Shadish & Baldwin, 2005). Studies confirm cognitive therapy's effectiveness in coping with depression and reducing suicide risk (Brown et al., 2005; DeRubeis et al., 2005; Hollon et al., 2005).

"Different sores have different salves."
—English proverb

Moreover, we can say that therapy is most effective when the problem is clear-cut (Singer, 1981; Westen & Morrison, 2001). Those who experience phobias or panic, who are unassertive, or who are frustrated by sexual performance problems can hope for improvement. Those with less-focused problems, such as depression and anxiety, usually benefit in the short term but often relapse later. And those with the negative symptoms of chronic schizophrenia or a desire to change their entire personality are unlikely to benefit from psychotherapy alone (Pfammatter et al., 2006; Zilbergeld, 1983). The more specific the problem, the greater the hope.

But no prizes—and little or no scientific support—go to certain other therapies (Arkowitz & Lilienfeld, 2006):

- ***Energy therapies*** propose to manipulate people's invisible energy fields.
- ***Recovered-memory therapies*** aim to unearth "repressed memories" of early childhood abuse.
- ***Rebirthing therapies*** engage people in reenacting the supposed trauma of their birth.
- ***Facilitated communication*** has an assistant touch the typing hand of a child with autism.
- ***Crisis debriefing*** forces people to verbalize, rehearse, and "process" their traumatic experiences.

The question—Which therapies get prizes and which do not?—lies at the heart of a serious controversy some call psychology's civil war. To what extent should science guide both clinical practice and the willingness of health care providers and insurers to pay for psychotherapy? On the one side are research psychologists using scientific methods to extend the list of well-defined and validated therapies for various disorders. On the other side are nonscientist therapists who view their practices as more art than science, saying that people are too complex and therapy too intuitive to describe in a manual or test in an experiment. Between these two factions stand the science-oriented clinicians, who advocate **evidence-based practice,** the integration of the best available research with clinical expertise and patient preferences and characteristics. These clinicians believe that by basing practice on evidence and making mental health professionals accountable for effectiveness, therapy will only gain in credibility. Moreover, the public will be protected from pseudotherapies, and therapists will be protected from accusations of sounding like snake-oil salespeople—"Trust me, I know it works, I've seen it work."

evidence-based practice clinical decision making that integrates the best available research with clinical expertise and patient characteristics and preferences.

To encourage evidence-based practice in psychology, the American Psychological Association (2006; Spring, 2007) has followed the Institute of Medicine's lead, advocating that available therapies "should be rigorously evaluated" and then applied by

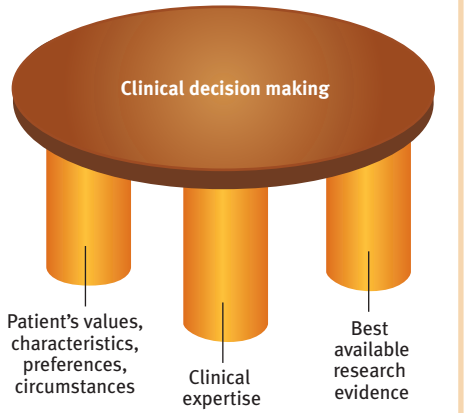


FIGURE 35.4 Evidence-based clinical decision making Ideal clinical decision making is a three-legged stool, upheld by knowledge of the patient, clinical expertise, and research evidence.

clinicians who are mindful of their skills and of each patient's unique situation (**FIGURE 35.4**). Increasingly, insurer and government support for mental health services requires evidence-based practice. In late 2007, for example, Britain's National Health Service announced that it would pour the equivalent of $600 million into training new mental health workers in evidence-based practices (such as cognitive-behavioral therapy) and to disseminating information about such treatments (DeAngelis, 2008).

Evaluating Alternative Therapies

35-8: How do alternative therapies fare under scientific scrutiny?

Bolstered by anecdotes, heralded by the media, and praised on the Internet, alternative therapies can spread like wildfire. In one national survey, 57 percent of those with a history of anxiety attacks and 54 percent of those with a history of depression had used alternative treatments, such as herbal medicine, massage, and spiritual healing (Kessler et al., 2001).

Natural or *spontaneous recovery* (the tendency of many abnormal states of mind to return to normal), combined with the *placebo effect* (a result caused by expectations alone), creates fertile soil for pseudotherapies. Testimonials aside, what does the evidence say? This is a tough question, because there is no evidence for or against most alternative therapies. Some, however, have been the subject of controlled research. Let's consider two of them. As we do, remember that sifting sense from nonsense requires the scientific attitude: being skeptical but not cynical, open to surprises but not gullible.

Eye Movement Desensitization and Reprocessing (EMDR)

EMDR (eye movement desensitization and reprocessing) is a therapy adored by thousands and dismissed by thousands more as a sham—"an excellent vehicle for illustrating the differences between scientific and pseudoscientific therapy techniques," suggested James Herbert and seven others (2000). Francine Shapiro (1989, 2007) developed EMDR one day while walking in a park and observing that anxious thoughts vanished as her eyes spontaneously darted about. Offering her novel anxiety treatment to others, she had people imagine traumatic scenes while she triggered eye movements by waving her finger in front of their eyes, supposedly enabling them to unlock and reprocess previously frozen memories. After she tried this on 22 people haunted by old traumatic memories, and all reported marked reductions in their distress after just one therapeutic session, the extraordinary result evoked an enormous response from mental health professionals. To date, nearly 70,000 of them, from more than 75 countries, have undergone training (EMDR, 2008). Not since the similarly charismatic Franz Anton Mesmer introduced *animal magnetism* (hypnosis) more than two centuries ago (also after feeling inspired by an outdoor experience) has a new therapy attracted so many devotees so quickly.

Does EMDR work? For 84 to 100 percent of single-trauma victims participating in four studies, the answer was *yes*, reported Shapiro (1999, 2002). (When EMDR did not fare well in other trials, Shapiro argued that the therapists were not properly trained.) Moreover, the treatment need take no more than three 90-minute sessions. The Society of Clinical Psychology task force on empirically validated treatments has acknowledged that the treatment is "probably efficacious" for the treatment of

nonmilitary post-traumatic stress disorder (Chambless et al., 1997; see also Bisson & Andrew, 2007; Seidler & Wagner, 2006). Encouraged by their seeming successes, EMDR therapists have applied the technique to other anxiety disorders, such as panic disorder, and, with Shapiro's (1995, 2002) encouragement, to a wide range of complaints, including pain, grief, paranoid schizophrenia, rage, and guilt.

Why, wonder the skeptics, should rapidly moving one's eyes while recalling traumas be therapeutic? Indeed, controlled trials have indicated that eye movements are *not* the therapeutic ingredient: Whether people imagined traumatic scenes and tapped a finger, or just stared straight ahead while the therapist's finger wagged, the therapeutic results were the same (Devilly, 2003). EMDR does work better than doing nothing, acknowledge the skeptics (Lilienfeld & Arkowitz, 2007), but many suspect that what is therapeutic is the combination of exposure therapy—repeatedly associating traumatic memories with a safe and reassuring context that provides some emotional distance from the experience—and a robust placebo effect. Had Mesmer's pseudotherapy been compared with no treatment at all, it, too (thanks to the healing power of positive belief), could have been found "probably efficacious," observed Richard McNally (1999).

"Studies indicate that EMDR is just as effective with fixed eyes. If that conclusion is right, what's useful in the therapy (chiefly behavioral desensitization) is not new, and what's new is superfluous."

***—Harvard Mental Health Letter*, 2002**

Light Exposure Therapy

Have you ever found yourself oversleeping, gaining weight, and feeling lethargic during the dark mornings and overcast days of winter? There likely was a survival advantage to your distant ancestors' slowing down and conserving energy during the dark days of winter. For some people, however, especially women and those living far from the equator, the wintertime blahs constitute a form of depression known as *seasonal affective disorder,* for which the appropriate acronym is SAD. To counteract these dark spirits, National Institute of Mental Health researchers in the early 1980s had an idea: Give SAD people a timed daily dose of intense light. Sure enough, people reported they felt better.

Courtesy of Christine Brune

Light therapy To counteract winter depression, some people spend time each morning exposed to intense light that mimics natural outdoor light. Light boxes to counteract SAD are available from health supply and lighting stores.

Was this a bright idea, or another dim-witted example of the placebo effect, attributable to people's expectations? Further research shed some light. One exposed some people with SAD to 90 minutes of bright light and others to a sham placebo treatment—a "negative ion generator" about which the staff expressed similar enthusiasm (but which, unknown to the participants, was not turned on). After four weeks of treatment, 61 percent of those exposed to morning light had greatly improved, as had 50 percent of those exposed to evening light and 32 percent of those exposed to the placebo (Eastman et al., 1998). Other studies found that 30 minutes of exposure to 10,000-lux white fluorescent light produced relief for more than half the people receiving morning light therapy and for one-third receiving evening light therapy (Terman et al., 1998, 2001). From 20 carefully controlled trials we have a verdict (Golden et al., 2005): Morning bright light does indeed dim SAD symptoms for many people. Moreover, it does so as effectively as taking antidepressant drugs or undergoing cognitive-behavioral therapy (Lam et al., 2006; Rohan et al., 2007). The effects are clear in brain scans; this therapy sparks activity in a brain region that influences the body's arousal and hormones (Ishida et al., 2005).

Commonalities Among Psychotherapies

35-9: What three elements are shared by all forms of psychotherapy?

The scientific attitude helps us sift sense from nonsense as we consider new forms of therapy. Might it also help explain another curious finding: There is little correlation between clinicians' experience, training, supervision, and licensing and their clients' outcomes. Clients in the *Consumer Reports* survey, for example, seemed equally satisfied

Close-Up:

A Consumer's Guide to Psychotherapists

Life for everyone is marked by a mix of serenity and stress, blessing and bereavement, good moods and bad. So, when should we seek a mental health professional's help? The American Psychological Association offers these common trouble signals:

- Feelings of hopelessness
- Deep and lasting depression
- Self-destructive behavior, such as alcohol and drug abuse
- Disruptive fears
- Sudden mood shifts
- Thoughts of suicide
- Compulsive rituals, such as hand washing
- Sexual difficulties

Before 1950, psychiatrists were the primary providers of mental health care. Today, surging demands for psychotherapy also occupy the time and attention of clinical and counseling psychologists; clinical and psychiatric social workers; pastoral, marital, abuse, and school counselors; and psychiatric nurses (**TABLE 35.2**). In looking for a therapist, you may want to have a preliminary consultation with two or three. You can describe your problem and learn each therapist's treatment approach. You can ask questions about the therapist's values, credentials, and fees. And, knowing the importance of the emotional bond between therapist and client, you can assess your own feelings about each of them.

TABLE 35.2 Therapists and Their Training

Type	Description
Counselors	Marriage and family counselors specialize in problems arising from family relations. Pastoral and school counselors provide counseling to countless people. Abuse counselors work with substance abusers and with spouse and child abusers and their victims.
Clinical or psychiatric social workers	A two-year master of social work graduate program plus postgraduate supervision prepares some social workers to offer psychotherapy, mostly to people with everyday personal and family problems. About half have earned the National Association of Social Workers' designation of clinical social worker.
Clinical psychologists	Most are psychologists with a Ph.D. or Psy.D. and expertise in research, assessment, and therapy, supplemented by a supervised internship and, often, postdoctoral training. About half work in agencies and institutions, half in private practice.
Psychiatrists	Psychiatrists are physicians who specialize in the treatment of psychological disorders. Not all psychiatrists have had extensive training in psychotherapy, but as M.D.s they can prescribe medications. Thus, they tend to see those with the most serious problems. Many have their own private practice.

whether treated by a psychiatrist, psychologist, or social worker; whether seen in a group or individual context; whether the therapist had extensive or relatively limited training and experience (Seligman, 1995). Other studies concur.

In search of some answers, researchers have studied the common ingredients of various therapies (Frank, 1982; Goldfried & Padawer, 1982; Strupp, 1986; Wampold, 2001, 2007). They suggest they all offer at least three benefits: *hope for demoralized people; a new perspective on oneself and the world;* and *an empathic, trusting, caring relationship*. (For those thinking about and seeking therapy, Close-Up: A Consumer's Guide to Psychotherapists offers some tips on when to seek help and how to start your search for a therapist who shares your perspective and goals.)

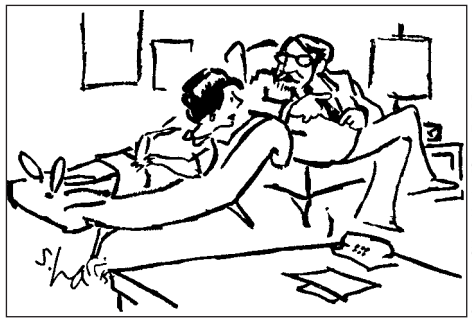
Hope for Demoralized People

People seeking therapy typically feel anxious, depressed, devoid of self-esteem, and incapable of turning things around. What any therapy offers is the expectation that, with commitment from the therapy seeker, things can and will get better. This belief, apart from any therapeutic technique, may function as a placebo, improving morale, creating feelings of self-efficacy, and diminishing symptoms (Prioleau et al., 1983). Statistical analyses showing that improvement is greater for placebo-treated

people than for untreated people suggest that one way therapies help is by harnessing the client's own healing powers. And that, said psychiatrist Jerome Frank (1982), helps us understand why all sorts of treatments—including some folk healing rites that are powerless apart from the participants' belief—may in their own time and place produce cures.

A New Perspective

Every therapy also offers people a plausible explanation of their symptoms and an alternative way of looking at themselves or responding to their world. Armed with a believable fresh perspective, they may approach life with a new attitude, open to making changes in their behaviors and their views of themselves.



"I utilize the best from Freud, the best from Jung, and the best from my Uncle Marty, a very smart fellow."

An Empathic, Trusting, Caring Relationship

To say that therapy outcome is unrelated to training and experience is not to say all *therapists* are equally effective. No matter what technique they use, effective therapists are empathic people who seek to understand another's experience; who communicate their care and concern to the client; and who earn the client's trust and respect through respectful listening, reassurance, and advice. Marvin Goldfried and his associates (1998) found these qualities in taped therapy sessions from 36 recognized master therapists. Some were cognitive-behavioral therapists, others were psychodynamic-interpersonal therapists. Regardless, the striking finding was how *similar* they were during the parts of their sessions they considered most significant. At key moments, the empathic therapists of both persuasions would help clients evaluate themselves, link one aspect of their life with another, and gain insight into their interactions with others.

The emotional bond between therapist and client—the *therapeutic alliance*—is a key aspect of effective therapy (Klein et al., 2003; Wampold, 2001). One U.S. National Institute of Mental Health depression-treatment study confirmed that the most effective therapists were those who were perceived as most empathic and caring and who established the closest therapeutic bonds with their clients (Blatt et al., 1996).

That all therapies offer hope through a fresh perspective offered by a caring person is what also enables paraprofessionals (briefly trained caregivers) to assist so many troubled people so effectively (Christensen & Jacobson, 1994). These three common elements are also part of what the growing numbers of self-help and support groups offer their members. And they are part of what traditional healers have offered (Jackson, 1992). Healers everywhere—special people to whom others disclose their suffering, whether psychiatrists, witch doctors, or

A caring relationship Effective therapists form a bond of trust with their patients.

shamans—have listened in order to understand and to empathize, reassure, advise, console, interpret, or explain (Torrey, 1986). Such qualities may also explain why people who feel supported by close relationships—who enjoy the fellowship and friendship of caring people—are less likely to need or seek therapy (Frank, 1982; O'Connor & Brown, 1984).

* * *

To recap, people who seek help usually improve. So do many of those who do not undergo psychotherapy, and that is a tribute to our human resourcefulness and our capacity to care for one another. Nevertheless, though the therapist's orientation and experience appear not to matter much, people who receive some psychotherapy usually improve more than those who do not. People with clear-cut, specific problems tend to improve the most.

Culture and Values in Psychotherapy

35-10: How do culture and values influence the therapist-client relationship?

All therapies offer hope, and nearly all therapists attempt to enhance their clients' sensitivity, openness, personal responsibility, and sense of purpose (Jensen & Bergin, 1988). But in matters of culture and values, therapists differ from one another and may differ from their clients (Delaney et al., 2007; Kelly, 1990).

These differences can become significant when a therapist from one culture meets a client from another. In North America, Europe, and Australia, for example, most therapists reflect their culture's individualism, which often gives priority to personal desires and identity. Clients who are immigrants from Asian countries, where people are mindful of others' expectations, may have trouble relating to therapies that require them to think only of their own well-being. Such differences help explain the reluctance of some minority populations to use mental health services (Sue, 2006). In one experiment, Asian-American clients matched with counselors who shared their cultural values (rather than mismatched with those who did not) perceived more counselor empathy and felt a stronger alliance with the counselor (Kim et al., 2005). Recognizing that therapists and clients may differ in their values, communication styles, and language, many therapy training programs now provide training in cultural sensitivity and recruit members of underrepresented cultural groups.

Another area of potential value conflict is religion. Highly religious people may prefer and benefit from religiously similar therapists (Smith et al., 2007; Wade et al., 2006; Worthington et al., 1996). They may have trouble establishing an emotional bond with a therapist who does not share their values. Albert Ellis, who advocated an aggressive *rational-emotive therapy,* and Allen Bergin, co-editor of the *Handbook of Psychotherapy and Behavior Change*, illustrated how sharply such differences can affect a therapist's view of a healthy person. Ellis (1980) assumed that "no one and nothing is supreme," that "self-gratification" should be encouraged, and that "unequivocal love, commitment, service, and . . . fidelity to any interpersonal commitment, especially marriage, leads to harmful consequences." Bergin (1980) assumed the opposite—that "because God is supreme, humility and the acceptance of divine authority are virtues," that "self-control and committed love and self-sacrifice are to be encouraged," and that "infidelity to any interpersonal commitment, especially marriage, leads to harmful consequences."

Bergin and Ellis disagreed more radically than most therapists on what values are healthiest. In so doing, however, they agreed on a more general point: Psychotherapists' personal beliefs influence their practice. Because clients tend to adopt their therapists' values (Worthington et al., 1996), some psychologists believe therapists should divulge those values more openly. (For a social-cultural perspective on disorders and therapy, see Close-Up: Preventing Psychological Disorders.)

Close-Up:

Preventing Psychological Disorders

35-11: What is the rationale for preventive mental health programs?

Psychotherapies and biomedical therapies tend to locate the cause of psychological disorders within the person with the disorder. We infer that people who act cruelly must be cruel and that people who act "crazy" must be "sick." We attach labels to such people, thereby distinguishing them from "normal" folks. It follows, then, that we try to treat "abnormal" people by giving them insight into their problems, by changing their thinking, by helping them gain control with drugs.

There is an alternative viewpoint: We could interpret many psychological disorders as understandable responses to a disturbing and stressful society. According to this view, it is not just the person who needs treatment, but also the person's social context. Better to prevent a problem by reforming a sick situation and by developing people's coping competencies than to wait for a problem to arise and then treat it.

A story about the rescue of a drowning person from a rushing river illustrates this viewpoint: Having successfully administered first aid to the first victim, the rescuer spots another struggling person and pulls her out, too. After a half-dozen repetitions, the rescuer suddenly turns and starts running away while the river sweeps yet another floundering person into view. "Aren't you going to rescue that fellow?" asks a bystander. "Heck no," the rescuer replies. "I'm going upstream to find out what's pushing all these people in."

Preventive mental health is upstream work. It seeks to prevent psychological casualties by identifying and alleviating the conditions that cause them. As George Albee (1986) pointed out, there is abundant evidence that poverty, meaningless work, constant criticism, unemployment, racism, and sexism undermine people's sense of competence, personal control, and self-esteem. Such stresses increase their risk of depression, alcohol dependency, and suicide.

"It is better to prevent than to cure."

—Peruvian folk wisdom

We who care about preventing psychological casualties should, Albee contended, support programs that alleviate these demoralizing situations. We eliminated smallpox not by treating the afflicted but by inoculating the unafflicted. We conquered yellow fever by controlling mosquitoes. Preventing psychological problems means empowering those who have learned an attitude of helplessness, changing environments that breed loneliness, renewing the disintegrating family, and bolstering parents' and teachers' skills at nurturing children's achievements and resulting self-esteem. Indeed, "Everything aimed at improving the human condition, at making life more fulfilling and meaningful, may be considered part of primary prevention of mental or emotional disturbance" (Kessler & Albee, 1975, p. 557). That includes the cognitive training that promotes positive thinking in children at risk for depression (Gillham et al., 2006).

REVIEWING

The Psychological Therapies

Module Review

Psychotherapy consists of interactions between a trained therapist and someone seeking to overcome psychological difficulties or achieve personal growth. The major psychotherapies derive from psychology's psychoanalytic, humanistic, behavioral, and cognitive perspectives. Today, many therapists combine aspects of these perspectives in an *eclectic approach* or psychotherapy integration.

35-1: What are the aims and methods of psychoanalysis, and how have they been adapted in psychodynamic therapy? Freud believed that *psychoanalysis* would help people achieve healthier, less anxious lives by gaining insight into the unconscious origins of their disorders and by taking responsibility for their own growth. Techniques included free association, dream analysis, and *interpretation* of *resistances* and *transference* to the therapist of long-repressed feelings. Contemporary *psychodynamic therapy* is briefer and less expensive than traditional psychoanalysis, and it focuses on current symptoms and themes common to many past and present important relationships.

35-2: What are the basic themes of humanistic therapy, such as Rogers' client-centered approach? Humanistic therapists have focused on clients' current conscious feelings and on their taking responsibility for their own growth. Rogers' *client-centered therapy* proposed that therapists' most important contributions are to exhibit genuineness, acceptance, and empathy. These qualities, plus the technique of *active listening*, provide a growth-fostering environment of *unconditional positive regard*. The humanistic and psychoanalytic therapies are known as *insight therapies* because they attempt to improve functioning by increasing awareness of underlying motives and defenses.

35-3: What are the assumptions and techniques of the behavior therapies? *Behavior therapists* do not attempt to explain the origin of problems or to promote self-awareness. Instead, they attempt to modify the problem behaviors themselves. Thus, they may *countercondition* behaviors through *exposure therapies,* such as *systematic desensitization* or virtual reality exposure therapy, or through *aversive conditioning.* Or they may apply operant conditioning principles with behavior modification techniques, such as *token economies.*

35-4: What are the goals and techniques of the cognitive therapies? The *cognitive therapies,* such as Beck's cognitive therapy for depression, aim to change unwanted behaviors by teaching people new and more adaptive ways of thinking and behaving. The widely researched and practiced *cognitive-behavioral therapy* combines cognitive and behavior therapies to help clients learn new ways of thinking and to practice the more positive approach in their actions.

35-5: What are the aims and benefits of group and family therapy? Group therapy sessions can help more people and cost less per person than individual therapy would. Clients may benefit from knowing others have similar problems and from getting feedback and reassurance. *Family therapy* views a family as an interactive system and attempts to help members discover the roles they play and to learn to communicate more openly and directly.

35-6: Does psychotherapy work? Who decides? Neither the positive testimonials of clients nor those of therapists can prove that therapy is effective. Statistical summaries of hundreds of outcome studies of psychotherapy's effectiveness indicate that people who remain untreated often improve, but those who receive psychotherapy are more likely to improve.

35-7: Are some therapies more effective than others? No one type of psychotherapy has been found to be generally superior to all others. Therapy is most effective for those with clear-cut, specific problems. Some therapies—such as behavioral conditioning for treating phobias and compulsions—are more effective for specific disorders. *Evidence-based practice* integrates the best available research with clinicians' expertise and patients' characteristics and preferences.

35-8: How do alternative therapies fare under scientific scrutiny? Controlled research has not supported the therapeutic power of eye movements during eye movement desensitization and reprocessing (EMDR) therapy. Light exposure therapy does seem to relieve the symptoms of seasonal affective disorder (SAD).

35-9: What three elements are shared by all forms of psychotherapy? All psychotherapies offer new hope for demoralized people; a fresh perspective; and (if the therapist is effective) an empathic, trusting, and caring relationship.

35-10: How do culture and values influence the therapist-client relationship? Therapists differ in the values that influence their aims. These differences may create problems when therapists work with clients with different cultural or religious perspectives. A person seeking therapy may want to ask about the therapist's treatment approach, values, credentials, and fees.

35-11: What is the rationale for preventive mental health programs? Preventive mental health programs are based on the idea that many psychological disorders could be prevented by changing oppressive, esteem-destroying environments into more benevolent, nurturing environments that foster individual growth and self-confidence.

Rehearse It!

1. A therapist who helps patients search for the unconscious roots of their problems and offers interpretations of their behaviors, feelings, and dreams is drawing from
   a. psychoanalysis.
   b. humanistic therapies.
   c. client-centered therapy.
   d. nondirective therapy.

2. According to psychoanalytic theory, important relationships in a patient's life—for example, an early relationship with a parent—may be reflected in strong feelings for the analyst. This process is called
   a. transference.
   b. resistance.
   c. interpretation.
   d. empathy.

3. Compared with psychoanalysts, humanistic therapists are more likely to emphasize
   a. hidden or repressed feelings.
   b. childhood experiences.
   c. psychological disorders.
   d. self-fulfillment and growth.

4. Especially important to Rogers' client-centered therapy is the technique of active listening. The therapist who practices active listening
   a. engages in free association.
   b. exposes the patient's resistances.
   c. restates and clarifies the client's statements.
   d. directly challenges the client's self-perceptions.

5. Behavior therapists apply learning principles to the treatment of problems such as phobias and alcohol dependency. In such treatment, the goal is to
   a. identify and treat the underlying causes of the problem.
   b. improve learning and insight.
   c. eliminate the unwanted behavior.
   d. improve communication and social sensitivity.

6. Behavior therapists often use counterconditioning to produce new responses to old stimuli. Two counterconditioning techniques are systematic desensitization and
   a. resistance.
   b. aversive conditioning.
   c. transference.
   d. active listening.

7. Systematic desensitization, which teaches people to relax in the presence of progressively more anxiety-provoking stimuli, has been especially effective in the treatment of
   a. phobias.
   b. depression.
   c. alcohol dependency.
   d. bed-wetting.

8. In token economies, people who display a desired behavior earn tokens that they can later exchange for other rewards. Token economies are an application of
   a. classical conditioning.
   b. counterconditioning.
   c. cognitive therapy.
   d. operant conditioning.

9. Cognitive therapy has been shown to be especially effective in treating
   a. bed-wetting.
   b. phobias.

c. alcohol dependency.
d. depression.

10. In family therapy, the therapist assumes that
a. only one family member needs to change.
b. each person's actions trigger reactions from other family members.
c. dysfunctional families must improve their interactions or give up their children.
d. all of these statements are true.

11. The most enthusiastic or optimistic view of the effectiveness of psychotherapy comes from
a. outcome research.
b. randomized clinical trials.
c. reports of clinicians and clients.
d. a government study of treatment for depression.

12. On average, troubled people who undergo therapy are more likely to improve than those who do not. Studies show that _____ therapy is most effective overall.
a. behavior
b. humanistic
c. psychodynamic
d. no one type of

13. The three ingredients of evidence-based practice are
a. research evidence, clinical expertise, and knowledge of the patient.
b. hope, a fresh perspective, and a caring relationship.
c. biological, psychological, and social-cultural influences.
d. the client, the clinician, and their shared values.

14. One alternative therapy that has passed the test of critical evaluation is
a. rebirthing therapy.
b. light exposure therapy.
c. facilitated communication.
d. energy therapy.

15. An approach that seeks to identify and alleviate conditions that put people at high risk for developing psychological disorders is called
a. deep-brain stimulation.
b. the mood-stabilizing perspective.
c. spontaneous recovery.
d. preventive mental health.

Answers: 1. a, 2. a, 3. d, 4. c, 5. c, 6. b, 7. a, 8. d, 9. d, 10. b, 11. c, 12. d, 13. a, 14. b, 15. d.

Terms and Concepts to Remember

psychotherapy, p. 513
eclectic approach, p. 513
psychoanalysis, p. 513
resistance, p. 513
interpretation, p. 513
transference, p. 514
psychodynamic therapy, p. 514
insight therapies, p. 515
client-centered therapy, p. 515
active listening, p. 515
unconditional positive regard, p. 515
behavior therapy, p. 516
counterconditioning, p. 517
exposure therapies, p. 517
systematic desensitization, p. 517
aversive conditioning, p. 518
token economy, p. 519
cognitive therapy, p. 520
cognitive-behavioral therapy, p. 521
family therapy, p. 522
evidence-based practice, p. 525

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. American playwright August Wilson (1945–2005) advised, "Your willingness to wrestle with your demons will cause your angels to sing." Which psychological therapy best matches this quote, and why?

2. After a near-fatal car accident, Rico developed an intense fear of driving on the freeway. In fact, his anxious response to the freeway has become so intense that he must take lengthy alternative routes to work each day. Which psychological therapy might best help Rico overcome his phobia, and why?

3. Talia is convinced the "anxiety-relief" herbal tea she ordered online has improved her mental health over the past few weeks. What other explanations might account for Talia's improvement?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

36

The Biomedical Therapies

One way to treat psychological disorders is with *psychotherapy,* in which a trained therapist uses psychological techniques to assist someone seeking to overcome difficulties or achieve personal growth. The other, often used with serious disorders, is **biomedical therapy**—physically changing the brain's functioning by altering its chemistry with drugs, or affecting its circuitry with various kinds of direct stimulation or psychosurgery. Psychologists can provide psychological therapies. But with a few exceptions, only psychiatrists (as medical doctors) offer biomedical therapies.

Drug Therapies

36-1: What are the drug therapies? What criticisms have been leveled against drug therapies?

By far the most widely used biomedical treatments today are the drug therapies. Since the 1950s, discoveries in **psychopharmacology** (the study of drug effects on mind and behavior) have revolutionized the treatment of people with severe disorders, liberating hundreds of thousands from hospital confinement. Thanks to drug therapy—and to efforts to minimize involuntary hospitalization and to support people with community mental health programs—the resident population of U.S. state and county mental hospitals is a small fraction of what it was a half-century ago (**FIGURE 36.1**).

Les Snider/The Image Works

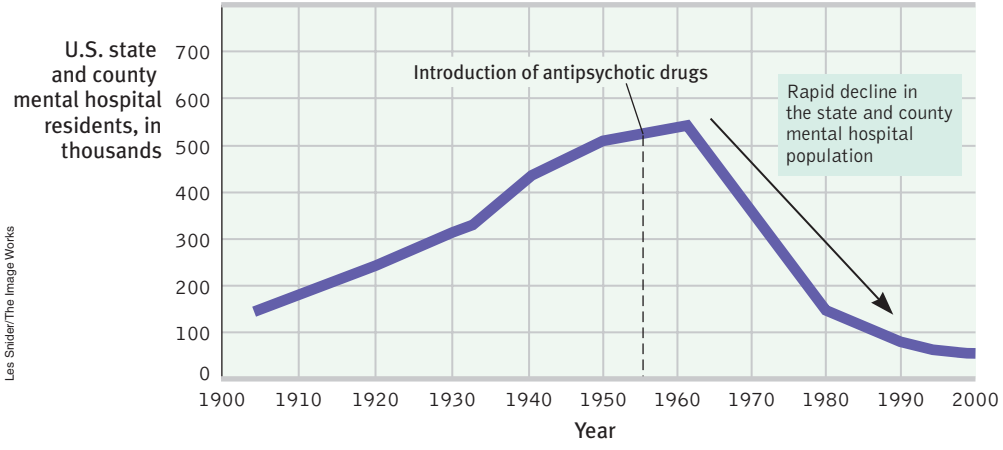


FIGURE 36.1 The emptying of U.S. mental hospitals After the widespread introduction of antipsychotic drugs, starting in about 1955, the number of residents in state and county mental hospitals declined sharply. But in the rush to deinstitutionalize the mentally ill, many people who were ill-equipped to care for themselves were left homeless on city streets. (Data from the U.S. National Institute of Mental Health and Bureau of the Census, 2004.)

Almost any new treatment, including drug therapy, is greeted by an initial wave of enthusiasm as many people apparently improve. But that enthusiasm often diminishes after researchers subtract the rates of (1) *spontaneous recovery* (normal recovery among untreated persons) and (2) recovery due to the *placebo effect,* which arises from the positive expectations of patients and mental health workers alike. So, to evaluate the effectiveness of any new drug, researchers give half the patients the drug, and the other half a similar-appearing placebo. Because neither the staff nor the patients know who gets which, this is called a *double-blind procedure*. The good news: In double-blind studies, several types of drugs have proven useful in treating psychological disorders.

Drug or placebo effect? For many people, depression lifts while taking an antidepressant drug. But people given a placebo may experience the same effect. Double-blind clinical trials suggest that, especially for those with severe depression, antidepressant drugs do have at least a modest clinical effect.

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"Our psychopharmacologist is a genius."

Antipsychotic Drugs

biomedical therapy prescribed medications or medical procedures that act directly on the patient's nervous system.

psychopharmacology the study of the effects of drugs on mind and behavior.

antipsychotic drugs drugs used to treat schizophrenia and other forms of severe thought disorder.

antianxiety drugs drugs used to control anxiety and agitation.

The revolution in drug therapy for psychological disorders began with the accidental discovery that certain drugs, used for other medical purposes, calmed patients with *psychoses* (disorders in which hallucinations or delusions indicate some loss of contact with reality). These **antipsychotic drugs,** such as chlorpromazine (sold as Thorazine), dampened responsiveness to irrelevant stimuli. Thus, they provided the most help to patients experiencing positive symptoms of schizophrenia, such as auditory hallucinations and paranoia (Lehman et al., 1998; Lenzenweger et al., 1989).

The molecules of most conventional antipsychotic drugs are similar enough to molecules of the neurotransmitter dopamine to occupy its receptor sites and block its activity. This finding reinforces the idea that an overactive dopamine system contributes to schizophrenia. Antipsychotics are powerful drugs. Some can produce sluggishness, tremors, and twitches similar to those of Parkinson's disease, which is marked by too little dopamine (Kaplan & Saddock, 1989). Long-term use of these medications can also produce *tardive dyskinesia* with involuntary movements of the facial muscles (such as grimacing), tongue, and limbs.

Perhaps you can guess an occasional side effect of L-dopa, a drug that raises dopamine levels for Parkinson's patients: hallucinations.

Patients exhibiting the negative symptoms of schizophrenia, such as apathy and withdrawal, often do not respond well to conventional antipsychotic drugs. Newer *atypical antipsychotics,* such as clozapine (marketed since 1989 as Clozaril), target both dopamine and serotonin receptors. This helps alleviate negative symptoms, sometimes enabling "awakenings" in these individuals. Atypical antipsychotics may also help those who have positive symptoms but have not responded to other drugs.

Although not more effective in controlling schizophrenia symptoms, many of the newer antipsychotics have fewer conventional side effects. But they may increase the risk of obesity and diabetes (Lieberman et al., 2005, 2006). One drug now undergoing testing stimulates receptors for the amino acid called glutamate. An initial trial has raised hopes that it may reduce schizophrenia symptoms with fewer side effects (Berenson, 2007).

Despite their drawbacks, antipsychotic drugs, combined with life-skills programs and family support, have enabled hundreds of thousands of people with schizophrenia who had been consigned to the back wards of mental hospitals to return to work and to near-normal lives (Leucht et al., 2003).

Antianxiety Drugs

Like alcohol, **antianxiety** agents, such as Xanax or Ativan, depress central nervous system activity (and so should not be used in combination with alcohol). Antianxiety drugs are often used in combination with psychological therapy. A new antianxiety drug, the antibiotic D-cycloserine, acts upon a receptor that facilitates the extinction of learned fears. Experiments indicate that the drug enhances the benefits of exposure therapy and helps relieve the symptoms of post-traumatic stress disorder and obsessive-compulsive disorder (Davis, 2005; Kushner et al., 2007).

A criticism sometimes made of the behavior therapies—that they reduce symptoms without resolving underlying problems—is also made of antianxiety drugs. Unlike the behavior therapies, however, these substances may be used as an ongoing treatment. "Popping a Xanax" at the first sign of tension can produce psychological dependence; the immediate relief reinforces a person's tendency to take drugs when anxious. Antianxiety drugs can also cause physiological dependence. After heavy use, people who stop taking them may experience increased anxiety, insomnia, and other withdrawal symptoms.

Over the dozen years at the end of the twentieth century, the rate of outpatient treatment for anxiety disorders nearly doubled. The proportion of psychiatric patients receiving medication during that time increased from 52 to 70 percent (Olfson et al., 2004). And the new standard drug treatment for anxiety disorders? Antidepressants.

On U.S. college campuses, the 9 percent of counseling center visitors taking psychiatric medication in 1994 nearly tripled, to 24.5 percent in 2004 (Duenwald, 2004).

antidepressant drugs drugs used to treat depression; also increasingly prescribed for anxiety. Different types work by altering the availability of various neurotransmitters.

Antidepressant Drugs

The **antidepressants** were named for their ability to lift people up from a state of depression, and this was their main use until recently. The label is a bit of a misnomer now that these drugs are increasingly being used to successfully treat anxiety disorders such as obsessive-compulsive disorder. They work by increasing the availability of norepinephrine or serotonin, neurotransmitters that elevate arousal and mood and appear scarce during depression. Fluoxetine, which tens of millions of users worldwide have known as Prozac, partially blocks the reabsorption and removal of serotonin from synapses (**FIGURE 36.2**). Because they slow the synaptic vacuuming up of serotonin, Prozac and its cousins Zoloft and Paxil are called *selective-serotonin-reuptake-inhibitors (SSRIs)*. Other antidepressants work by blocking the reabsorption or breakdown of both norepinephrine and serotonin. Though effective, these dual-action drugs have more potential side effects, such as dry mouth, weight gain, hypertension, or dizzy spells (Anderson, 2000; Mulrow, 1999). Administering them by means of a patch, bypassing the intestines and liver, helps reduce such side effects (Bodkin & Amsterdam, 2002).

After the introduction of SSRI drugs, the percentage of patients receiving medication for depression jumped dramatically, from 70 percent in 1987, the year before SSRIs were introduced, to 89 percent in 2001 (Olfson et al., 2003; Stafford et al., 2001). In the United States, 11 percent of women and 5 percent of men are now taking antidepressants (Barber, 2008).

Be advised: Patients with depression who begin taking antidepressants do not wake up the next day singing "Oh, what a beautiful morning!" Although the drugs begin to influence neurotransmission within hours, their full psychological effect often requires four weeks (and may involve a side effect of diminished sexual desire). One possible reason for the delay is that increased serotonin promotes *neurogenesis*—the birth of new brain cells, perhaps reversing stress-induced loss of neurons (Becker & Wojtowicz, 2007; Jacobs, 2004).

Antidepressant drugs are not the only way to give the body a lift. Aerobic exercise, which helps calm people who feel anxious and energize those who feel depressed, does about as much good for some people with mild to moderate depression, and has additional positive side effects (more on this topic later in this module). Cognitive therapy, by helping people reverse their habitual negative thinking style, can boost the drug-aided relief from depression and reduce the post-treatment risk of relapse (Hollon et al., 2002; Keller et al., 2000; Vittengl et al.,

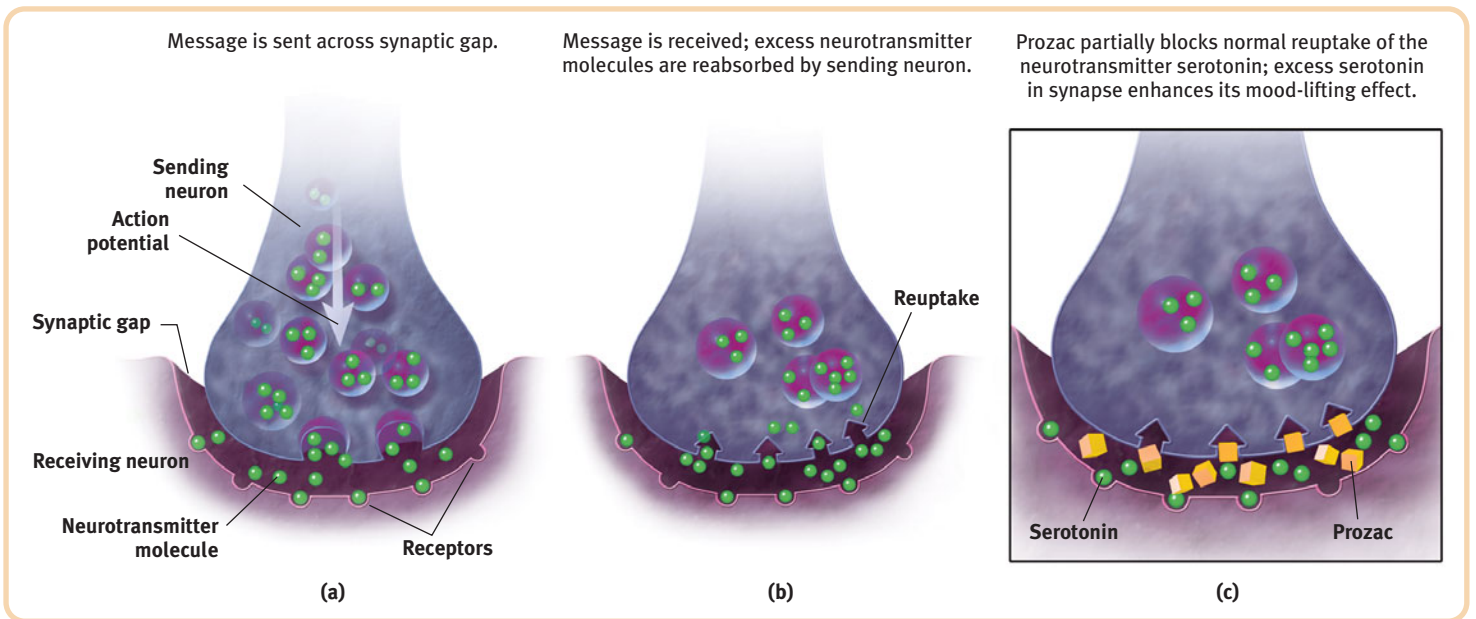


FIGURE 36.2 Biology of antidepressants
Shown here is the action of Prozac, which partially blocks the reuptake of serotonin.

2007). Better yet, some studies suggest, is to attack depression from both above and below (Goldapple et al., 2004; TADS, 2004). Use antidepressant drugs (which work, bottom-up, on the emotion-forming limbic system) in conjunction with cognitive-behavioral therapy (which works, top-down, starting with changed frontal lobe activity).

"If this doesn't help you don't worry, it's a placebo."

Everyone agrees that people with depression often improve after a month on antidepressants. But drug effects, like psychotherapy effects, can be inflated by other influences. After allowing for natural recovery and the placebo effect, how big is the drug effect? Not big, report Irving Kirsch and his colleagues (1998, 2002). Their analyses of double-blind clinical trials indicate that placebos accounted for about 75 percent of the active drug's effect. In a follow-up review that included unpublished clinical trials, the antidepressant drug effect was again modest (Kirsch et al., 2008). The placebo effect was less for those with severe depression, who benefited somewhat more from taking the drug. "Given these results, there seems little reason to prescribe antidepressant medication to any but the most severely depressed patients, unless alternative treatments have failed," Kirsch concluded (BBC, 2008). For about 1 in 4 people who do not respond to a particular antidepressant, switching to another does bring relief (Rush et al., 2006). Scientists dream of a not-too-far-off day when patients may be screened for genetic variations that will indicate drugs to use or avoid.

"No twisted thought without a twisted molecule."

—Attributed to psychologist Ralph Gerard

The effects of drug therapy may be less exciting than many TV ads suggest, but they also are less frightening than other stories have warned. Some people taking Prozac, for example, have committed suicide, but their numbers seem fewer than we would expect from the millions of depressed people now taking that medication. Moreover, a large British study revealed that the ups and downs of adolescent SSRI prescriptions over time were unrelated to the adolescent suicide rate (Wheeler et al., 2008). Prozac users who commit suicide are like cell-phone users who get brain cancer. Given the millions of people taking Prozac and using cell phones, alarming anecdotes tell us nothing.

"First of all I think you should know that last quarter's sales figures are interfering with my mood-stabilizing drugs."

The question critical thinkers want answered is this: Do these groups suffer an elevated *rate* of suicide and brain cancer? The answer in each case appears to be *no* (Grunebaum et al., 2004; Paulos, 1995; Tollefson et al., 1993, 1994). Three recent studies of between 70,000 and 439,000 patients concur that, in the long run, patients attempt fewer suicides if treated with antidepressants (Gibbons et al., 2007; Simon & Savarino, 2007; Sønergård et al., 2006).

Mood-Stabilizing Medications

In addition to antipsychotic, antianxiety, and antidepressant drugs, psychiatrists have *mood-stabilizing drugs* in their arsenal. The simple salt *lithium* can be an effective mood stabilizer for those suffering the emotional highs and lows of bipolar disorder. Australian physician John Cade discovered this in the 1940s when he administered lithium to a patient with severe mania. Although Cade's reasoning was misguided—he thought lithium had calmed excitable guinea pigs when actually it had made them sick—his patient became perfectly well in less than a week (Snyder, 1986). After suffering mood swings for years, about 7 in 10 people with bipolar disorder benefit from a long-term daily dose of this cheap salt (Solomon et al., 1995). Their risk of suicide is but one-sixth that of bipolar patients not taking lithium (Tondo et al., 1997).

"Lithium prevents my seductive but disastrous highs, diminishes my depressions, clears out the wool and webbing from my disordered thinking, slows me down, gentles me out, keeps me from ruining my career and relationships, keeps me out of a hospital, alive, and makes psychotherapy possible."

—Kay Redfield Jamison, *An Unquiet Mind*, 1995

Although we do not fully understand why, lithium works. And so does Depakote, a drug originally used to treat epilepsy and more recently found effective in the control of manic episodes associated with bipolar disorder.

Brain Stimulation

36-2: How effective is electroconvulsive therapy, and what other brain-stimulation options may offer relief from severe depression?

Electroconvulsive Therapy

The medical use of electricity is an ancient practice. Physicians treated the Roman Emperor Claudius (10 B.C.E.–C.E. 54) for headaches by pressing electric eels to his temples.

A more controversial brain manipulation occurs through shock treatment, or **electroconvulsive therapy (ECT).** When ECT was first introduced in 1938, the wide-awake patient was strapped to a table and jolted with roughly 100 volts of electricity to the brain, producing racking convulsions and brief unconsciousness. ECT therefore gained a barbaric image, one that lingers. Today, however, it is administered with briefer pulses, sometimes only to the brain's right side and with less memory disruption (HMHL, 2007). The patient receives a general anesthetic and a muscle relaxant (to prevent injury from convulsions) before a psychiatrist delivers 30 to 60 seconds of electrical current to the patient's brain (FIGURE 36.3). Within 30 minutes, the patient awakens and remembers nothing of the treatment or of the preceding hours. After three such sessions each week for two to four weeks, 80 percent or more of people receiving ECT improve markedly, showing no discernible brain damage. Study after study has confirmed that ECT is an effective treatment for severe depression in patients who have not responded to drug therapy (Pagnin et al., 2004; UK ECT Review Group, 2003). ECT reduces suicidal thoughts and is credited with saving many from suicide (Kellner et al., 2005). One leading medical journal has concluded that "the results of ECT in treating severe depression are among the most positive treatment effects in all of medicine" (Glass, 2001).

How does ECT alleviate severe depression? After more than 50 years, no one knows for sure. One recipient likened ECT to the smallpox vaccine, which was saving lives before we knew how it worked. Perhaps the shock-induced seizures calm neural centers where overactivity produces depression. ECT, like antidepressant drugs and exercise, also appears to boost the production of new brain cells (Bolwig & Madsen, 2007).

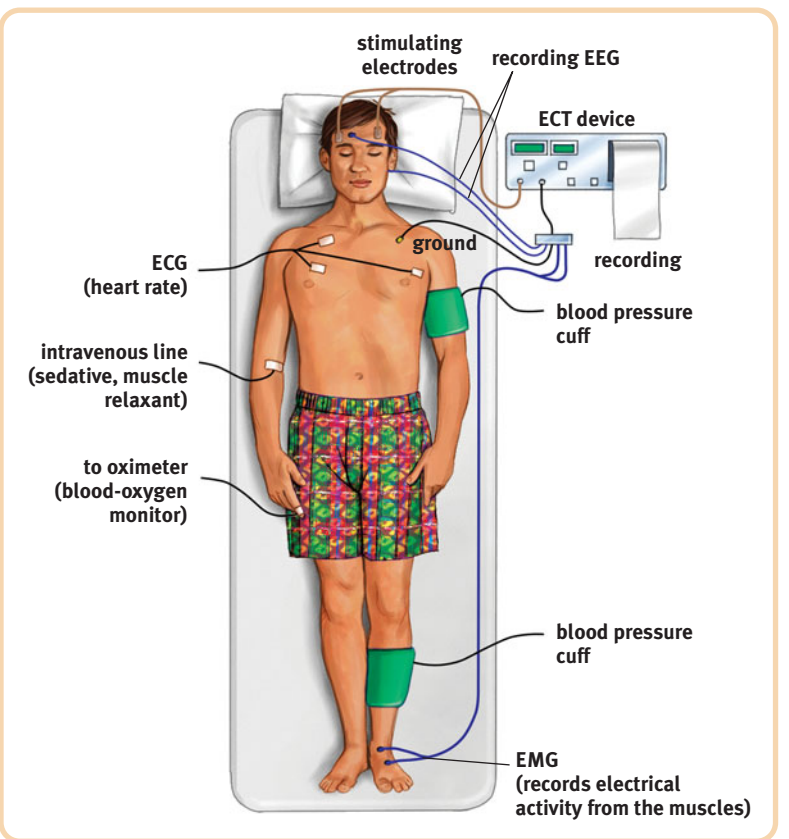


FIGURE 36.3 Electroconvulsive therapy
Although controversial, ECT is often an effective treatment for depression that does not respond to drug therapy.

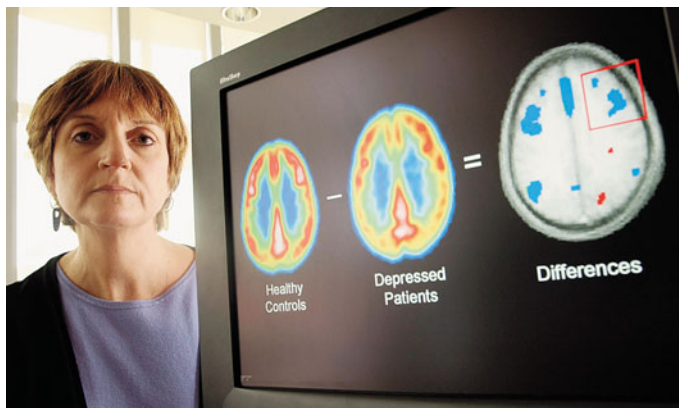
ECT's results are not always long lasting. About 4 in 10 ECT-treated patients relapse into depression within six months (Kellner et al., 2006). Nevertheless, in the minds of many psychiatrists and patients, ECT is a lesser evil than severe depression's misery, anguish, and risk of suicide. As research psychologist Norman Endler (1982) reported after ECT alleviated his deep depression, "A miracle had happened in two weeks."

Alternative Neurostimulation Therapies

Some patients with chronic depression have found relief through a chest implant that intermittently stimulates the vagus nerve, which sends signals to the brain's mood-related limbic system (Fitzgerald & Daskalakis, 2008; George & Belmaker, 2007; Marangell et al., 2007). Two other techniques—deep-brain stimulation and magnetic stimulation—are also raising hopes for gentler alternatives that jump-start neural circuits in the depressed brain.

Deep-Brain Stimulation

Patients whose depression has resisted both drugs that flood the body and ECT that jolts at least half the brain have benefited from an experimental treatment pinpointing a brain depression center. Neuroscientist Helen Mayberg and her colleagues (2005, 2006, 2007; Dobbs, 2006) have been focusing on a cortex area that bridges the thinking frontal lobes to the limbic system. They have discovered that this area, which is overactive in the brain of a depressed or temporarily sad person, becomes calm when treated by ECT or antidepressants.



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A depression switch? By comparing the brains of patients with and without depression, researcher Helen Mayberg identified a brain area that appears active in people who are depressed or sad, and whose activity may be calmed by deep-brain stimulation.

To experimentally excite neurons that inhibit this negative emotion-feeding activity, Mayberg drew upon the deep-brain stimulation technology sometimes used to treat tremors associated with Parkinson's disease. Among an initial 12 patients receiving implanted electrodes and a pacemaker stimulator, 8 experienced relief. Some felt suddenly more aware and became more talkative and engaged; others improved only slightly if at all. Future research will explore whether Mayberg has discovered a switch that can lift depression. Other researchers are following up on reports that deep-brain stimulation can offer relief to people with obsessive-compulsive disorder.

Magnetic Stimulation

Depressed moods also seem to improve when repeated pulses surge through a magnetic coil held close to a person's skull (**FIGURE 36.4** on the next page). Unlike deep-brain stimulation, the magnetic energy penetrates only to the brain's surface (though tests are under way with a higher energy field that penetrates more deeply). The painless procedure—called **repetitive transcranial magnetic stimulation (rTMS)**—is performed on wide-awake patients over several weeks. Unlike ECT, the rTMS procedure produces no seizures, memory loss, or other side effects.

In one double-blind experiment, 67 Israelis with major depression were randomly assigned to two groups (Klein et al., 1999). One group received rTMS daily for two weeks, while the other received sham treatments (without magnetic stimulation). At the end of the two weeks, half the stimulated patients showed at least a 50 percent improvement in their scores on a depression scale, as did only a quarter of the placebo group. One possible explanation is that the stimulation energizes depressed patients' relatively inactive left frontal lobe (Helmuth, 2001). When repeatedly stimulated, nerve cells can form functioning circuits through *long-term potentiation* (LTP), a process in which a synapse's firing potential increases.

electroconvulsive therapy (ECT) a biomedical therapy for severely depressed patients in which a brief electric current is sent through the brain of an anesthetized patient.

repetitive transcranial magnetic stimulation (rTMS) the application of repeated pulses of magnetic energy to the brain; used to stimulate or suppress brain activity.

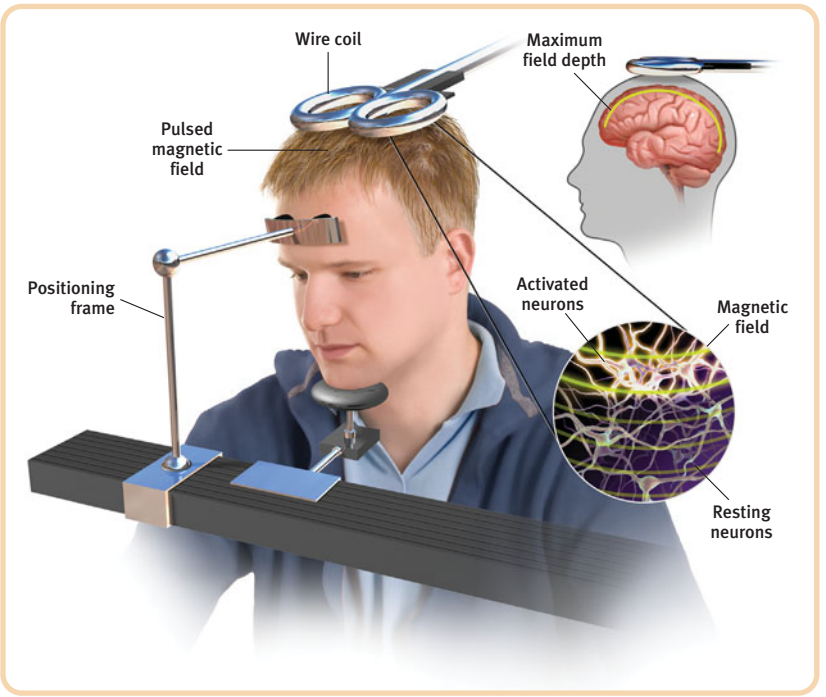


FIGURE 36.4 Magnets for the mind
Repetitive transcranial magnetic stimulation (rTMS) sends a painless magnetic field through the skull to the surface of the cortex. Pulses can be used to stimulate or dampen activity in various cortical areas. (From George, 2003.)

Other clinical experiments have had mixed results. Some have found little effect of rTMS treatment. However, several recent studies using the latest techniques have produced significant relief from depression, as compared with sham treatments (George & Belmaker, 2007; Gross et al., 2007; O'Reardon et al., 2007).

Psychosurgery

36-3: What is psychosurgery?

Because its effects are irreversible, **psychosurgery**—surgery that removes or destroys brain tissue—is the most drastic and the least-used biomedical intervention for changing behavior. In the 1930s, Portuguese physician Egas Moniz developed what became the best-known psychosurgical operation: the **lobotomy.** Moniz found that cutting the nerves connecting the frontal lobes with the emotion-controlling centers of the inner brain calmed uncontrollably emotional and violent patients. In a crude but easy and inexpensive procedure that took only about 10 minutes, a neurosurgeon would shock the patient into a coma, hammer an icepick-like instrument through each eye socket into the brain, and then wiggle it to sever connections running up to the frontal lobes. Tens of thousands of severely disturbed people—including President John F. Kennedy's sister, Rosemary—were "lobotomized" between 1936 and 1954, and Moniz was honored with a Nobel Prize (Valenstein, 1986).

Although the intention was simply to disconnect emotion from thought, a lobotomy's effect was often more drastic: It usually decreased the person's misery or tension, but it also produced a permanently lethargic, immature, uncreative person. During the 1950s, after some 35,000 people had been lobotomized in the United States alone, calming drugs became available and psychosurgery was largely abandoned. Today, lobotomies are history, and other psychosurgery is used only in extreme cases. For example, if a patient suffers uncontrollable seizures, surgeons can deactivate the specific nerve clusters that cause or transmit the convulsions. MRI-guided precision surgery is also occasionally done to cut the circuits involved in severe obsessive-compulsive disorder (Sachdev & Sachdev, 1997). Because these procedures are irreversible, however, neurosurgeons perform them only as a last resort.

psychosurgery surgery that removes or destroys brain tissue in an effort to change behavior.

lobotomy a now-rare psychosurgical procedure once used to calm uncontrollably emotional or violent patients. The procedure cut the nerves connecting the frontal lobes to the emotion-controlling centers of the inner brain.

Therapeutic Life-Style Change

36-4: How, by caring for their bodies with a healthy life-style, might people find some relief from depression?

The effectiveness of the biomedical therapies reminds us of a fundamental lesson: We find it convenient to talk of separate psychological and biological influences, but everything psychological is also biological (**FIGURE 36.5**). Every thought and feeling depends on the functioning brain. Every creative idea, every moment of joy or anger, every period of depression emerges from the electrochemical activity of the living brain. The influence is two-way: When psychotherapy relieves obsessive-compulsive behavior, PET scans reveal a calmer brain (Schwartz et al., 1996).

For years, we have trusted our bodies to physicians and our minds to psychiatrists and psychologists. That neat separation no longer seems valid. Stress affects body chemistry and health. And chemical imbalances, whatever their cause, can produce psychological disorders.

That lesson is being applied by Stephen Ilardi and his colleagues (2008) in their training seminars promoting *therapeutic life-style change*. Human brains and bodies were designed for physical activity and social engagement, they note. Our ancestors hunted, gathered, and built in groups, with little evidence of disabling depression. Indeed, those whose way of life entails strenuous physical activity, strong community ties, sunlight exposure, and plenty of sleep (think of foraging bands in Papua New Guinea, or Amish farming communities in North America) rarely experience major depression. "Simply put: Humans were never designed for the sedentary, disengaged, socially isolated, poorly nourished, sleep-deprived pace of twenty-first-century American life."

Other studies confirm that exercise reduces depression and anxiety and is therefore a useful adjunct to antidepressant drugs and psychotherapy (Dunn et al., 2005; Stathopoulou et al., 2006). Not only is exercise about as effective as drugs, some research suggests it better prevents symptom recurrence (Babyak et al., 2000; Salmon, 2001).

The Ilardi team was impressed by this research showing that regular aerobic exercise and a complete night's sleep boost mood and energy. So they invited small groups of people with depression to undergo a 12-week training program with the following goals:

- *Aerobic exercise,* 30 minutes a day, at least three times weekly (increases fitness and vitality, stimulates endorphins)
- *Adequate sleep,* with a goal of 7 to 8 hours a night (increases energy and alertness, boosts immunity)
- *Light exposure,* at least 30 minutes each morning with a light box (amplifies arousal, influences hormones)
- *Social connection,* with less alone time and at least two meaningful social engagements weekly (helps satisfy the human need to belong)
- *Anti-rumination,* by identifying and redirecting negative thoughts (enhances positive thinking)
- *Nutritional supplements,* including a daily fish oil supplement with omega-3 fatty acids (aids in healthy brain functioning)

In one study of 74 people, 77 percent of those who completed the program experienced relief from depressive symptoms, compared with a 19 percent rate in those assigned to a treatment-as-usual control condition. Future research will seek to replicate this striking result of life-style change and to identify which of the treatment components (some of which are part of other therapies) produce the therapeutic effect. But there seems little reason to doubt the truth of the Latin adage, *Mens sana in corpore sano:* "A healthy mind in a healthy body."

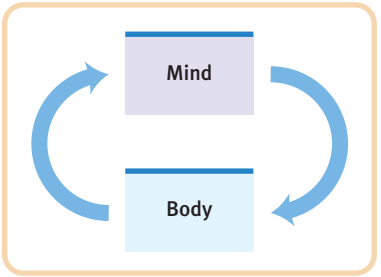


FIGURE 36.5 Mind-body interaction The biomedical therapies assume that mind and body are a unit: Affect one and you will affect the other.

"Mental disorders arise from physical ones, and likewise physical disorders arise from mental ones."

—*The Mahabharata,* C.E. 200

The Biomedical Therapies

Module Review

36-1: What are the drug therapies? What criticisms have been leveled against drug therapies? The *biomedical therapies* treat psychological disorders with medications or medical procedures that act directly on the nervous system. Drug therapy, the most widely used biomedical therapy, alters brain chemistry, often by decreasing or increasing the available supply of particular neurotransmitters. Many *antipsychotic drugs,* used in treating schizophrenia, block dopamine activity, and some can have serious side effects. *Antianxiety drugs,* which depress central nervous system activity, are used to treat anxiety disorders. These drugs can be physically and psychologically addictive. *Antidepressant drugs,* which increase the availability of serotonin and norepinephrine, are now used to treat anxiety as well as depression. Their full effect may not be felt for several weeks, and their effect is generally modest. Lithium and Depakote are mood stabilizers prescribed for those with bipolar disorder.

36-2: How effective is electroconvulsive therapy, and what other brain-stimulation options may offer relief from severe depression? *Electroconvulsive therapy (ECT),* in which a brief electric current is sent through the brain of an anesthetized patient, is an effective, last-resort treatment for severely depressed people who have not responded to other therapy. Newer alternative treatments being considered for chronic depression include deep brain stimulation, which has calmed an overactive brain region linked with negative emotions, and *repetitive transcranial magnetic stimulation (rTMS),* which is used to alter activity in cortical areas.

36-3: What is psychosurgery? *Psychosurgery* removes or destroys brain tissue in hopes of modifying behavior. The once-popular psychosurgery known as *lobotomy* proved to be dangerous and too radical. Neurosurgeons now rarely perform brain surgery to change behavior or moods. Brain surgery is a treatment of last resort because its effects are irreversible.

36-4: How, by caring for their bodies with a healthy life-style, might people find some relief from depression? Mind and body interact. In early studies, people who completed a program of aerobic exercise, adequate sleep, light exposure, social engagement, negative-thought reduction, and better nutrition have experienced relief from depressive symptoms.

Rehearse It!

1. Some antipsychotic drugs, used to calm schizophrenia patients, can have unpleasant side effects, most notably
   a. hyperactivity.
   b. convulsions and momentary memory loss.
   c. sluggishness, tremors, and twitches.
   d. paranoia.

2. Xanax and Ativan, which depress central nervous system activity, are often used as ongoing treatment and can lead to dependency. These drugs are referred to as _____ drugs.
   a. antipsychotic
   b. antianxiety
   c. antidepressant
   d. antineurotic

3. One substance that often brings relief to patients suffering the highs and lows of bipolar disorder is
   a. rTMS.
   b. Xanax.
   c. lithium.
   d. clozapine.

4. Lobotomy, once used to treat uncontrollably violent patients, is no longer an accepted biomedical treatment. ECT, however, remains in use as a treatment for
   a. severe obsessive-compulsive disorder.
   b. severe depression.
   c. schizophrenia.
   d. anxiety disorders.

Answers: 1. c, 2. b, 3. c, 4. b

Terms and Concepts to Remember

biomedical therapy, p. 534
psychopharmacology, p. 534
antipsychotic drugs, p. 535
antianxiety drugs, p. 535
antidepressant drugs, p. 536
electroconvulsive therapy (ECT), p. 538
repetitive transcranial magnetic stimulation (rTMS), p. 539
psychosurgery, p. 540
lobotomy, p. 540

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. How can we apply the knowledge that *everything psychological is simultaneously biological* to the treatment of depression?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

Social Psychology

Social Psychology

Although still young, this twenty-first century has dramatically reminded us that we are social animals whose lives and cultures revolve around how we think about, influence, and relate to one another.

On September 11, 2001, nineteen men with box cutters achieved an act of catastrophic violence that triggered fright, outrage, and a lust for revenge. But it also triggered an outpouring of compassion and care. What drives people to feel such hatred that they would destroy thousands of innocent lives? And what motivates the heroic altruism of those who died trying to save others and of the many more who reached out—with gifts of money, food, clothing, shelter, and love—to those coping with loss?

Echoes of these questions resurfaced after genocide plagued the Sudan's Darfur region beginning in 2003. And they resurfaced again during the war in Iraq, where survey-based estimates of deaths ranged from 151,000 to more than 1 million from 2002 through 2006 (Iraq Family Study, 2008; ORB, 2008). What factors affect the decision making of our world leaders? And how can we transform the closed fists of international conflict into the open arms of peace and cooperation?

As each day's news brings updates on acts of hate or heroism, defeats or victories, many of us live out our own experiences with love and loss. What spurs friendship and romance? And why do we help some but not others?

Human connections are powerful and can be perilous. Yet "we cannot live for ourselves alone," remarked the novelist Herman Melville. "Our lives are connected by a thousand invisible threads." *Social psychologists* explore these connections by *scientifically studying* how we *think about* one another (Module 37), *influence* one another (Module 38), and *relate to* one another (Module 39).

MODULE

37

Social Thinking

Attributing Behavior to Persons or to Situations

Attitudes and Actions

Our social behavior arises from our social cognition—our attitudes and our explanations of people's sometimes unexpected actions. Does her warmth reflect romantic interest, or is that how she relates to everyone? Does his absenteeism signify illness or laziness? Was the bar fight a hate crime or a drunken brawl? Such questions intrigue social psychologists. Just as personality psychologists study the enduring inner determinants of behavior that help to explain why different people act differently in a given situation, so **social psychologists** study the social influences that help explain why the same person acts differently in different situations.

Attributing Behavior to Persons or to Situations

37-1: How do we tend to explain others' behavior and our own?

Attribution theory proposes that we usually attribute others' behavior either to their internal dispositions or to their external situations (Heider, 1958). In class, we notice that Juliette seldom talks; over coffee, Jack talks nonstop. Attributing their behaviors to their personal dispositions, we decide Juliette is shy and Jack is outgoing. Because people do have enduring personality traits, these *dispositional attributions* are sometimes valid. However, we often fall prey to the **fundamental attribution error,** by overestimating the influence of personality and underestimating the influence of situations. In class, Jack may be as quiet as Juliette. Catch Juliette at a party and you may hardly recognize your quiet classmate. Explanations stressing these external influences are *situational attributions.*

A now-classic experiment illustrated the fundamental attribution error. David Napolitan and George Goethals (1979) had Williams College students talk, one at a time, with a young woman who acted either aloof and critical or warm and friendly. Beforehand, they told half the students that the woman's behavior would be spontaneous. They told the other half the truth—that she had been instructed to *act* friendly (or unfriendly). What do you suppose was the effect of being told the truth?

There was no effect. If the woman acted friendly, they inferred she *really was* a warm person. If she acted unfriendly, they inferred she *really was* a cold person. In other words, they attributed her behavior to her personal disposition *even when told that her behavior was situational*—that she was merely acting that way for the purposes of the experiment. Although the fundamental attribution error occurs in all cultures studied, this tendency to explain people's behavior in terms of their personal traits runs especially strong in individualistic Western countries. In East Asian cultures, for example, people are more sensitive to the power of the situation (Masuda & Kitayama, 2004).

You have surely committed the fundamental attribution error. In judging whether your psychology instructor is shy or outgoing, you have perhaps by now inferred that he or she has an outgoing personality. But you know your instructor only from the classroom, a situation that demands outgoing behavior. Catch the instructor in a different situation and you might be surprised. Outside their assigned roles, professors seem less professorial, presidents less presidential, servants less servile.

The instructor, however, might say, "Me, outgoing? It all depends on the situation. In class or with good friends, yes, I'm outgoing. But at conventions I'm really rather shy." When explaining *our own* behavior, which we observe in many different situations, or the behavior of those we know well and also see in varied situations, we are sensitive to how behavior changes with the situation (Idson & Mischel, 2001). (An important exception is our own intentional and admirable actions, which we more often attribute to our own good reasons than to situational causes [Malle, 2006; Malle et al., 2007].)

Alloy Photography/Veer

The fundamental attribution error If our new friend acts grouchy, we may decide she's a grouchy person. Her grouchiness may actually reflect her current situation—losing sleep over a financial worry, getting a flat tire on the way to work, or having a fight with a family member.

social psychology the scientific study of how we think about, influence, and relate to one another.

attribution theory the theory that we explain someone's behavior by crediting either the situation or the person's disposition.

fundamental attribution error the tendency for observers, when analyzing another's behavior, to underestimate the impact of the situation and to overestimate the impact of personal disposition.

Actor and observer perspectives make for differing attributions During their contentious U.S. presidential primaries in 2008, Barack Obama was criticized for seeming—in this camera perspective that faces him—to turn a cold shoulder to his opponent, Hillary Clinton. Obama later explained that he had greeted her earlier, and here was turning to speak to (as a picture shot from behind him might have shown) the unseen person to his left. In laboratory experiments, when a camera shows the actor's perspective, observers better appreciate the situation's influence.

Doug Mills/*New York Times*/Redux

When explaining *others'* behavior, particularly the behavior of strangers we have observed in only one type of situation, we often commit the fundamental attribution error: We disregard the situation and leap to unwarranted conclusions about their personality traits.

If we could take the observer's point of view, would we become more aware of our own personal style? To test this idea, researchers have reversed the perspectives of actor and observer. They filmed some interactions and then had participants view a replay of the situation—filmed from the other person's perspective. It worked. The viewers reversed their explanations of the behaviors (Lassiter & Irvine, 1986; Storms, 1973). Seeing the world from the actor's perspective, the observers better appreciated the situation.

As we act, our eyes look outward; we see others' faces, not our own. Reflecting on our past selves of 5 or 10 years ago also switches our perspective. Our present self adopts the observer's perspective and attributes our past behavior mostly to our traits (Pronin & Ross, 2006). In another 5 or 10 years, your today's self may seem like another person.

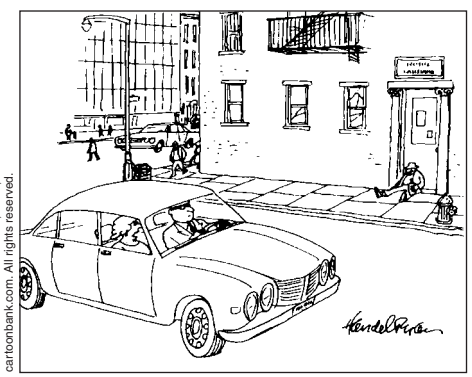
The Effects of Attribution

Our attributions—either to the person or to the situation—have important consequences in everyday life, as we struggle to explain others' actions (Fincham & Bradbury, 1993; Fletcher et al., 1990). A jury must decide whether a shooting was malicious or in self-defense. An interviewer must judge whether the applicant's geniality is genuine. A person must decide whether to attribute another's friendliness to sexual interest. Attributions matter. Happily married couples attribute a spouse's tart-tongued remark to a temporary situation ("She must have had a bad day at work"). Unhappily married couples attribute the same remark to a mean disposition ("Why did I marry such a hostile person?").

Some 7 in 10 college women report having experienced a man misattributing her friendliness as a sexual come-on (Jacques-Tiura et al., 2007).

Consider the political effects of attribution. How do you explain poverty or unemployment? Researchers in Britain, India, Australia, and the United States (Furnham, 1982; Pandey et al., 1982; Wagstaff, 1982; Zucker & Weiner, 1993) report that political conservatives tend to attribute such social problems to the personal dispositions of the poor and unemployed themselves: "People generally get what they deserve. Those who don't work are often freeloaders. Anybody who takes the initiative can still get ahead." Political liberals (and social scientists) are more likely to blame past and present situations: "If you or I had to live with the same poor education, lack of opportunity, and discrimination, would we be any better off?" To understand and prevent terrorism, they say, consider the situations that breed terrorists. Better to drain the swamps than swat the mosquitoes.

The point to remember: Our attributions—to individuals' dispositions or to their situations—should be made carefully. They have real consequences.



"Otis, shout at that man to pull himself together."

Attitudes and Actions

37-2: Does what we think affect what we do, or does what we do affect what we think?

Attitudes are feelings, often influenced by our beliefs, that predispose our reactions to objects, people, and events. If we *believe* someone is mean, we may *feel* dislike for the person and *act* unfriendly.

Mike Marsland/WireImage

Persuasive celebrity Long an environmental advocate, Leonardo DiCaprio has persuaded many to consider his cause by way of the peripheral route, thanks to his celebrated-actor status. Yet in 2007 he wrote, produced, and narrated a feature film documentary, *The 11th Hour,* which may also have persuaded others through the central route.

Attitudes Affect Actions

Our attitudes often predict our behavior. Attitudes are especially likely to affect behavior when external influences are minimal, and when the attitude is stable, specific to the behavior, and easily recalled (Glasman & Albarracín, 2006). One experiment used vivid, easily recalled information to persuade people that sustained tanning put them at risk for future skin cancer. One month later, 72 percent of the participants, and only 16 percent of those in a waitlist control group, had lighter skin (McClendon & Prentice-Dunn, 2001).

On a larger scale, former Vice President Al Gore's movie *An Inconvenient Truth,* and the Alliance for Climate Protection it spawned, are based on a similar premise: People's views of the reality and dangers of global climate change can change, and those changed attitudes can affect both personal behaviors and public policies. Indeed, by the end of 2007, an analysis of international opinion surveys by WorldPublicOpinion.org showed "widespread and growing concern about climate change. Large majorities believe that human activity causes climate change and favor policies designed to reduce emissions." Thanks to the mass persuasion campaign, many corporations, as well as campuses, are going green.

This tidal wave of change is an example of attitude change through **central route persuasion:** Interested people have focused on scientific evidence and arguments and responded with favorable thoughts. This type of persuasion occurs mostly when people are naturally analytical or involved in the issue. When issues don't engage systematic thinking, persuasion may still change attitudes through a faster **peripheral route.** In such cases, people respond to incidental cues, such as celebrity endorsements, and make snap judgments. Because central route persuasion is deeper—more thoughtful and less superficial—it is more durable and more likely to influence behavior.

So, our attitudes can change our behaviors. Sometimes, however, strong social pressures can weaken the attitude-behavior connection (Wallace et al., 2005). For example, after 9/11, the American public overwhelmingly supported President George W. Bush's preparation to attack Iraq. This support formed a social pressure that motivated Democratic leaders to vote for Bush's war plan, despite their private reservations (Nagourney, 2002). Nevertheless, when external influences are minimal, our attitudes influence our actions.

Actions Affect Attitudes

Now consider a more surprising principle: Not only will people sometimes stand up for what they believe, they will also come to believe in the idea they have supported. Many streams of evidence confirm that *attitudes follow behavior* (**FIGURE 37.1** on the next page).

The Foot-in-the-Door Phenomenon

Inducing people to act against their beliefs can affect their attitude. During the Korean war, many captured U.S. soldiers were imprisoned in war camps run by Chinese communists. Without using brutality, the captors secured the prisoners' collaboration in various activities. Some merely ran errands or accepted favors. Others made radio appeals and false confessions. Still others informed on fellow prisoners and divulged military information. When the war ended, 21 prisoners chose to stay with the communists, and many more returned home convinced that communism was good for Asia.

attitude feelings, often influenced by our beliefs, that predispose us to respond in a particular way to objects, people, and events.

central route persuasion attitude-change path in which interested people focus on the arguments and respond with favorable thoughts.

peripheral route persuasion attitude-change path in which people are influenced by incidental cues, such as a speaker's attractiveness.

FIGURE 37.1 Attitudes follow behavior
Cooperative actions, such as those performed by people on sports teams, feed mutual liking. Such attitudes, in turn, promote positive behavior.

foot-in-the-door phenomenon the tendency for people who have first agreed to a small request to comply later with a larger request.

role a set of expectations (norms) about a social position, defining how those in the position ought to behave.

A key ingredient of the Chinese "brain-washing" program was its effective use of the **foot-in-the-door phenomenon**—a tendency for people who agree to a small action to comply later with a larger one. The Chinese began with harmless requests but gradually escalated their demands (Schein, 1956). Having "trained" the prisoners to speak or write trivial statements, the communists then asked them to copy or create something more important—noting, perhaps, the flaws of capitalism. Then, perhaps to gain privileges, the prisoners participated in group discussions, wrote self-criticisms, or uttered public confessions. After doing so, they often adjusted their beliefs toward consistency with their public acts. This chicken-and-egg spiral, of actions-feeding-attitudes-feeding-actions, enables behavior to escalate. A trivial act makes the next act easier.

In dozens of experiments, people have been coaxed into acting against their attitudes or violating their moral standards. The nearly inevitable result: Doing becomes believing. When people are induced to harm an innocent victim—by making nasty comments or delivering electric shocks—they then begin to disparage their victim. If induced to speak or write on behalf of a position they have qualms about, they begin to believe their own words. The point is simple: To get people to agree to something big, "start small and build," said Robert Cialdini (1993). Knowing this, you can be wary of those who would exploit you with the tactic. Succumb to a temptation and you will find the next temptation harder to resist.

"If the King destroys a man, that's proof to the King it must have been a bad man."
—Thomas Cromwell, in Robert Bolt's *A Man for All Seasons,* 1960

Fortunately, the attitudes-follow-behavior principle works as well for good deeds as for bad. In one experiment, researchers posing as safe-driving volunteers asked Californians to permit the installation of a large, poorly lettered "Drive Carefully" sign in their front yards. Only 17 percent consented. They approached other home owners with a small request first: Would they display a 3-inch-high "Be a Safe Driver" sign? Nearly all readily agreed. When reapproached two weeks later to allow the large, ugly sign in their front yards, 76 percent consented (Freedman & Fraser, 1966). To secure a big commitment—whether a charitable contribution, blood donation, or product sale—it often pays to put your foot in the door: Start small and build.

Role-Playing Affects Attitudes

When you adopt a new **role**—when you become a college student, marry, or begin a new job—you strive to follow the social prescriptions. At first, your behaviors may feel phony, because you are *acting* a role. The first weeks in the military feel artificial—as if one is pretending to be a soldier. The first weeks of a marriage may feel like "playing house." Before long, however, what began as play-acting in the theater of life becomes *you*.

"Fake it until you make it."
—Alcoholics Anonymous saying

Close-Up:

Abu Ghraib Prison: An "Atrocity-Producing Situation"?

As the first photos emerged in 2004 from Iraq's Abu Ghraib prison, the civilized world was shocked. The photos showed U.S. military guards stripping prisoners naked, placing hoods on them, stacking them in piles, prodding them with electricity, taunting them with attack dogs, and subjecting them to sleep deprivation, humiliation, and extreme stress. Was the problem, as so many people initially supposed, a few bad apples—a few irresponsible or sadistic guards? That was the U.S. Army's seeming verdict when it court-martialed and imprisoned some of the guards, and then cleared four of the five top commanding officers responsible for Abu Ghraib's policies and operations. The lower-level military guards were "sick bastards," explained the defense attorney for one of the commanding officers (Tarbert, 2004).

Many social psychologists, however, reminded us that a toxic situation can make even good apples go bad (Fiske et al., 2004). "When ordinary people are put in a novel, evil place, such as most prisons, Situations Win, People Lose," offered

Originally published in the *New Yorker*

Bad apples or bad barrels? Like the Stanford Prison Experiment in 1972, the real-life Abu Ghraib prison fiasco in 2004 was a powerfully toxic situation, contended social psychologist Philip Zimbardo.

Philip Zimbardo (2004), adding, "That is true for the majority of people in all the relevant social psychological research done over the past 40 years."

Consider the situation, explained Zimbardo. The guards, some of them model soldier-reservists with no prior criminal or sadistic history, were exhausted from working 12-hour shifts, seven days a week. They were dealing with an enemy, and their prejudices were heightened by fears of lethal attacks and by the violent deaths of many fellow soldiers. They were put in an understaffed guard role, with minimal training and supervision. With support from high ranking people, they were then encouraged to "soften up" for interrogation detainees who had been denied access to the Red Cross. "When you put that set of horrendous work conditions and external factors together, it creates an evil barrel. You could put virtually anybody in it and you're going to get this kind of evil behavior" (Zimbardo, 2005).

Atrocious behaviors often emerge in atrocious situations. But remember also that people and situations interact. When put in with rotten apples, some people, but not others, become bad apples.

One famous laboratory study dramatically demonstrated the way actions—in this case, role-playing—can change attitudes. In the Stanford Prison Experiment, male college students volunteered to spend time in a simulated prison devised by psychologist Philip Zimbardo (1972). Some he randomly designated as guards; he gave them uniforms, billy clubs, and whistles and instructed them to enforce certain rules. The remainder became prisoners; they were locked in barren cells and forced to wear humiliating outfits. After a day or two in which the volunteers self-consciously "played" their roles, the simulation became real—too real. Most of the guards developed disparaging attitudes, and some devised cruel and degrading routines. One by one, the prisoners broke down, rebelled, or became passively resigned, causing Zimbardo to call off the study after only six days.

Psychologists add a cautionary note: In Zimbardo's prison simulation and in other atrocity-producing situations, some people succumb to the situation and others do not (Carnahan & McFarland, 2007; Haslam & Reicher, 2007; Mastroianni & Reed, 2006; Zimbardo, 2007). Person and situation interact. Water has the power to dissolve some substances, notes John Johnson (2007), but not all. In a watery situation, salt dissolves, sand does not (see Close-Up: Abu Ghraib Prison: An "Atrocity-Producing Situation"?).

Philip G. Zimbardo, Inc.

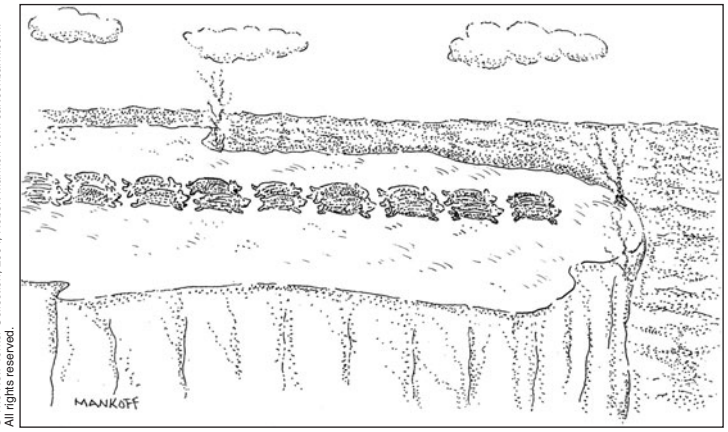
The power of the situation In Philip Zimbardo's Stanford Prison simulation, a toxic situation triggered degrading behaviors among those assigned to the guard role.

cognitive dissonance theory the theory that we act to reduce the discomfort (dissonance) we feel when two of our thoughts (cognitions) are inconsistent. For example, when our awareness of our attitudes and of our actions clash, we can reduce the resulting dissonance by changing our attitudes.

Cognitive Dissonance: When Actions and Attitudes Clash

So far, we have seen that actions can affect attitudes, sometimes turning prisoners into collaborators, doubters into believers, and compliant guards into abusers. But why?

One explanation is that when we become aware that our attitudes and actions don't coincide, we experience tension, or *cognitive dissonance*. To relieve this tension, according to the **cognitive dissonance theory** proposed by Leon Festinger, we often bring our attitudes into line with our actions. Dozens of experiments have explored this idea by having people perform some small act that they otherwise would not have supported. As a participant in one of these experiments, you might agree for a measly $2 to help a researcher by writing an essay that supports something you don't believe in (perhaps a tuition increase). Later, thinking that an administrator would be reading your essay, and feeling responsible for what you've done, you would probably feel uncomfortable about the inconsistency of your action (asking for a hike in tuition) and your attitudes ("Tuition is already too expensive!"). How could you reduce the dissonance? One way would be to start believing your phony words. At such times, it is as if we rationalize, "If I chose to do it (or write it), I must believe in it."



"Look, I have my misgivings, too, but what choice do we have except stay the course?"

The greater the dissonance, the more motivated we are to find consistency, such as changing our attitudes to help justify the act. The U.S. invasion of Iraq was mainly premised on the presumed threat of Saddam Hussein's weapons of mass destruction (WMD). As the war began, only 38 percent of Americans surveyed said the war was justified even if Iraq did not have WMD (Gallup, 2003). Nearly 80 percent believed such weapons would be found (Duffy, 2003; Newport et al., 2003). When no WMD were found, many Americans felt dissonance, which was heightened by their awareness of the war's financial and human costs, by scenes of chaos in Iraq, and by inflamed anti-American and pro-terrorist sentiments in some parts of the world.

To reduce this dissonance, some people revised their memories of the main rationale for going to war, convincing themselves that the goal had been liberating an oppressed people and promoting democracy in the Middle East. Before long, 58 percent of Americans—a majority—said they supported the war even if there were no WMD (Gallup, 2003). It was not until late 2004, when hopes for a flourishing peace waned, that Americans' support for the war dropped below 50 percent.

The attitudes-follow-behavior principle has a heartening implication: Although we cannot directly control all our feelings, we can influence them by altering our behavior. Our facial expressions and body postures affect our emotions. If we are down in the dumps, we can do as cognitive therapists advise and talk in more positive, self-accepting ways with fewer self–put-downs. If we are unloving, we can become more loving by behaving as if we were so—by doing thoughtful things, expressing affection, giving affirmation. "Assume a virtue, if you have it not," says Hamlet to his mother. "For use can almost change the stamp of nature."

"Sit all day in a moping posture, sigh, and reply to everything with a dismal voice, and your melancholy lingers. . . . If we wish to conquer undesirable emotional tendencies in ourselves, we must . . . go through the outward movements of those contrary dispositions which we prefer to cultivate."

—William James, *Principles of Psychology*, 1890

Racial attitudes in the United States have followed this pattern. In the years immediately after the introduction of school desegregation and the passage of the Civil Rights Act of 1964, White Americans expressed diminishing racial prejudice, enabling, 45 years later, Barack Obama's inauguration. As Americans in different regions came to act more alike—thanks to more uniform national standards against discrimination—they began to think more alike.

The point to remember: Cruel acts shape the self. But so do acts of good will. Act as though you like someone, and you soon will. Changing our behavior can change how we think about others and how we feel about ourselves.

Social Thinking

Module Review

37-1: How do we tend to explain others' behavior and our own? *Social psychologists* study how people think about, influence, and relate to one another. We generally explain people's behavior by *attributing* it to internal dispositions and/or to external situations. In committing the *fundamental attribution error,* we underestimate the influence of the situation on others' actions. When explaining our own behavior, we more often point to the situation.

37-2: Does what we think affect what we do, or does what we do affect what we think? *Attitudes*—feelings influenced by beliefs—affect our behavior when other influences are minimal, and when the attitude is stable, specific to the behavior, and easily recalled. Attempts to change behaviors by changing attitudes may follow a *central route to persuasion* or *peripheral route to persuasion.*

Studies of the *foot-in-the-door phenomenon* and of *role*-playing reveal that our actions (especially those we feel responsible for) can also modify our attitudes. *Cognitive dissonance theory* proposes that behavior shapes attitudes because we feel discomfort when our actions and attitudes differ. We reduce the discomfort by bringing our attitudes more into line with what we have done.

Rehearse It!

1. If we encounter a person who appears to be high on drugs, and we make the fundamental attribution error, we will probably attribute the person's behavior to
   a. moral weakness or an addictive personality.
   b. peer pressure.
   c. the easy availability of drugs on city streets.
   d. society's acceptance of drug use.
2. We tend to agree to a larger request more readily if we have already agreed to a small request. This tendency is called
   a. the fundamental attribution error.
   b. the foot-in-the-door phenomenon.
   c. the behavior-follows-attitudes principle.
   d. role-playing.
3. Cognitive dissonance theory predicts that we will act to reduce the discomfort we feel when our actions and attitudes clash. The theory explains why
   a. people who act against their attitudes tend to change their attitudes.
   b. attitudes predict actions when social pressures are minimized.
   c. changing an attitude—through persuasion—often fails to result in behavioral changes.
   d. people are hypocritical, talking one way and acting another.

Answers: 1. a, 2. b, 3. a.

Terms and Concepts to Remember

social psychology, p. 545
attribution theory, p. 545
fundamental attribution error, p. 545
attitude, p. 547
central route persuasion, p. 547
peripheral route persuasion, p. 547
foot-in-the-door phenomenon, p. 548
role, p. 548
cognitive dissonance theory, p. 550

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Driving to school one wintry day, Marco narrowly misses a car that slides through a red light. "Slow down! What a terrible driver," he thinks to himself. Moments later, Marco himself slips through an intersection and yelps, "Wow! These roads are awful. The city snow plows need to get out here." What social psychology principle has Marco just demonstrated? Explain.
2. Jamal's therapist has suggested that Jamal should "act as if" he is confident, even though he feels insecure and shy. Which social psychological theory would best support this suggestion, and what might the therapist be hoping to achieve?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

38

Social Influence

Social psychology's great lesson is the enormous power of social influence. This influence can be seen in our conformity, our compliance, and our group behavior. On campus, jeans are the dress code; on New York's Wall Street or London's Bond Street, dress suits are the norm. When we know how to act, how to groom, how to talk, life functions smoothly. Armed with social influence principles, advertisers, fund-raisers, and campaign workers aim to sway our decisions to buy, to donate, to vote. Isolated with others who share their grievances, dissenters may gradually become rebels, and rebels may become terrorists. Let's examine the pull of these social strings. How strong are they? How do they operate?

Conformity and Obedience

38-1: What do experiments on conformity and compliance reveal about the power of social influence?

social psychology the scientific study of how we think about, influence, and relate to one another.

Behavior is contagious. Consider:

- A cluster of people stand gazing upward, and passersby pause to do likewise.
- Baristas and street musicians know to "seed" their tip containers with money to suggest that others have given.
- One person laughs, coughs, or yawns, and others in the group soon do the same. Chimpanzees, too, are more likely to yawn after observing another chimpanzee yawn (Anderson et al., 2004).
- "Sickness" can also be psychologically contagious. In the anxious 9/11 aftermath, more than two dozen elementary and middle schools had outbreaks of children reporting red rashes, sometimes causing parents to wonder whether biological terrorism was at work (Talbot, 2002). Some cases may have been stress-related, but mostly, health experts concluded, people were just noticing normal early acne, insect bites, eczema, and dry skin from overheated classrooms.

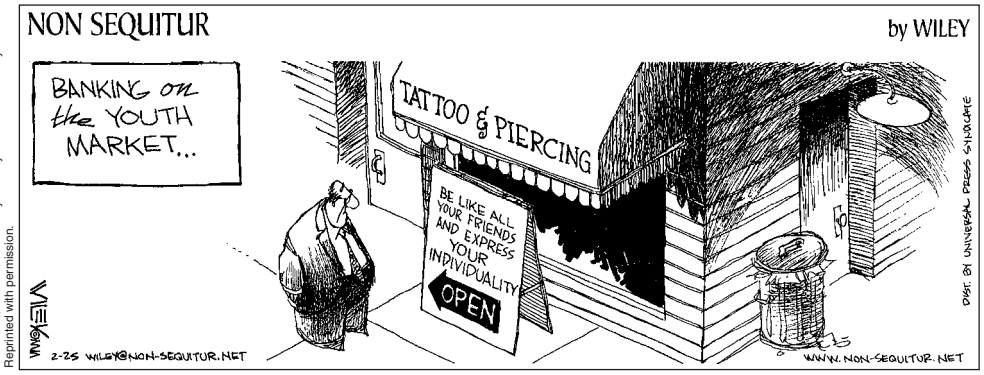
We are natural mimics—an effect Tanya Chartrand and John Bargh (1999) have called the *chameleon effect*—an effect they demonstrated by having students work in a room alongside a person who, unknown to the students, was working for the experimenter. Sometimes the persons rubbed their face; on other occasions, they shook their foot. Sure enough, the students tended to rub their own face when with the face-rubbing person and shake their own foot when with the foot-shaking person.

Unconsciously mimicking others' expressions, postures, and voice tones helps us feel what they are feeling. This helps explain why we feel happier around happy people than around depressed ones. Just hearing someone reading a neutral text in either a happy- or sad-sounding voice creates "mood contagion" in listeners (Neumann & Strack, 2000). Such automatic mimicry is part of empathy. Empathic people yawn more after seeing others yawn (Morrison, 2007). And empathic, mimicking people are liked more. Those most eager to fit in with a group seem intuitively to know this, for they are especially prone to unconscious mimicry (Lakin & Chartrand, 2003).

Sometimes the effects of suggestibility are more serious. Suicides, bomb threats, airplane hijackings, and school violence all have a curious tendency to come in clusters. In the eight days following the 1999 shooting rampage at Colorado's Columbine High School, every U.S. state except Vermont experienced threats of copycat violence. Pennsylvania alone recorded 60 such threats (Cooper, 1999). And in the wake of screen idol Marilyn Monroe's reported suicide on August 6, 1962, the number of suicides in the United States exceeded the usual August count by 200 (Phillips et al., 1985, 1989).

Niche conformity Are these students asserting their individuality or identifying themselves with others of the same microculture?

Yuriko Nakao/Reuters/Corbis



conformity adjusting one's behavior or thinking to coincide with a group standard.

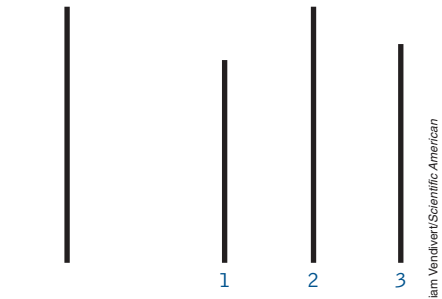
What causes clusters of violence? Do people act similarly because of their influence on one another? Or because they are simultaneously exposed to the same events and conditions? Seeking answers, social psychologists have conducted experiments on group pressure and conformity.

Group Pressure and Conformity

Suggestibility is a subtle type of **conformity**—adjusting our behavior or thinking toward some group standard. To study conformity, Solomon Asch (1955) devised a simple test. As a participant in what you believe is a study of visual perception, you arrive at the experiment location in time to take a seat at a table where five people are already seated. The experimenter asks which of three comparison lines is identical to a standard line. You see clearly that the answer is Line 2 and await your turn to say so after the others. Your boredom with this experiment begins to show when the next set of lines proves equally easy.

Now comes the third trial, and the correct answer seems just as clear-cut, but the first person gives what strikes you as a wrong answer: "Line 3" (**FIGURE 38.1**). When the second person and then the third and fourth give the same wrong answer, you sit up straight and squint. When the fifth person agrees with the first four, you feel your heart begin to pound. The experimenter then looks to you for your answer. Torn between the unanimity of your five fellow respondents and the evidence of your own eyes, you feel tense and much less sure of yourself than you were moments ago. You hesitate before answering, wondering whether you should suffer the discomfort of being the oddball. What answer do you give?

In the experiments conducted by Asch and others after him, thousands of college students have experienced this conflict. Answering such questions alone, they erred less than 1 percent of the time. But the odds were quite different when several others—confederates working for the experimenter—answered incorrectly. Although most people went with their eyes even when others did not, Asch nevertheless was disturbed by his result: More than one-third of the time, these "intelligent and well-meaning" college-student participants were then "willing to call white black" by going along with the group.



William Vandivert/*Scientific American*

FIGURE 38.1 Asch's conformity experiments Which of the three comparison lines is equal to the standard line? What do you suppose most people would say after hearing five others say, "Line 3"? In this photo from one of Asch's experiments, the student in the center shows the severe discomfort that comes from disagreeing with the responses of other group members (in this case, confederates of the experimenter).

normative social influence influence resulting from a person's desire to gain approval or avoid disapproval.

informational social influence influence resulting from one's willingness to accept others' opinions about reality.

Conditions That Strengthen Conformity

Asch's procedure became the model for later investigations. Although experiments have not always found so much conformity, they do reveal that conformity increases when

- one is made to feel incompetent or insecure.
- the group has at least three people.
- the group is unanimous. (The dissent of just one other person greatly increases social courage.)
- one admires the group's status and attractiveness.
- one has made no prior commitment to any response.
- others in the group observe one's behavior.
- one's culture strongly encourages respect for social standards.

Thus, we might predict the behavior of Austin, an enthusiastic but insecure new fraternity member: Noting that the 40 other members appear unanimous in their plans for a fund-raiser, Austin is unlikely to voice his dissent.

"Have you ever noticed how one example—good or bad—can prompt others to follow? How one illegally parked car can give permission for others to do likewise? How one racial joke can fuel another?"

—Marian Wright Edelman, *The Measure of Our Success*, 1992

Reasons for Conforming

Fish swim in schools. Birds fly in flocks. And humans, too, tend to go with their group, to think what it thinks and do what it does. Researchers have seen this in college residence halls, where over time students' attitudes become more similar to those living near them (Cullum & Harton, 2007). But why? Why do we clap when others clap, eat as others eat, believe what others believe, even see what others see? Social psychologists invite us to consider two reasons.

Sometimes we conform because we are responding to **normative social influence,** trying to avoid rejection or to gain social approval. The price we pay for violating social norms—understood rules for accepted and expected behavior—may be severe.

At other times, we are responding to **informational social influence.** Groups may provide valuable information, and only an uncommonly stubborn person will never listen to others. As Rebecca Denton demonstrated in 2004, sometimes it pays to assume others are right and to follow their lead. Denton set a record for the furthest distance driven on the wrong side of a British divided highway—30 miles, with only one minor sideswipe, before the motorway ran out and police were able to puncture her tires. Denton later explained that she thought the hundreds of other drivers coming at her were all on the wrong side of the road (Woolcock, 2004).

"Those who never retract their opinions love themselves more than they love truth."

—Joseph Joubert, eighteenth-century French essayist

Social influence experiments conducted in 17 countries demonstrate that cultures vary in the extent to which they value conformity. As we have seen throughout this text, Western Europeans and people in most English-speaking countries tend to prize individualism more than conformity and obedience, and in those cultures, conformity rates are lower than in cultures that stress collectivist values (Bond & Smith, 1996). American university students, for example, tend to see themselves, in domains ranging from consumer purchases to political views, as less conforming than others (Pronin et al., 2007). We are, in our own eyes, individuals amid a crowd of sheep. Thus, tattoos, once a symbol of nonconformity, may lose their appeal if they become too popular.

"I love the little ways you're identical to everyone else."

Obedience

Social psychologist Stanley Milgram (1963, 1974), a student of Solomon Asch, knew that people often comply with social pressures. But how would they respond to outright commands? To find out, he undertook what have become social psychology's most famous and controversial experiments. Imagine yourself as one of the nearly 1000 participants in Milgram's 20 experiments.

Responding to an advertisement, you come to Yale University's psychology department to participate in an experiment. Professor Milgram's assistant explains

that the study concerns the effect of punishment on learning. You and another person draw slips from a hat to see who will be the "teacher" (which your slip says) and who will be the "learner." The learner is then led to an adjoining room and strapped into a chair that is wired through the wall to an electric shock machine. You sit in front of the machine, which has switches labeled with voltages. Your task: to teach and then test the learner on a list of word pairs. You are to punish the learner for wrong answers by delivering brief electric shocks, beginning with a switch labeled "15 Volts—Slight Shock." After each of the learner's errors, you are to move up to the next higher voltage. With each flick of a switch, lights flash, relay switches click on, and an electric buzzing fills the air.

Courtesy of CUNY Graduate School and University Center

Stanley Milgram (1933–1984) This social psychologist's obedience experiments "belong to the self-understanding of literate people in our age" (Sabini, 1986).

Complying with the experimenter's instructions, you hear the learner grunt when you flick the third, fourth, and fifth switches. After you activate the eighth switch (labeled "120 Volts—Moderate Shock"), the learner shouts that the shocks are painful. After the tenth switch ("150 Volts—Strong Shock"), he cries, "Get me out of here! I won't be in the experiment anymore! I refuse to go on!" Hearing these pleas, you draw back. But the experimenter prods you: "Please continue—the experiment requires that you continue." If you still resist, he insists, "It is absolutely essential that you continue," or "You have no other choice, you *must* go on."

Obeying, you hear the learner's protests escalate to shrieks of agony as you continue to raise the shock level with each succeeding error. After the 330-volt level, the learner refuses to answer and falls silent. Still, the experimenter pushes you toward the final, 450-volt switch, ordering you to ask the questions and, if no correct answer is given, to administer the next shock level.

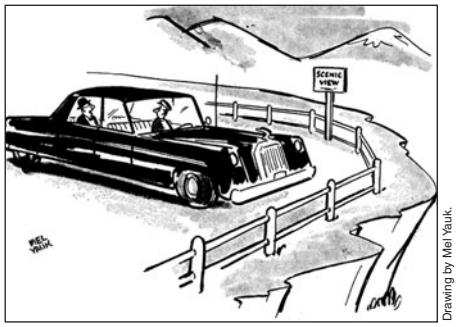
How far do you think you would follow the experimenter's commands? In a survey Milgram conducted before the experiment, most people declared they would stop playing such a sadistic-seeming role soon after the learner first indicated pain and certainly before he shrieked in agony. This also was the prediction made by each of 40 psychiatrists Milgram asked to guess the outcome. When Milgram actually conducted the experiment with men aged 20 to 50, he was astonished to find that 63 percent complied fully—right up to the last switch. Ten later studies that included women found women's compliance rates were similar to men's (Blass, 1999).

Did the teachers figure out the hoax—that no shock was being delivered? Did they correctly guess the learner was a confederate who only pretended to feel the shocks? Did they realize the experiment was really testing their willingness to comply with commands to inflict punishment? No. The teachers typically displayed genuine distress: They perspired, trembled, laughed nervously, and bit their lips.

Wondering whether the participants obeyed because the learners' protests were unconvincing, Milgram repeated the experiment with 40 new teachers. This time his confederate mentioned a "slight heart condition" while being strapped into the chair, and then he complained and screamed more intensely as the shocks became more punishing. Still, 65 percent of the new teachers complied fully (**FIGURE 38.2** on the next page).

In later experiments, Milgram discovered that subtle details of a situation powerfully influence people. When he varied the social conditions, the proportion of fully compliant participants varied from 0 to 93 percent. Obedience was highest when

- the person giving the orders was close at hand and was perceived to be a legitimate authority figure. (Such was the case in 2005 when Temple University's basketball coach sent a 250-pound bench player, Nehemiah Ingram, into a game with instructions to commit "hard fouls." Following orders, Ingram fouled out in four minutes after breaking an opposing player's right arm.)



Drawing by Mel Yauk.

"Drive off the cliff, James, I want to commit suicide."

Milgram's use of deception and stress triggered a debate over his research ethics. In response, Milgram cited participants' statements that they did not regret taking part, and psychiatrists' opinions (based on interviews of 40 "teachers") that there were no apparent emotional aftereffects. The experiments, he said, provoked less enduring stress than university students experience when facing and failing big exams (Blass, 1996).

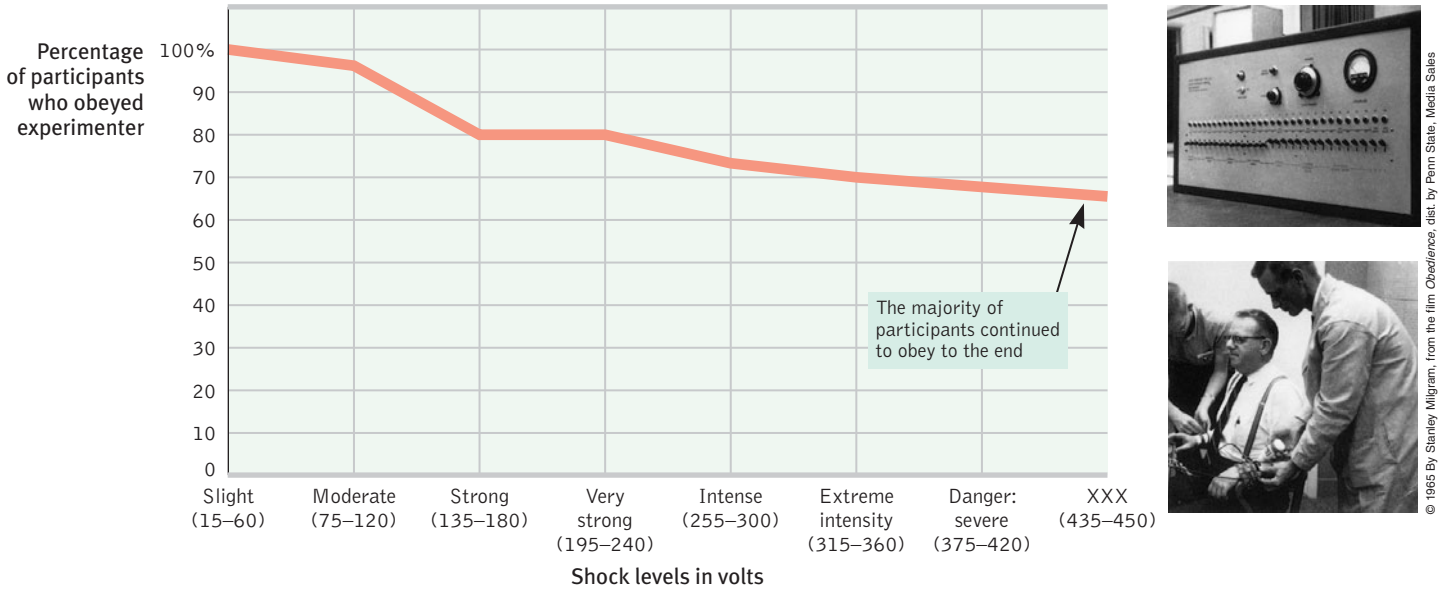


FIGURE 38.2 Milgram's follow-up obedience experiment In a repeat of the earlier experiment, 65 percent of the adult male "teachers" fully obeyed the experimenter's commands to continue. They did so despite the "learner's" earlier mention of a heart condition and despite hearing cries of protest after 150 volts and agonized protests after 330 volts. (Data from Milgram, 1974.)

- the authority figure was supported by a prestigious institution. Compliance was somewhat lower when Milgram dissociated his experiments from Yale University.
- the victim was depersonalized or at a distance, even in another room. (Similarly, in combat with an enemy they can see, many soldiers either do not fire their rifles or do not aim them properly. Such refusals to kill are rare among those who operate more distant artillery or aircraft weapons [Padgett, 1989].)
- there were no role models for defiance; that is, no other participants were seen disobeying the experimenter.

The power of legitimate, close-at-hand authorities is dramatically apparent in stories of those who complied with orders to carry out the Holocaust atrocities, and those who didn't. Obedience alone does not explain the Holocaust; anti-Semitic ideology produced eager killers as well (Mastroianni, 2002). But obedience was a factor. In the summer of 1942, nearly 500 middle-aged German reserve police officers were dispatched to German-occupied Jozefow, Poland. On July 13, the group's visibly upset commander informed his recruits, mostly family men, that they had been ordered to round up the village's Jews, who were said to be aiding the enemy. Able-bodied men were to be sent to work camps, and all the rest

Standing up for democracy Some individuals—roughly one in three in Milgram's experiments—resist social coercion, as did this unarmed man in Beijing, by single-handedly challenging an advancing line of tanks the day after the 1989 Tiananmen Square student uprising was suppressed.

were to be shot on the spot. Given a chance to refuse participation in the executions, only about a dozen immediately did so. Within 17 hours, the remaining 485 officers killed 1500 helpless women, children, and elderly by shooting them in the back of the head as they lay face down. Hearing the pleas of the victims, and seeing the gruesome results, some 20 percent of the officers did eventually dissent, managing either to miss their victims or to wander away and hide until the slaughter was over (Browning, 1992). But in real life, as in Milgram's experiments, the disobedient were the minority.

Another story was being played out in the French village of Le Chambon, where French Jews destined for deportation to Germany were being sheltered by villagers who openly defied orders to cooperate with the "New Order." The villagers' Protestant ancestors had themselves been persecuted and their pastors had been teaching them to "resist whenever our adversaries will demand of us obedience contrary to the orders of the Gospel" (Rochat, 1993). Ordered by police to give a list of sheltered Jews, the head pastor modeled defiance: "I don't know of Jews, I only know of human beings." Without realizing how long and terrible the war would be, or how much punishment and poverty they would suffer, the resisters made an initial commitment to resist. Supported by their beliefs, their role models, their interactions with one another, and their own initial acts, they remained defiant to the war's end.

Lessons From the Conformity and Obedience Studies

What do the Asch and Milgram experiments teach us about ourselves? How does judging the length of a line or flicking a shock switch relate to everyday social behavior? These studies, like all psychological experiments, aimed not to re-create the literal behaviors of everyday life but to capture and explore the underlying processes that shape those behaviors. Asch and Milgram devised experiments in which the participants had to choose between adhering to their own standards and being responsive to others, a dilemma we all face frequently.

In Milgram's experiments and its later replications (Burger, 2009), participants were also torn. Their moral sense warned them not to harm another, yet it also prompted them to obey the experimenter and to be a good research participant. With kindness and obedience on a collision course, obedience usually won.

Such experiments demonstrate that strong social influences can make people conform to falsehoods or capitulate to cruelty. "The most fundamental lesson of our study," Milgram noted, is that "ordinary people, simply doing their jobs, and without any particular hostility on their part, can become agents in a terrible destructive process" (1974, p. 6). Milgram did not entrap his teachers by asking them first to zap learners with enough electricity to make their hair stand on end. Rather, he exploited the foot-in-the-door effect, beginning with a little tickle of electricity and escalating step by step. In the minds of those throwing the switches, the small action became justified, making the next act tolerable. In Jozefow, in Le Chambon, and in Milgram's experiments, those who resisted usually did so early. After the first acts of compliance or resistance, attitudes began to follow and justify behavior.

"I was only following orders."

—Adolf Eichmann, Director of Nazi deportation of Jews to concentration camps

So it happens when people succumb, gradually, to evil. In any society, great evils sometimes grow out of people's compliance with lesser evils. The Nazi leaders suspected that most German civil servants would resist shooting or gassing Jews directly, but they found them surprisingly willing to handle the paperwork of the Holocaust (Silver & Geller, 1978). Likewise, when Milgram asked 40 men to administer the learning test while someone else did the shocking, 93 percent complied. Contrary to images of devilish villains, cruelty does not require monstrous characters; all it takes is ordinary people corrupted by an evil situation—ordinary soldiers who follow orders to torture prisoners, ordinary students who follow orders to haze initiates into their group, ordinary employees who follow orders to produce and market harmful products. Before leading the 9/11 attacks, Mohammed Atta reportedly was a sane, rational person who had been a "good boy" and an excellent student from a close-knit family—not someone who fits our image of a barbaric monster.

"The normal reaction to an abnormal situation is abnormal behavior."

—James Waller, *Becoming Evil: How Ordinary People Commit Genocide and Mass Killing*, 2007

Group Influence

When we conform, when we comply, we are reacting to the power of social influence. How do groups affect our behavior? To find out, social psychologists study the various influences that operate in the simplest of groups—one person in the presence of another—and those that operate in more complex groups, such as families, teams, and committees.

Individual Behavior in the Presence of Others

38-2: How is our behavior affected by the presence of others or by being part of a group?

Appropriately, social psychology's first experiments focused on the simplest of all questions about social behavior: How are we influenced by people watching us or joining us in various activities?

Social Facilitation

Having noticed that cyclists' racing times were faster when they competed against each other than when they competed with a clock, Norman Triplett (1898) hypothesized that the presence of others boosts performance. To test his hypothesis, Triplett had adolescents wind a fishing reel as rapidly as possible. He discovered that they wound the reel faster in the presence of someone doing the same thing. This phenomenon of stronger performance in others' presence is called **social facilitation.** For example, after a light turns green, drivers take about 15 percent less time to travel the first 100 yards when another car is beside them at the intersection than when they are alone (Towler, 1986).

But on tougher tasks (learning nonsense syllables or solving complex multiplication problems), people perform *less* well when observers or others working on the same task are present. Further studies revealed why the presence of others sometimes helps and sometimes hinders performance (Guerin, 1986; Zajonc, 1965). When others observe us, we become aroused. This arousal strengthens the most *likely* response—the correct one on an easy task, an incorrect one on a difficult task. Thus, when we are being observed, we perform well-learned tasks more quickly and accurately, and unmastered tasks less quickly and accurately.

James Michaels and his associates (1982) found that expert pool players who made 71 percent of their shots when alone made 80 percent when four people came to watch them. Poor shooters, who made 36 percent of their shots when alone, made only 25 percent when watched. The energizing effect of an enthusiastic audience probably contributes to the home advantage enjoyed by various sports teams. Studies of more than 80,000 college and professional athletic events in Canada, the United States, and England reveal that home teams win about 6 in 10 games (somewhat fewer for baseball and football, somewhat more for basketball and soccer—see TABLE 38.1).

The point to remember: What you do well, you are likely to do even better in front of an audience, especially a friendly audience; what you normally find difficult may seem all but impossible when you are being watched.

Social Loafing

Social facilitation experiments test the effect of others' presence on performance on an *individual task,* such as shooting baskets. But what happens to performance when people perform the task as a group? In a team tug-of-war, for example, do you suppose your effort would be more than, less than, or the same as the effort you would exert in a one-on-one tug-of-war? If you are like a group of blindfolded University of Massachusetts students told to pull as hard as you can on a rope, you would exert only 82 percent as much effort when you thought three others were pulling with you (Ingham et al., 1974).

Courtesy Hope College Public Relations

Social facilitation Skilled athletes often find they are "on" before an audience. What they do well, they do even better when people are watching.

TABLE 38.1 Home Advantage in Major Team Sports

Sport	Games Studied	Home Team Winning Percentage
Baseball	23,034	53.5%
Football	2,592	57.3
Ice hockey	4,322	61.1
Basketball	13,596	64.4
Soccer	37,202	69.0

From Courneya & Carron (1992).

Tony Freeman/Photo Edit

Working hard, or hardly working? In group projects, such as car washes, social loafing often occurs, as individuals free-ride on the efforts of others.

Bibb Latané (1981; Jackson & Williams, 1988) and others have described this diminished effort as **social loafing.** In 78 experiments conducted in the United States, India, Thailand, Japan, China, and Taiwan, social loafing occurred on various tasks, though it was especially common among men in individualistic cultures (Karau & Williams, 1993). In one of Latané's experiments, blindfolded people seated in a group clapped or shouted as loud as they could while listening through headphones to the sound of loud clapping or shouting. When told they were doing it with the others, the participants produced about one-third less noise than when they thought their individual efforts were identifiable.

Why this social loafing? First, people acting as part of a group feel less accountable and therefore worry less about what others think. Second, they may view their contribution as dispensable (Harkins & Szymanski, 1989; Kerr & Bruun, 1983). As many leaders of organizations know—and as you have perhaps observed on student group assignments—if group members share equally in the benefits regardless of how much they contribute, some may slack off. Unless highly motivated and identified with their group, they may free-ride on the other group members' efforts.

Deindividuation

So, the presence of others can arouse people (as in the social facilitation experiments) or can diminish their feelings of responsibility (as in the social loafing experiments). But sometimes the presence of others both arouses people *and* diminishes their sense of responsibility. The result can be uninhibited behavior ranging from screaming at a basketball referee to political rioting in the streets.

This diminished self-consciousness and loss of normal restraints in a group situation is termed **deindividuation.** It often occurs when group participation makes people feel aroused and anonymous. In one experiment, New York University women dressed in depersonalizing Ku Klux Klan–style hoods delivered twice as much electric shock to a victim as did identifiable women (Zimbardo, 1970). (As in all such experiments, the "victim" did not actually receive the shocks.) Similarly, tribal warriors who depersonalize themselves with face paints or masks are more likely than those with exposed faces to kill, torture, or mutilate captured enemies (Watson, 1973). Whether in a mob, at a rock concert, at a ballgame, or at worship, to lose self-consciousness (to become deindividuated) is to become more responsive to the group experience.

Effects of Group Interaction

38-3: What are group polarization and groupthink?

We have examined the conditions under which being in the *presence* of others can make easy tasks easier and difficult tasks harder, motivate people to exert themselves or tempt them to free-ride on the efforts of others, and enhance team spirit or fuel mob violence. Research shows that *interacting* with others can similarly have both bad and good effects.

social facilitation stronger responses on simple or well-learned tasks in the presence of others.

social loafing the tendency for people in a group to exert less effort when pooling their efforts toward attaining a common goal than when individually accountable.

deindividuation the loss of self-awareness and self-restraint occurring in group situations that foster arousal and anonymity.

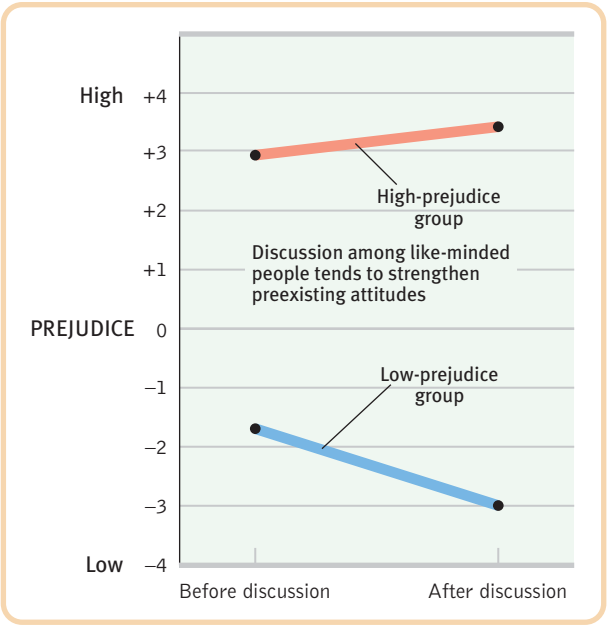


FIGURE 38.3 Group polarization If a group is like-minded, discussion strengthens its prevailing opinions. Talking over racial issues increased prejudice in a high-prejudice group of high school students and decreased it in a low-prejudice group (Myers & Bishop, 1970).

Group Polarization

Over time, initial differences between groups of college students tend to grow. If the first-year students at College X tend to be more intellectually oriented than those at College Y, that difference will probably be amplified by the time they are seniors. And if the political conservatism of students who join fraternities and sororities is greater than that of students who do not, the gap in the political attitudes of the two groups will probably widen as they progress through college (Wilson et al., 1975). Similarly, notes Eleanor Maccoby (2002) from her decades of observing gender development, gender differences—girls talking more intimately than boys and playing and fantasizing less aggressively—widen over time as children interact mostly with their own gender.

This enhancement of a group's prevailing tendencies—called **group polarization**—occurs when people within a group discuss an idea that most of them either favor or oppose. Group polarization can have beneficial results, as when it reinforces the resolve of those in a self-help group. But it can also have dire consequences. George Bishop and I discovered that when high-prejudice students discussed racial issues, they became *more* prejudiced (FIGURE 38.3). (Low-prejudice students became even more accepting.) The experiment's ideological separation and polarization finds a seeming parallel in the growing polarization of American politics. The percentage of landslide counties—voting 60 percent or more for one presidential candidate—increased from 26 percent in 1976 to 48 percent in 2004 (Bishop, 2004). More and more, people are living near and learning from others who think as they do. One experiment brought together small groups of citizens in liberal Boulder, Colorado, and other groups down in conservative Colorado Springs, to discuss global climate change, affirmative action, and same-sex unions. Although the discussions increased agreement within groups, those in Boulder generally moved further left and those in Colorado Springs moved further right (Schkade et al., 2006). Thus, ideological separation + deliberation = polarization between groups.

The polarizing effect of interaction among the like-minded applies also to suicide terrorists. Analyses of terrorist organizations around the world reveal that the terrorist mentality does not erupt suddenly (McCauley, 2002; McCauley & Segal, 1987). Rather, it usually arises among people who get together because of a grievance and then become more and more extreme as they interact in isolation from any moderating influences. Increasingly, group members (who may be isolated with other "brothers" and "sisters" in camps) categorize the world as "us" against "them" (Moghaddam, 2005; Qirko, 2004). Suicide terrorism is virtually never done on a personal whim (Merari, 2002). The like-minded echo chamber will continue to polarize people, speculates the 2006 U.S. National Intelligence Estimate: "We assess that the operational threat from self-radicalized cells will grow."

The Internet provides a medium for group polarization. Its tens of thousands of virtual groups enable bereaved parents, peacemakers, and teachers to find solace and support from kindred spirits. But the Internet also enables people who share interests in government conspiracy, extraterrestrial visitors, White supremacy, or citizen militias to find one another and to find support for their shared suspicions (McKenna & Bargh, 1998).

group polarization the enhancement of a group's prevailing inclinations through discussion within the group.

Groupthink

Does group interaction ever distort important decisions? Social psychologist Irving Janis began to think so as he read historian Arthur M. Schlesinger Jr.'s account of how President John F. Kennedy and his advisers blundered into an ill-fated plan to invade Cuba with 1400 CIA-trained Cuban exiles. When the invaders were easily captured and soon linked to the U.S. government, Kennedy wondered in hindsight, "How could we have been so stupid?"

To find out, Janis (1982) studied the decision-making procedures that led to the fiasco. He discovered that the soaring morale of the recently elected president and his advisers fostered undue confidence in the plan. To preserve the good group feeling, any dissenting views were suppressed or self-censored, especially after President Kennedy voiced his enthusiasm for the scheme. Since no one spoke strongly against the idea, everyone assumed support was unanimous. To describe this harmonious but unrealistic group thinking, Janis coined the term **groupthink.**

groupthink the mode of thinking that occurs when the desire for harmony in a decision-making group overrides a realistic appraisal of alternatives.

Janis and others then examined other historical fiascos—the failure to anticipate the 1941 Japanese attack on Pearl Harbor, the escalation of the Vietnam war, the U.S. Watergate cover-up, the Chernobyl nuclear reactor accident (Reason, 1987), and the U.S. space shuttle *Challenger* explosion (Esser & Lindoerfer, 1989). They discovered that in these cases, too, groupthink was fed by overconfidence, conformity, self-justification, and group polarization.

Groupthink surfaced again, reported the bipartisan U.S. Senate Intelligence Committee (2004), when "personnel involved in the Iraq WMD issue demonstrated several aspects of groupthink: examining few alternatives, selective gathering of information, pressure to conform within the group or withhold criticism, and collective rationalization." This groupthink led analysts to "interpret ambiguous evidence as conclusively indicative of a WMD program as well as ignore or minimize evidence that Iraq did not have [WMD] programs."

Despite such fiascos and tragedies, two heads are better than one in solving some types of problems. Knowing this, Janis also studied instances in which U.S. presidents and their advisers collectively made good decisions, such as when the Truman administration formulated the Marshall Plan, which offered assistance to Europe after World War II, and when the Kennedy administration worked to keep the Soviets from installing missiles in Cuba. In such instances—and in the business world, too, Janis believed—groupthink is prevented when a leader welcomes various opinions, invites experts' critiques of developing plans, and assigns people to identify possible problems. Just as the suppression of dissent bends a group toward bad decisions, so open debate often shapes good ones. This is especially so with diverse groups, whose varied perspectives enable creative or superior outcomes (Nemeth & Ormiston, 2007; Page, 2007). None of us is as smart as all of us.

"Truth springs from argument among friends."

—Philosopher David Hume, 1711–1776

"One of the dangers in the White House, based on my reading of history, is that you get wrapped up in groupthink and everybody agrees with everything and there's no discussion and there are no dissenting views. So I'm going to be welcoming a vigorous debate inside the White House."

—President-elect Barack Obama, press conference, December 1, 2008

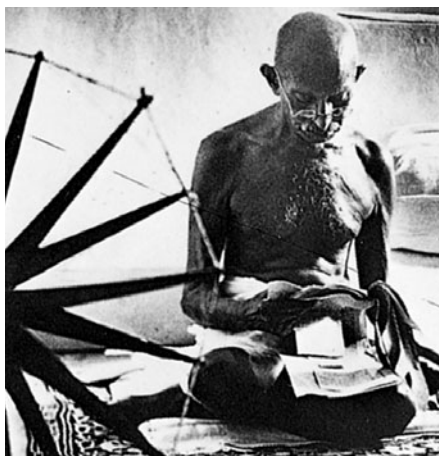
The Power of Individuals

38-4: How much power do we have as individuals? Can a minority sway a majority?

In affirming the power of social influence, we must not overlook our power as individuals. *Social control* (the power of the situation) and *personal control* (the power of the individual) interact. People aren't billiard balls. When feeling pressured, we may react by doing the opposite of what is expected, thereby reasserting our sense of freedom (Brehm & Brehm, 1981).

Three individual soldiers asserted their personal control at the Abu Ghraib prison (O'Connor, 2004). Lt. David Sutton put an end to one incident, which he reported to his commanders. Navy dog-handler William Kimbro refused pressure to participate in improper interrogations using his attack dogs. Specialist Joseph Darby brought those visual images of the horrors into the light of day, providing incontestable evidence of the atrocities. Each risked ridicule or even court-martial for not following orders.

Committed individuals can sway the majority and make social history. Were this not so, communism would have remained an obscure theory, Christianity would be a small Middle Eastern



Margaret Bourke-White/*Life* Magazine. © 1946 Time Warner, Inc.

Gandhi As the life of Hindu nationalist and spiritual leader Mahatma Gandhi powerfully testifies, a consistent and persistent minority voice can sometimes sway the majority. Gandhi's nonviolent appeals and fasts were instrumental in winning India's independence from Britain in 1947.

sect, and Rosa Parks' refusal to sit at the back of the bus would not have ignited the U.S. civil rights movement. Technological history, too, is often made by innovative individuals who overcome the majority's resistance to change. To many, the railroad was a nonsensical idea; some farmers even feared that train noise would prevent hens from laying eggs.

European social psychologists have sought to better understand *minority influence*—the power of one or two individuals to sway majorities (Moscovici, 1985). They investigated groups in which one or two individuals consistently expressed a controversial attitude or an unusual perceptual judgment. They repeatedly found that a minority that unswervingly holds to its position is far more successful in swaying the majority than is a minority that waffles. Holding consistently to a minority opinion will not make you popular, but it may make you influential. This is especially so if your self-confidence stimulates others to consider why you react as you do. Although people often follow the majority view publicly, they may privately develop sympathy for the minority view. Even when a minority's influence is not yet visible, it may be persuading some members of the majority to rethink their views (Wood et al., 1994). The powers of social influence are enormous, but so are the powers of the committed individual.

REVIEWING

Social Influence

Module Review

38-1: What do experiments on conformity and compliance reveal about the power of social influence? Asch's *conformity* studies demonstrated that under certain conditions people will adopt a group's judgment even when it is clearly incorrect. We may conform either to gain social approval *(normative social influence)* or because we welcome the information that others provide *(informational social influence)*. In Milgram's famous experiments, people torn between obeying an experimenter and responding to another's pleas to stop the apparent shocks usually chose to obey orders. People most often obeyed when the person giving orders was nearby and was perceived as a legitimate authority figure; when the person giving orders was supported by a prestigious institution; when the victim was depersonalized or at a distance; and when no other person modeled defiance by disobeying.

38-2: How is our behavior affected by the presence of others or by being part of a group? *Social facilitation* experiments reveal that the presence of either observers or co-actors can arouse individuals, boosting their performance on easy tasks but hindering it on difficult ones. When people pool their efforts toward a group goal, *social loafing* may occur as individuals free-ride on others' efforts. *Deindividuation*—becoming less self-aware and self-restrained in a group situation—may happen when people are both aroused and made to feel anonymous.

38-3: What are group polarization and groupthink? Discussions among like-minded members often produces *group polarization*, as prevailing attitudes intensify. *Groupthink* is the tendency to suppress unwelcome information and make unrealistic decisions for the sake of group harmony. To prevent groupthink, leaders can welcome a variety of opinions, invite experts' critiques, and assign people to identify possible problems in developing plans.

38-4: How much power do we have as individuals? Can a minority sway a majority? The power of the group is great, but even a small minority may sway group opinion, especially when the minority expresses its views consistently.

Rehearse It!

1. Researchers have found that a person is most likely to conform to a group if
   a. the group members have diverse opinions.
   b. the person feels competent and secure.
   c. the person admires the group's status.
   d. no one else will observe the person's behavior.
2. In Milgram's experiments, the rate of compliance was highest when
   a. the victim was at a distance from the "teacher."
   b. the victim was close at hand.
   c. other "teachers" refused to go along with the experimenter.
   d. the "teacher" disliked the victim.
3. Social facilitation—improved performance in the presence of others—occurs with

a. any physical task.
b. new learning.
c. a well-learned task.
d. competitive sports or activities only.

4. When people are part of a group working toward a common goal, their individual efforts are diminished. Latané and his colleagues called this
a. minority influence.
b. social facilitation.
c. social loafing.
d. group polarization.

5. In a group situation that fosters arousal and anonymity, a person sometimes loses self-consciousness and self-control. This phenomenon is called
a. social loafing.
b. deindividuation.
c. groupthink.
d. group polarization.

6. If a group is like-minded, discussion strengthens its prevailing opinion. This effect is called
a. groupthink.
b. minority influence.
c. group polarization.
d. social facilitation.

7. When a group's desire for harmony overrides its realistic appraisal of alternatives, _____ has occurred.
a. group polarization
b. groupthink
c. social facilitation
d. deindividuation

Answers: 1. c, 2. a, 3. c, 4. c, 5. b, 6. c, 7. b.

Terms and Concepts to Remember

social psychology, p. 552
conformity, p. 553
normative social influence, p. 554
informational social influence, p. 554
social facilitation, p. 558
social loafing, p. 559
deindividuation, p. 559
group polarization, p. 560
groupthink, p. 561

Test For Success: Critical Thinking Exercise

By Amy Himsel, El Camino College

1. Dr. Huang, a popular music professor whose classes are always jam-packed, delivers riveting lectures on music history but gets nervous and often makes mistakes when describing exam statistics in front of the class. Why does his performance vary by task?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

MODULE

39

Social Relations

What does **social psychology** teach us about how we relate to one another? What causes us to harm or to help or to fall in love? How can we move a destructive conflict toward a just peace? We will ponder the bad and the good: from prejudice and aggression to attraction, altruism, and peacemaking.

Prejudice

39-1: What is prejudice?

Prejudice means "prejudgment." It is an unjustifiable and usually negative attitude toward a group—often a different cultural, ethnic, or gender group. Like all attitudes, **prejudice** is a mixture of *beliefs* (in this case called **stereotypes**), *emotions* (hostility, envy, or fear), and predispositions to *action* (to **discriminate**). To *believe* that obese people are gluttonous, to *feel* dislike for an obese person, and to be hesitant to hire or date an obese person is to be prejudiced. Prejudice is a negative *attitude;* discrimination is a negative *behavior.*

How Prejudiced Are People?

To learn about levels of prejudice, we can assess what people say and what they do. Judging by what Americans say, gender and racial attitudes have changed dramatically in the last half-century. The one-third of Americans who in 1937 told Gallup they would vote for a qualified woman whom their party nominated for president soared to 89 percent in 2007. Support for all forms of racial contact, including interracial marriage, has also dramatically increased. And nearly everyone agrees that children of all races should attend the same schools and that women and men should receive the same pay for the same job.

Yet as *overt* prejudice wanes, *subtle* prejudice lingers. A slew of recent experiments illustrates that prejudice can be not only subtle but also automatic and unconscious (see Close-Up: Automatic Prejudice). Despite increased verbal support for interracial marriage, many people admit that in socially intimate settings (dating, dancing, marrying) they would feel uncomfortable with someone of another race. And in Western Europe, where many "guest workers" and refugees settled at the end of the twentieth century, "modern prejudice"—an indirect racial prejudice that, for example, rejects immigrant minority job applicants for supposedly nonracial reasons—has been replacing blatant prejudice (Jackson et al., 2001; Lester, 2004; Pettigrew, 1998, 2006).

In most places in the world, gays and lesbians cannot comfortably acknowledge who they are and whom they love. Gender prejudice and discrimination persist, too. Despite gender equality in intelligence scores, people have tended to perceive their fathers as more intelligent than their mothers (Furnham & Rawles, 1995). In Saudi Arabia, women are not allowed to drive. In Western countries, we pay more to those (usually men) who drive machines that take care of our streets than to those (usually women) who take care of our children. Worldwide, women are more likely to live in poverty (Lipps, 1999), and their 69 percent literacy rate is well below men's 83 percent (PRB, 2002).

Female infants are no longer left out on a hillside to die of exposure, as was the practice in ancient Greece. Yet even today boys are often valued more than their sisters. With testing that enables sex-selective abortions, several south Asian countries, including certain regions of China and India, have experienced a shortfall in female births. Natural female mortality and the normal male-to-female newborn ratio (105-to-100) hardly explain why 95 percent of children in Chinese orphanages have reportedly been girls (Webley, 2009). Nor do they explain the world's estimated

"Unhappily the world has yet to learn how to live with diversity."

—Pope John Paul II, Address to the United Nations, 1995

social psychology the scientific study of how we think about, influence, and relate to one another.

prejudice an unjustifiable (and usually negative) attitude toward a group and its members. Prejudice generally involves stereotyped beliefs, negative feelings, and a predisposition to discriminatory action.

stereotype a generalized (sometimes accurate but often overgeneralized) belief about a group of people.

discrimination unjustifiable negative behavior toward a group and its members.

Close-Up:

Automatic Prejudice

As we have seen throughout this book, we process information on two levels: conscious and unconscious. To some extent, our thinking, our memories, and our attitudes are *explicit*—on the radar screen of our awareness. And to an even greater extent, today's researchers believe, they are *implicit*—below the radar, out of sight. Modern studies of implicit, automatic attitudes indicate that prejudice is often more of an unthinking knee-jerk response than a decision. Consider these findings on U.S. racial prejudice:

IMPLICIT RACIAL ASSOCIATIONS Asked to tap keys to associate words and images, people more quickly associate positive words such as *happy* or *peace* with positive objects such as flowers, and negative words such as *rotten* or *ugly* with insects. Extending these Implicit Association Tests, Anthony Greenwald and his colleagues (1998) showed that even people who deny harboring racial prejudice may carry negative associations. For example, 9 in 10 White respondents took longer to identify pleasant words (such as *peace* and *paradise*) as "good" when presented with Black-sounding names (such as *Latisha* and *Darnell*) rather than White-sounding names (such as *Katie* and *Ian*). Moreover, people who more quickly associate good things with White names or faces also are the quickest to perceive anger and apparent threat in Black faces (Hugenberg & Bodenhausen, 2003). (By 2008, more than 6 million people had taken the Implicit Association Test, as you can, at www.implicit.harvard.edu.)

UNCONSCIOUS PATRONIZATION Kent Harber (1998) asked White university women to evaluate a flawed essay said to be written by a Black or a White fellow student. When they believed the writer was Black, the women gave markedly higher ratings and never expressed the harsh criticisms they assigned to White-authored essays, such as "When I read college work this bad I just want to lay my head down on the table and cry." Did the evaluators calibrate their evaluations to their racial stereotypes, Harber wondered, leading them to patronize the Black writers with less exacting standards? If used in real-world evaluations, such low expectations and the resulting "inflated praise and insufficient criticism" could hinder minority student achievement. (To preclude such bias, many teachers read essays while "blind" to their authors.)

"There are still barriers and biases out there, often unconscious."

—Senator Hillary Rodham Clinton, 2008 U.S. presidential primary concession speech

RACE-INFLUENCED PERCEPTIONS Two research teams were interested in the shooting of an unarmed man in the doorway of his Bronx apartment building by officers who mistook his wallet for a gun. Each research team reenacted the situation with a video, asking viewers to press buttons quickly to "shoot" or not shoot men who suddenly appeared on screen holding either a gun or a harmless object such as a flashlight or bottle (Correll et al., 2002, 2007; Greenwald et al., 2003). People (both Blacks and Whites, in one of the studies) more often mistakenly shot targets who were Black. Priming people with a flashed Black rather than White face also makes them more likely then to misperceive a flashed tool as a gun (**FIGURE 39.1**).

FIGURE 39.1 Race primes perceptions
In experiments by Keith Payne (2006), people viewed a White or Black face, immediately followed by a gun or hand tool, which was then followed by a visual mask that obscured the images. Participants were more likely to misperceive a tool as a gun when it was preceded by a Black rather than White face.


Paul Burns/Blend/Getty Images


Punchstock/Corbis

B. K. Payne (2006)

SEEING BLACK Several studies show that the more a person's features are perceived as typical of their racial category, the more likely they are to elicit race-based responding (Maddox, 2004). In one study of 182 police officers, Jennifer Eberhardt and her collaborators (2004; 2006) found that "Black faces looked more criminal to police officers; the more Black, the more criminal." In a follow-up study, they found people more willing to give the death sentence to Black defendants having the most stereotypically Black features.

REFLEXIVE BODILY RESPONSES Today's biopsychosocial approach has stimulated neuroscience studies that measure people's instant responses to viewing White and Black faces. These studies have detected implicit prejudice in people's facial-muscle responses and in the activation of their amygdala, the emotion-processing center (Cunningham et al., 2004; Eberhardt, 2005; Vanman et al., 2004). Even people who consciously express little prejudice may give off telltale signals as their body responds selectively to another's race.

If your own gut check sometimes reveals feelings you would rather not have about other people, be assured that you are not alone. It is what we do with our feelings that matters. By monitoring our feelings and actions, and by replacing old habits with new ones based on new friendships, we can work to free ourselves from prejudice.

Professor Dave Perrett, St. Andrews University

(a) (b)

FIGURE 39.2 Who do you like best?
Which one placed an ad seeking "a special lady to love and cherish forever?" See inverted answer below.

Research suggests that subtly feminized features convey a likeable image, which people tend to associate more with committed dads than with promiscuous cads. Thus, 66 percent of the women picked computer-generated face b in response to both of these questions.

101 million (say that number slowly) "missing women" (Sen, 2003). In 2005, China's newborn sex ratio reportedly reached 118 boys for every 100 girls (AP, 2007). With demographic predictions of 40 million Chinese bachelors unable to find mates, China has declared that sex-selective abortions—gender genocide—are now a criminal offense.

Suppose that you could only have one child. Would you prefer that it be a boy or a girl? When Gallup asked that question of Americans, two-thirds expressed a gender preference, and for two-thirds of those—in 2003 as in 1941—it was for a boy (Lyons, 2003).

But the news isn't all bad for girls and women. Researchers have found that most people also *feel* more positively about women in general than they do about men (Eagly, 1994; Haddock & Zanna, 1994). People worldwide see women as having some traits (such as nurturance, sensitivity, and less aggressiveness) that most people prefer (Glick et al., 2004; Swim, 1994). That may explain why women tend to like women more than men like men (Rudman & Goodwin, 2004). And perhaps that is also why people prefer slightly feminized computer-generated faces—men's and women's—to slightly masculinized faces. Researcher David Perrett and his colleagues (1998) have speculated that a slightly feminized male face connotes kindness, cooperativeness, and other traits of a good father. When the British Broadcasting Company invited 18,000 women to guess which of the men in **FIGURE 39.2** was most likely to place a personal ad seeking a "special lady to love and cherish forever," which one do you think they picked?

Social Roots of Prejudice

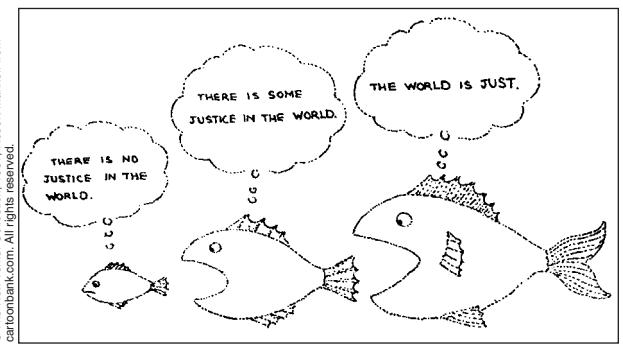
39-2: What are the social and emotional roots of prejudice?

Why does prejudice arise? Inequalities, social divisions, and emotional scapegoating are partly responsible.

Social Inequalities

When some people have money, power, and prestige and others do not, the "haves" usually develop attitudes that justify things as they are. In the extreme case, slave "owners" perceived slaves as innately lazy, ignorant, and irresponsible—as having the very traits that "justified" enslaving them. More commonly, women have been perceived as unassertive but sensitive and therefore suited for the caretaking tasks they have traditionally performed (Hoffman & Hurst, 1990). In short, stereotypes rationalize inequalities.

Discrimination also increases stereotyping and prejudice through the reactions it provokes in its victims. In his classic 1954 book, *The Nature of Prejudice*, Gordon Allport noted that being a victim of discrimination can produce either self-blame or anger. Both reactions may create new grounds for prejudice through the classic *blame-the-victim* dynamic, if observers assume the world is just and "people get what they deserve." In experiments, merely watching someone receive painful shocks has led many people to think less of the victim (Lerner, 1980). This **just-world phenomenon** reflects an idea we commonly teach our children—that good is rewarded and evil is punished. From this it is but a short leap to assume that those who succeed must be good and those who suffer must be bad. Such reasoning enables the rich to see both their own wealth and the poor's misfortune as justly deserved. As one German civilian is said to have remarked when visiting the Bergen-Belsen concentration camp shortly after World War II, "What terrible criminals these prisoners must have been to receive such treatment."



Us and Them: Ingroup and Outgroup

We are a group-bound species. Our ancestors, living in a world where neighboring tribes occasionally raided and pillaged one another's camps, knew that there was safety in solidarity (those who didn't band together left fewer descendants). Whether defending, attacking, or hunting, 10 hands were better than 2. Dividing the world into "us" and "them" entails racism and war, but it also provides the benefits of communal solidarity. Thus, we cheer for our groups, kill for them, die for them. Indeed, we define who we are—our identities—partly in terms of our groups.

Eric Travers/EPA/Landov

French fury Members of France's marginalized ethnic groups reached the tipping point for tolerance in 2005, when they began destructive rioting.

And that social definition of who we are also implies who we are not. Mentally drawing a circle that defines "us" (the **ingroup**) excludes "them" (the **outgroup**). Australian psychologists John Turner (1987, 2007) and Michael Hogg (1996, 2006) note that through our *social identities* we associate ourselves with certain groups and contrast ourselves with others. When Nicholas identifies himself as a man, an Aussie, a Labourite, a University of Sydney student, a Catholic, and a MacGregor, he knows who he is, and so do we. Such group identifications typically promote an **ingroup bias**—a favoring of one's own group. Even arbitrarily creating an us-them distinction—by grouping people with the toss of a coin—leads people to show favoritism to their own group when dividing any rewards (Tajfel, 1982; Wilder, 1981).

Ironically, we often reserve our most intense dislike for outgroup rivals most like us. In surveys, 7 in 10 Japanese express an unfavorable view of China, and 7 in 10 Chinese similarly dislike Japan (Pew, 2006). Hostilities between the Iraqi Sunni and Shia, the Rwandan Hutu and Tutsi, and the Northern Ireland Protestant and Catholic have pitted ingroups against outgroups who, on a world diversity scale, are much more alike than different. Consider Scotland. As an occasional resident there, I've witnessed many examples of *The Xenophobe's Guide to the Scots* observation—that Scots divide non-Scots "into two main groups: (1) The English; (2) The Rest." As rabid Chicago Cubs fans are happy if either the Cubs win or the Chicago White Sox lose, so rabid Scottish soccer fans rejoice in either a Scotland victory or an England defeat. "Phew! They lost," rejoiced one Scottish tabloid's front-page headline after England's 1996 Euro Cup defeat—by Germany, no less.

Numerical minorities, such as the Scots in Britain, are especially conscious of their social identities. The 5 million Scots are more conscious of their national identity vis-à-vis the neighboring 51 million English than vice versa. Likewise, the 4 million New Zealanders are more conscious of their identity vis-à-vis the 21 million Australians, and they are more likely to root for Australia's sports opponents (Halberstadt et al., 2006).

just-world phenomenon the tendency for people to believe the world is just and that people therefore get what they deserve and deserve what they get.

ingroup "Us"—people with whom we share a common identity.

outgroup "Them"—those perceived as different or apart from our ingroup.

ingroup bias the tendency to favor our own group.

Mike Hewitt/Getty Images

The ingroup Scotland's famed "Tartan Army" soccer fans, shown here during a match against archrival England, share a social identity that defines "us" (the Scottish ingroup) and "them" (the English outgroup).

"All good people agree,
And all good people say
All nice people, like Us, are We
And every one else is They.
But if you cross over the sea
Instead of over the way
You may end by (think of it)
Looking on We
As only a sort of They."

—Rudyard Kipling, "We and They," 1926

The urge to distinguish enemies from friends and to have one's group be dominant appears even among children: Most believe their school is better than all other schools in town. Many high school students form cliques—jocks, goths, skaters, gangsters, freaks, geeks—and disparage those outside their own group. Even chimpanzees have been seen to wipe clean the spot where they were touched by a chimpanzee from another group (Goodall, 1986). Ingroup bias predisposes prejudice against strangers (Whitley, 1999).

Emotional Roots of Prejudice

Prejudice springs not only from the divisions of society but also from the passions of the heart. Facing the terror of death tends to heighten patriotism and produce loathing and aggression toward "them"—those who threaten one's world (Pyszczynski et al., 2002). Recalling such terror may alter attitudes, as happened to participants when Mark Landau and eight others (2004) reminded them of their own mortality or of the terror of 9/11. This terror reminder led to their expressing increased support for President George W. Bush.

"If the Tiber reaches the walls, if the Nile does not rise to the fields, if the sky doesn't move or the Earth does, if there is famine, if there is plague, the cry is at once: 'The Christians to the lion!'"

—Tertullian, *Apologeticus*, C.E. 197

Prejudice may also express anger. According to the **scapegoat theory** of prejudice, finding someone to blame when things go wrong can provide a target for one's anger. This may help explain why prejudice levels are high among economically frustrated people. And why, in laboratory experiments, students who experience failure or are made to feel insecure often restore their self-esteem by disparaging a rival school or another person (Cialdini & Richardson, 1980; Crocker et al., 1987). Following 9/11, some outraged people similarly lashed out at innocent Arab-Americans, about whom negative stereotypes blossomed. Calls to eliminate Saddam Hussein, whom Americans had been grudgingly tolerating, also increased. "Fear and anger create aggression, and aggression against citizens of different ethnicity or race creates racism and, in turn, new forms of terrorism," noted Philip Zimbardo (2001).

In short, to boost our own sense of status, it helps to have others to denigrate. That is why a rival's misfortune sometimes provides a twinge of pleasure. By contrast, those made to feel loved and supported become more open to and accepting of others who differ (Mikulincer & Shaver, 2001).

One seeming antidote to prejudice is intelligence. In a large national study, British children with high intelligence scores at age 10 typically expressed low prejudice at age 30 (Deary et al., 2008).

Cognitive Roots of Prejudice

39-3: What are the cognitive roots of prejudice?

Prejudice springs not only from a culture's divisions and the heart's passions, but also from the mind's natural workings. Stereotyped beliefs are a by-product of how we cognitively simplify the world.

Categorization

One way we simplify our world is to categorize. A chemist categorizes molecules as organic and inorganic. A mental health professional categorizes psychological disorders by types. In categorizing people into groups, however, we often stereotype them, overlooking their diversity. We recognize that "we" are diverse, but "they"—the members of some other group—seem to look and act alike (Bothwell et al., 1989). To those in one ethnic group, members of another often seem more alike than they really are in attitudes, personality, and appearance. This greater recognition for own-race faces—called the **other-race effect,** or *own-race bias*—emerges during infancy, between 3 and 9 months of age (Kelly et al., 2007).

With experience, however, people get better at recognizing individual faces from another group (Li et al., 1996). For example, the longer Chinese people reside in a Western country, the less they exhibit the other-race effect (Hancock & Rhodes, 2008).

scapegoat theory the theory that prejudice offers an outlet for anger by providing someone to blame.

other-race effect the tendency to recall faces of one's own race more accurately than faces of other races. Also called the *cross-race effect* and the *own-race bias.*

Vivid Cases

In judging other groups, we often overgeneralize from vivid, memorable cases. In one classic experiment (Rothbart et al., 1978), researchers divided University of Oregon student volunteers into two groups, then showed them information about 50 men. The first group's list included 10 men arrested for nonviolent crimes, such as forgery. The second group's list included 10 men arrested for violent crimes, such as assault. Later, when both groups recalled how many men on their list had committed any sort of crime, the second group overestimated the number. Vivid (violent) cases come readily to mind and therefore influence our judgments of a group (**FIGURE 39.3**).

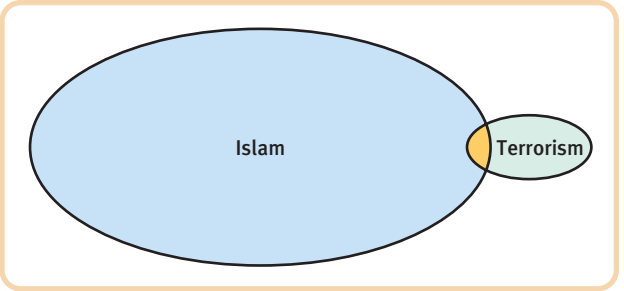


FIGURE 39.3 Vivid cases feed stereotypes The 9/11 Muslim terrorists created, in many minds, an exaggerated stereotype of Muslims as terror-prone. Actually, reported a U.S. National Research Council panel on terrorism, when offering the inexact illustration at left, most terrorists are not Muslim and "the vast majority of Islamic people have no connection with and do not sympathize with terrorism" (Smelser & Mitchell, 2002).

Aggression

The most destructive force in our social relations is aggression. In psychology, *aggression* has a more precise meaning than it does in everyday usage. The assertive, persistent salesperson is not aggressive. Nor is the dentist who makes you wince with pain. But the person who passes along a vicious rumor about you, the person who verbally assaults you, and the attacker who mugs you are aggressive. Thus, to a psychologist, **aggression** is any physical or verbal behavior intended to hurt or destroy, whether done reactively out of hostility or proactively as a calculated means to an end. Thus, murders and assaults that occurred as hostile outbursts are aggression. So were the 110 million war-related deaths that took place during this and the last century, many of which were cool and calculated.

Aggression research shows that behavior emerges from the interaction of biology and experience. For a gun to fire, the trigger must be pulled; with some people, as with hair-trigger guns, it doesn't take much to trip an explosion. Let us look first at biological factors that influence our thresholds for aggressive behavior, then at the psychological factors that pull the trigger.

In the last 40 years in the United States, well over 1 million people—more than all deaths in all wars in American history—have been killed by firearms in nonwar settings. Compared with people of the same sex, race, age, and neighborhood, those who keep a gun in the home (ironically, often for protection) are nearly three times more likely to be murdered in the home—nearly always by a family member or close acquaintance. For every self-defense use of a gun in the home, there are 4 unintentional shootings, 7 criminal assaults or homicides, and 11 attempted or completed suicides (Kellermann et al., 1993, 1997, 1998).

The Biology of Aggression

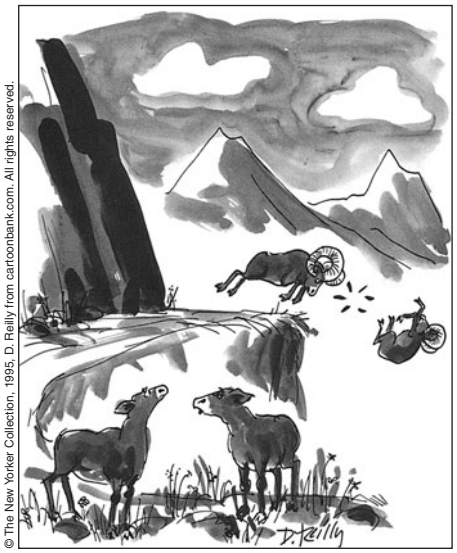
39-4: What biological factors make us more prone to hurt one another?

Aggression varies too widely from culture to culture, era to era, and person to person to be considered an unlearned instinct. But biology does *influence* aggression. Stimuli that trigger aggressive behavior operate through our biological system. We can look for biological influences at three levels—genetic, neural, and biochemical. Our genes engineer our individual nervous systems, which operate electrochemically.

Genetic Influences

Animals have been bred for aggressiveness—sometimes for sport, sometimes for research. Pit bulls and cocker spaniels are formed by differing genes. Twin studies suggest that genes influence human aggression as well (Miles & Carey, 1997; Rowe et al., 1999). If one identical twin admits to "having a violent temper," the other twin will often independently admit the same. Fraternal twins are much less likely to respond similarly. This story is still unfolding, as researchers search for genetic markers found in those who commit the most violence. (One is already well known and is carried by half the human race: the Y chromosome.)

aggression any physical or verbal behavior intended to hurt or destroy.



"It's a guy thing."

Neural Influences

Animal and human brains have neural systems that, when stimulated, either inhibit or produce aggressive behavior (Moyer, 1983). Consider:

- The domineering leader of a caged monkey colony had a radio-controlled electrode implanted in a brain area that, when stimulated, inhibits aggression. When researchers placed the button that activated the electrode in the colony's cage, one small monkey learned to push it every time the boss became threatening.
- A mild-mannered woman had an electrode implanted in her brain's limbic system (in the amygdala) by neurosurgeons seeking to diagnose a disorder. Because the brain has no sensory receptors, she was unable to feel the stimulation. But at the flick of a switch she snarled, "Take my blood pressure. Take it now," then stood up and began to strike the doctor.
- One intensive evaluation of 15 death-row inmates revealed that all 15 had suffered a severe head injury. Although most neurologically impaired people are not violent, unrecognized neurological disorders may be one ingredient in the violence recipe (Lewis et al., 1986). Other studies of violent criminals have revealed diminished activity in the frontal lobes, which play an important role in controlling impulses (Amen et al., 1996; Davidson et al., 2000; Raine, 1999, 2005).

No one spot in the brain functions as a "violence center" that controls aggression. Rather, the brain has neural systems that, given provocation, will *facilitate* aggression. And it has a frontal lobe system for inhibiting aggression, making aggression more likely if this system is damaged, inactive, disconnected, or not yet fully mature.

Biochemical Influences

Hormones, alcohol, and other substances in the blood influence the neural systems that control aggression. A raging bull will become a gentle creature when castration reduces its testosterone level. The same is true of aggressive mice. When injected with testosterone, however, the castrated mice once again become aggressive.

Although humans are less sensitive to hormonal changes, violent criminals tend to be muscular young males with lower-than-average intelligence scores, low levels of the neurotransmitter serotonin, and higher-than-average testosterone levels (Dabbs et al., 2001a; Pendick, 1994). Drugs that sharply reduce their testosterone levels also subdue their aggressive tendencies. High testosterone correlates with irritability, assertiveness, impulsiveness, and low tolerance for frustration—qualities that predispose somewhat more aggressive responses to provocation (Dabbs et al., 2001b; Harris, 1999). Among both teenage boys and adult men, high testosterone levels correlate with delinquency, hard drug use, and aggressive-bullying responses to frustration (Berman et al., 1993; Dabbs & Morris, 1990; Olweus et al., 1988). With age, testosterone levels—and aggressiveness—diminish. Hormonally charged, aggressive 17-year-olds mature into hormonally quieter and gentler 70-year-olds.

"We could avoid two-thirds of all crime simply by putting all able-bodied young men in cryogenic sleep from the age of 12 through 28."

—David T. Lykken, *The Antisocial Personalities*, 1995

A lean, mean, fighting machine—the testosterone-laden female hyena The hyena's unusual embryology pumps testosterone into female fetuses. The result is revved-up young female hyenas who seem born to fight.

For both biological and psychological reasons, alcohol unleashes aggressive responses to frustration (Bushman, 1993; Ito et al., 1996; Taylor & Chermack, 1993). Just *thinking* you've imbibed alcohol has some effect; but so, too, does unknowingly ingesting alcohol slipped into a drink. Police data and prison surveys reinforce conclusions drawn from experiments on alcohol and aggression: Aggression-prone people are more likely to drink and to become violent when intoxicated (White et al., 1993). People who have been drinking commit 4 in 10 violent crimes and 3 in 4 acts of spousal abuse (Greenfeld, 1998).

Psychological and Social-Cultural Factors in Aggression

39-5: What psychological and social-cultural factors may trigger aggressive behavior?

Biological factors influence the ease with which aggression is triggered. But aggression is a complex behavior that occurs in particular contexts. What psychological and social-cultural factors pull the trigger?

Aversive Events

Although suffering sometimes builds character, it may also bring out the worst in us. Being blocked short of a goal may increase our readiness to aggress. This phenomenon is called the **frustration-aggression principle:** Frustration creates anger, which may in some people generate aggression, especially in the presence of an aggressive cue, such as a gun—or a baseball. One study analyzed 27,667 hit-by-pitch major league baseball incidents between 1960 and 2004. It found that pitchers were most likely to hit batters when frustrated by the previous batter's hitting a home run, by the current batter's hitting a home run the last time at bat, or by a teammate's having been hit by a pitch in the previous half inning (Timmerman, 2007).

frustration-aggression principle the principle that frustration—the blocking of an attempt to achieve some goal—creates anger, which can generate aggression.

When we experience frustration and stress, we often respond with a *fight-or-flight reaction*. After 9/11, Americans responded with a readiness to fight. Terrorism similarly may spring from a desire for revenge, sometimes after a friend or family member has been killed or injured. Contrary to the popular idea that poverty breeds terrorists, studies indicate that suicide bombers and those who support them tend to be neither uneducated nor desperately poor (Krueger, 2007). The 9/11 suicide bombers, for example, were mostly educated men from wealthy Saudi Arabia (McDermott, 2005). Frustration (and aggression) arise less from deprivation than from the gap between reality and expectations, which may rise with education and attainments.

Like frustration, other aversive stimuli—physical pain, personal insults, foul odors, hot temperatures, cigarette smoke, and a host of others—can also evoke hostility. And studies in which animals or humans experience unpleasant events reveal that those made miserable will often make others miserable (Berkowitz, 1983, 1989). Violent crime and spousal abuse rates are higher during hotter years, seasons, months, and days (**FIGURE 39.4**). When overheated, people think, feel, and act more aggressively. From the available data, Craig Anderson and his colleagues (2000) have projected that, other things being equal, global warming of 4 degrees Fahrenheit (about 2 degrees centigrade) would induce more than 50,000 additional assaults and murders in the United States alone.

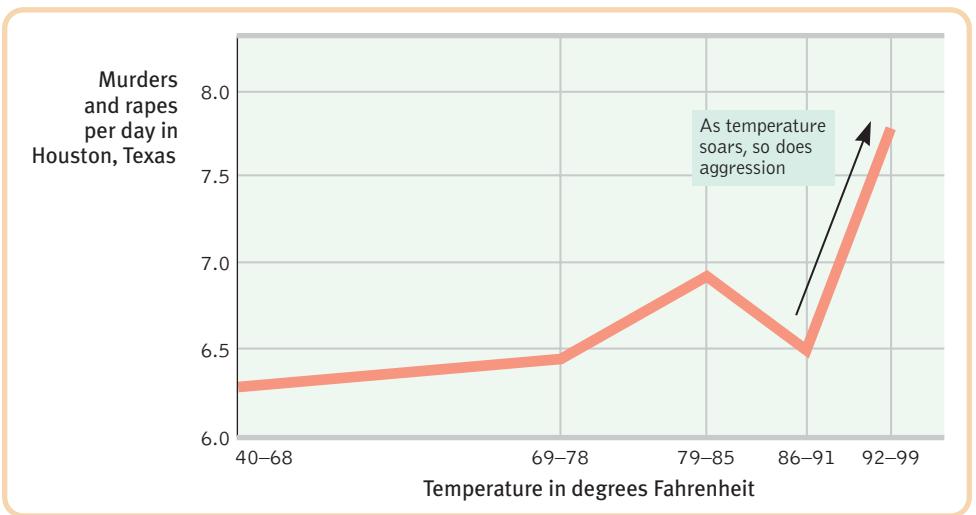


FIGURE 39.4 Uncomfortably hot weather and aggressive reactions
Between 1980 and 1982 in Houston, murders and rapes were more common on days over 91 degrees Fahrenheit (33 degrees centigrade), as shown in the graph. This finding is consistent with those from laboratory experiments in which people working in a hot room react to provocations with greater hostility. (From Anderson & Anderson, 1984.)

Social and Cultural Influences

Aggression may be a natural response to aversive events, but learning can alter natural reactions. We are likely to be more aggressive in situations where experience has taught us that aggression pays. Children whose aggression successfully intimidates other children may become more aggressive. Animals that have successfully fought to get food or mates become increasingly ferocious. Rewards and punishments can shape our behavior.

Rejection often intensifies aggression (Catanese & Tice, 2005; Gaertner & Iuzzini, 2005). In a series of studies, Jean Twenge and her collaborators (2001, 2002, 2003) told some people that others whom they had met didn't want them in their group, or that a personality test indicated they "were likely to end up alone later in life." People led to feel socially excluded were later more likely to disparage or even deliver a blast of noise to someone who had insulted them. This rejection-induced aggression brings to mind various North American and European school shootings, committed by youths who had been shunned, mocked, and sometimes bullied by peers. Ostracism can be a real pain.

Different cultures model, reinforce, and evoke different tendencies toward violence. For example, crime rates are higher (and average happiness is lower) in countries marked by a great disparity between rich and poor (Triandis, 1994). With great disparity may come, for those who have less, feelings of *relative deprivation*. Richard Nisbett and Dov Cohen (1996) have shown how violence can vary by culture within a country. They analyzed violence among White Americans in southern towns settled by Scots-Irish herders whose tradition emphasized "manly honor," the use of arms to protect one's flock, and a history of coercive slavery. Their cultural descendants, Nisbett and Cohen found, have triple the homicide rates and are more supportive of physically punishing children, of warfare initiatives, and of uncontrolled gun ownership than are their White counterparts in New England towns settled by the more traditionally peaceful Puritan, Quaker, and Dutch farmer-artisans.

Social influence also appears in high violence rates among cultures and families that experience minimal father care (Triandis, 1994). Even after controlling for parental education, race, income, and teen motherhood, American male youths from father-absent homes have double their peers' incarceration rate (Harper & McLanahan, 2004).

It is important, however, to note how many people are leading gentle, even heroic lives amid social stresses, reminding us again that individuals differ. The person matters. That people differ over time and place reminds us that environments also differ, and situations matter. Yesterday's plundering Vikings have become today's peace-promoting Scandinavians. Like all behavior, aggression arises from the interaction of persons and situations.

Observing Models of Aggression

"Why do we kill people who kill people to show that killing people is wrong?"

—National Coalition to Abolish the Death Penalty, 1992

Observational learning also influences our natural reactions. Modeling violence—screaming and hitting—is precisely what exasperated parents often do. Parents of delinquent youngsters typically discipline with beatings, thus modeling aggression as a method of dealing with problems (Patterson et al., 1982, 1992). They also frequently cave into (reward) their children's tears and temper tantrums. Parent-training programs advise a more positive approach. They encourage parents to discipline without modeling violence, to reinforce desirable behaviors, and to frame statements positively ("When you finish loading the dishwasher you can go play," rather than "If you don't load the dishwasher, there'll be no playing"). One *aggression-replacement program* has brought down re-arrest rates of juvenile offenders and gang members by teaching the youths and their parents communication skills, training them to control anger, and encouraging more thoughtful moral reasoning (Goldstein et al., 1998).

But parents are hardly the only aggression models. Observing TV violence tends to desensitize people to cruelty and prime them to respond aggressively when provoked. If, as research has shown, passively viewing violence elevates aggressive responses to

Thinking Critically About:

Do Video Games Teach, or Release, Violence?

Violent video games became an issue for public debate after teen assassins in more than a dozen places seemed to mimic the carnage in the splatter games they had so often played (Anderson, 2004a). In 2002, two Grand Rapids, Michigan, teens and a man in his early twenties spent part of a night drinking beer and playing *Grand Theft Auto III,* using cars to run down simulated pedestrians, before beating them with fists and leaving a bloody body behind (Kolker, 2002). Then they went out on a real drive, spotted a 38-year-old man on a bicycle, ran him down with their car, got out, stomped and punched him, and returned home to play the game some more. (The man, a father of three, died six days later.)

Interactive games transport the player into their own vivid reality. When youths play *Grand Theft Auto: San Andreas,* they can carjack vehicles; run down pedestrians; do drive-by shootings; pick up a prostitute, have sex with her, and then kill her. When youths play such games, do they learn social scripts?

Most abused children don't become abusive adults. Most social drinkers don't become alcohol dependent. And most youths who spend hundreds of hours in these mass murder simulators don't become teen assassins. Still, we wonder: Although very few will commit slaughter, how many will become desensitized to violence and more open to violent acts?

Thirty-eight studies of more than 7000 people offer some answers (Anderson et al., 2004). In one study, people with extensive experience in violent video gaming also display desensitization to violent images, as shown by blunted brain responses (Bartholow et al., 2006). Another study observed a rising level of arousal and feelings of hostility in college men as they played *Mortal Kombat* (Ballard & Wiest, 1998). Others have found that video games

Mark C. Burnett/Stock, Boston

Desensitizing people to violence

can prime aggressive thoughts and increase aggression. Consider this report from Craig Anderson and Karen Dill (2000): University men who have spent the most hours playing violent video games tend to be the most physically aggressive (for example, to acknowledge having hit or attacked someone else). In one experiment, people randomly assigned to play a game involving bloody murders with groaning victims (rather than to play nonviolent *Myst*) became more hostile. On a follow-up task, they also were more likely to blast intense noise at a fellow student.

Studies of young adolescents by Douglas Gentile and his co-researchers (2004; 2007) further reveal that kids who play a lot of violent video games see the world as more hostile, get into more arguments and fights, and get worse grades (those hours aren't spent reading or studying). Ah, but is this merely because naturally hostile kids are drawn to such games? *No,* says Gentile. Even among violent-game players scoring low in hostility, 38 percent had been in fights. That figure is nearly 10 times the rate (4 percent) found among their nongaming counterparts. Moreover, over time, the nongamers became more likely to have fights only if they started playing the violent games. Anderson and his colleagues (2007) believe that, due partly to the more active participation and rewarded violence of game play, violent video games have even greater effects on aggressive behavior and cognition than do violent television and movies.

"We are what we repeatedly do."

—Aristotle

Although much remains to be learned, these studies again disconfirm the *catharsis hypothesis*—the idea that we feel better if we "blow off steam" by venting our emotions. Playing violent video games *increases* aggressive thoughts, emotions, and behaviors. One video game company's CEO rationalized that we are "violent by nature [and] need release valves." "It's a way to process violent feelings and anxieties through a fantasy medium," added a prominent civil liberties lawyer in explaining her hunch that playing violent games calms violent tendencies (Heins, 2004). Actually, expressing anger breeds more anger, and practicing violence breeds more violence.

Tomorrow's games may have even greater effects. Social psychologists Susan Persky and Jim Blascovich (2005) created a violent video game for students to play on either a desktop computer or by putting on a headset and stepping into a virtual reality. As they predicted, the virtual reality more dramatically heightened aggressive feelings and behavior during and after the play.

provocation and lowers sensitivity to cruelty, what will be the effect of actively role-playing aggression? Social psychologists attribute the media's influence partly to the *social scripts* (mental tapes for how to act, provided by our culture) they portray (see Thinking Critically About: Do Video Games Teach, or Release, Violence?). When we find ourselves in new situations, uncertain how to act, we rely on social scripts. After so many action films, youngsters may acquire a script that gets played when they face real-life conflicts. Challenged, they may "act like a man" by intimidating or eliminating the threat.

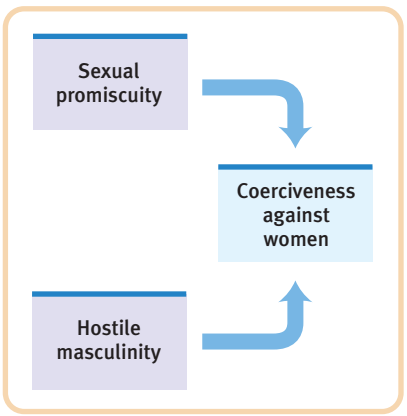


FIGURE 39.5 Men who sexually coerce women The recipe for coercion against women combines an impersonal approach to sex with a hostile masculinity. (Adapted from Malamuth, 1996.)

In follow-up studies, Zillmann (1989) found that after massive exposure to X-rated sexual films, men and women became more accepting of extramarital sex, of women's sexual submission to men, and of a man's seducing a 12-year-old girl. As people heavily exposed to televised crime perceive the world as more dangerous, so people heavily exposed to pornography see the world as more sexual.

Does this media influence extend to sexual violence? We do know that sexually coercive men typically are sexually promiscuous and hostile in their relationships with women (**FIGURE 39.5**). We also know from surveys of American and Australian teens and university students that viewing X-rated films and Internet pornography is several times higher among males than among females (Carroll et al., 2008; Flood, 2007; Wolak et al., 2007). Might sexually explicit media models contribute to sexually aggressive tendencies?

Content analyses reveal that most X-rated films have depicted quick, casual sex between strangers, but that scenes of rape and sexual exploitation of women by men are also common (Cowan et al., 1988; NCTV, 1987; Yang & Linz, 1990). In less graphic form, the same unrealistic script—she resists her attacker, he persists, she melts and is finally driven to ecstasy—is commonplace in movies, TV programs, and romance novels. Most rapists accept this *rape myth*—the idea that some women invite or enjoy rape and get "swept away" while being "taken" (Brinson, 1992). And—compared with those who watch little TV—men and women who watch a great deal are also more likely to accept the rape myth (Kahlor & Morrison, 2007). (In actuality, rape is traumatic, and it frequently harms women's reproductive and psychological health [Golding, 1996].)

Other studies have also found that repeatedly watching X-rated films (even if nonviolent) later makes one's own partner seem less attractive, makes a woman's friendliness seem more sexual, and makes sexual aggression seem less serious (Harris, 1994). In one such experiment, undergraduates were asked to suggest an appropriate prison term for a man convicted of raping a hitchhiker. Participants who had viewed sexually explicit films for six weeks recommended sentences half as long as those recommended by a control group that had viewed nonerotic films (Zillmann & Bryant, 1984).

Experiments cannot elicit actual sexual violence, but they can assess a man's willingness to hurt a woman. Often the research gauges the effect of violent versus nonviolent erotic films on men's willingness to deliver supposed electric shocks to women who had earlier provoked the men. These experiments suggest that it's not the eroticism but rather the depictions of sexual *violence* (whether in R-rated slasher films or X-rated films) that most directly affect men's acceptance and performance of aggression against women. A conference of 21 social scientists, including many of the researchers who conducted these experiments, produced a consensus (Surgeon General, 1986): "Pornography that portrays sexual aggression as pleasurable for the victim increases the acceptance of the use of coercion in sexual relations." Contrary to much popular opinion, viewing such depictions does not provide an outlet for bottled-up impulses. Rather, "in laboratory studies measuring short-term effects, exposure to violent pornography increases punitive behavior toward women."

Significant behaviors, such as violence, usually have many determinants, making any single explanation an oversimplification. Asking what causes violence is therefore like asking what causes cancer. Those who study the effects of asbestos exposure on cancer rates may remind us that asbestos is indeed a cancer cause, albeit only one among many. Factors that can create a predisposition to sexual violence include the media but also dominance motives, disinhibition by alcohol, and a history of childhood abuse (Malamuth et al., 1991, 1995). Still, if media depictions of violence can disinhibit and desensitize; if viewing sexual violence fosters hostile, domineering attitudes and behaviors; and if viewing pornography leads viewers to trivialize rape, devalue their partners, and engage in uncommitted sex, then media influence is not a minor issue.

In sexual aggression, as in other forms of aggression, the media provide social scripts. After viewing the multiple sexual innuendoes and acts found in most prime-time TV hours—often involving impulsive or short-term relationships—youths may acquire sexual scripts they later enact in real-life relationships (Kunkel et al., 2001; Sapolsky & Tabarlet, 1991). Music lyrics also write social scripts. In one set of experiments, German university men who listened to women-hating song lyrics administered the most hot chili sauce to a woman and recalled more negative feelings and beliefs about women. Man-hating song lyrics had a similar effect on the aggressive behavior of women listeners (Fischer & Greitemeyer, 2006).

Might public consciousness be raised by making people aware of the information you have just been reading? In the 1950s, movies often depicted attractive actors enjoying a cigarette. Today, after decades of education in the dangers of smoking, the entertainment industry now more often avoids such images. Researchers Brad Bushman and Craig Anderson (2001) have noted that the correlation between viewing violence and behaving aggressively nearly equals the correlation between smoking and lung cancer. They also noted other parallels, such as desensitization with continued exposure; severe long-term cumulative effects; and industry opposition to regulation of these products.

In response to growing public concern about violence in the media, television violence levels declined in the early 1990s (Gerbner et al., 1993). The growing sensitivity to violence has raised hopes that entertainers, producers, and audiences might someday look back with embarrassment on the days when movies "entertained" people with scenes of torture, mutilation, and sexual coercion.

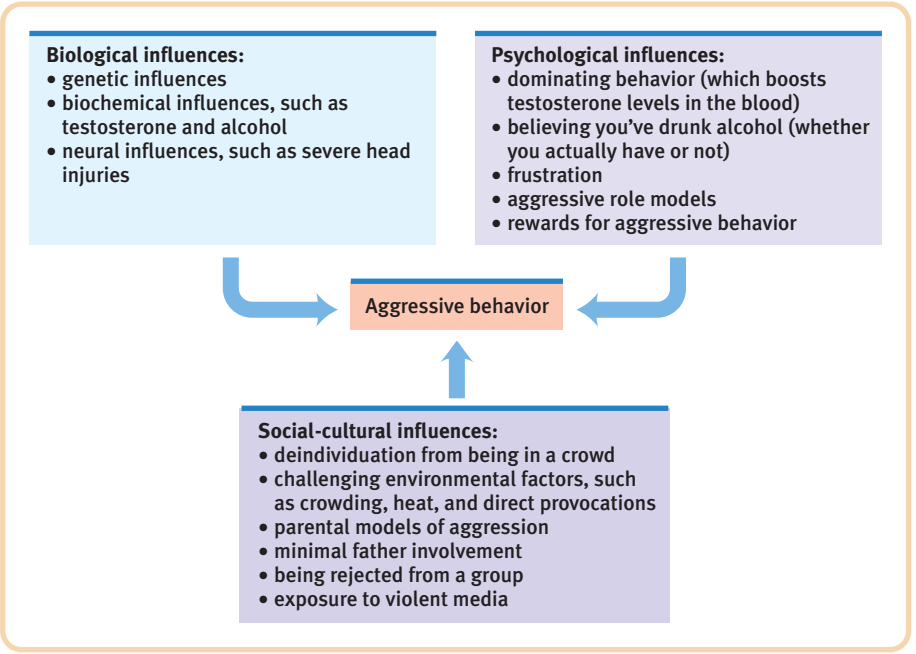


FIGURE 39.6 Biopsychosocial understanding of aggression Because many factors contribute to aggressive behavior, there are many ways to change such behavior, including learning anger management and communication skills, and avoiding violent media and video games.

* * *

To sum up, research reveals biological, psychological, and social-cultural influences on aggressive behavior. Like so much else, aggression is a biopsychosocial phenomenon (**FIGURE 39.6**).

Attraction

Pause a moment and think about your relationships with two people—a close friend, and someone who stirs in you feelings of romantic love. What is the psychological chemistry that binds us together in these special sorts of attachments that help us cope with all other relationships? Social psychology suggests some answers.

The Psychology of Attraction

39-6: Why do we befriend or fall in love with some people but not with others?

We endlessly wonder how we can win others' affection and what makes our own affections flourish or fade. Does familiarity breed contempt, or does it intensify our affection? Do birds of a feather flock together, or do opposites attract? Is beauty only skin deep, or does attractiveness matter greatly? Consider three ingredients of our liking for one another: proximity, physical attractiveness, and similarity.

Proximity

Before friendships become close, they must begin. *Proximity*—geographic nearness—is friendship's most powerful predictor. Proximity provides opportunities for aggression, but much more often it breeds liking. Study after study reveals that people are most inclined to like, and even to marry, those who live in the same neighborhood, who sit nearby in class, who work in the same office, who share the same parking lot, who eat in the same dining hall. Look around. (For more on modern ways to connect people, see Close-Up: Online Matchmaking on the next page.)

Familiarity breeds acceptance When this rare white penguin was born in the Sydney, Australia, zoo, his tuxedoed peers ostracized him. Zookeepers thought they would need to dye him black to gain acceptance. But after three weeks of contact, the other penguins came to accept him.

Rex USA

Close-Up:

Online Matchmaking

If you have not found a romantic partner in your immediate proximity, why not cast a wider net? In the United States, 16 million people have tried online dating and matchmaking services, as have an estimated 14 million more in China, 10 million in India, and tens of millions in other countries (Cullen & Masters, 2008).

Although published research on the effectiveness of Internet matchmaking services is sparse, this much seems well established: Some people dishonestly represent their age, attractiveness, occupation, or other details, and thus are not who they seem to be. Nevertheless, Katelyn McKenna and John Bargh and their colleagues have offered a surprising finding: Compared with relationships formed in person, Internet-formed friendships and romantic relationships are more likely to last beyond two years (Bargh et al., 2002, 2004; McKenna et al., 2002; McKenna & Bargh, 1998, 2000). In one of their studies, people disclosed more, with less posturing, to those whom they met online. When conversing online with someone for 20 minutes, they felt more liking for that person than they did for someone they had met and talked with face to face. This was true even when (unknown to them) it was the same person! Small wonder that Internet friendships often feel as real and important to people as in-person relationships.

"I can't wait to see what you're like online."

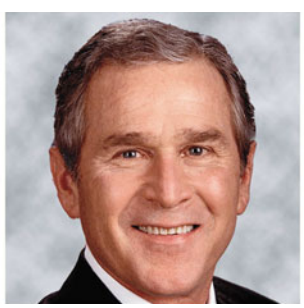
The mere exposure effect The mere exposure effect applies even to ourselves. Because the human face is not perfectly symmetrical, the face we see in the mirror is not the same face our friends see. Most of us prefer the familiar mirror image, while our friends like the reverse (Mita et al., 1977). The Bill Gates known to us all is at left. The person he sees in the mirror each morning is shown at right, and that's the photo he would probably prefer.

Why is proximity so conducive to liking? Obviously, part of the answer is the greater availability of those we often meet. But there is more to it than that. For one thing, repeated exposure to novel stimuli—be they nonsense syllables, musical selections, geometric figures, Chinese characters, human faces, or the letters of our own name—increases our liking for them (Moreland & Zajonc, 1982; Nuttin, 1987; Zajonc, 2001). People are even somewhat more likely to marry someone whose familiar-sounding first or last name resembles their own (Jones et al., 2004).

This phenomenon is the **mere exposure effect.** Within certain limits (Bornstein, 1989, 1999), familiarity breeds fondness. Richard Moreland and Scott Beach (1992) demonstrated this by having four equally attractive women silently attend a 200-student class for zero, 5, 10, or 15 class sessions. At the end of the course, students were shown slides of each woman and asked to rate each one's attractiveness. The most attractive? The ones they'd seen most often. The phenomenon will come as no surprise to the young Taiwanese man who wrote more than 700 letters to his girlfriend, urging her to marry him. She did marry—the mail carrier (Steinberg, 1993).

No face is more familiar than one's own. And that helps explain an interesting finding from Lisa DeBruine's research (2004): Men liked other men, and women liked other women, when their faces incorporated some morphed features of their own. When DeBruine (2002) had McMaster University students play a game with a supposed other player, they also were more trusting and cooperative when the other person's image had some features of their own face morphed into it. In me I trust. (See also **FIGURE 39.7**.)

Voter



Candidate George Bush

60:40 Blend

FIGURE 39.7 I like the candidate who looks a bit like dear old me Jeremy Bailenson and his colleagues (2005) incorporated morphed features of voters' faces into the faces of 2004 U.S. presidential candidates George Bush and John Kerry. Without conscious awareness that they were viewing some of their own features, the participants were more likely to favor the candidate whose face incorporated some of their own features.

For our ancestors, the mere exposure effect was adaptive. What was familiar was generally safe and approachable. What was unfamiliar was more often dangerous and threatening. Evolution seems to have hard-wired into us the tendency to bond with those who are familiar and to be wary of those who are unfamiliar (Zajonc, 1998). Gut-level prejudice against those who are culturally different may thus be a primitive, automatic emotional response (Devine, 1995). It's what we do with our knee-jerk prejudice that matters, suggest researchers. Do we let those feelings control our behavior? Or do we monitor our feelings and act in ways that reflect our conscious valuing of human equality?

mere exposure effect the phenomenon that repeated exposure to novel stimuli increases liking of them.

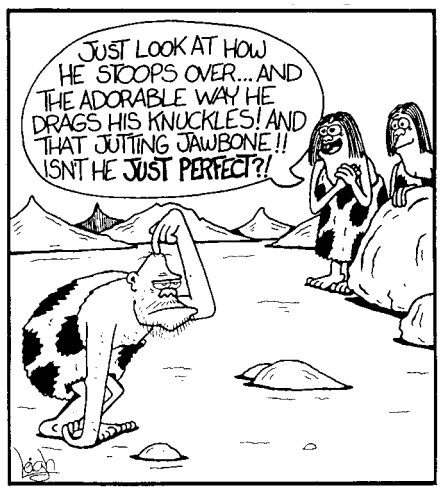
Physical Attractiveness

Once proximity affords you contact, what most affects your first impressions: The person's sincerity? Intelligence? Personality? Hundreds of experiments reveal that it is something far more superficial: Appearance.

In one study, Elaine Hatfield and her co-workers randomly matched new University of Minnesota students for a Welcome Week dance (Walster et al., 1966). Before the dance, each student took a battery of personality and aptitude tests. On the night of the blind date, the couples danced and talked for more than two hours and then took a brief intermission to rate their dates. What determined whether they liked each other? As far as the researchers could determine, only one thing mattered: Physical attractiveness (which had been rated by the researchers beforehand). Both the men and the women liked good-looking dates best. Have people changed since that early experiment? Apparently not. Recent speed-dating experiments confirm that attractiveness influences first impressions for both sexes (Belot & Francesconi, 2006; Finkel & Eastwick, 2008). Although women are more likely than men to say that another's looks don't affect them (Lippa, 2007), a man's looks do affect women's behavior (Feingold, 1990; Sprecher, 1989; Woll, 1986).

People's physical attractiveness also predicts their frequency of dating, their feelings of popularity, and others' initial impressions of their personalities. We perceive attractive people to be healthier, happier, more sensitive, more successful, and more socially skilled, though not more honest or compassionate (Eagly et al., 1991; Feingold, 1992; Hatfield & Sprecher, 1986). Attractive, well-dressed people are more likely to make a favorable impression on potential employers and to enjoy occupational success (Cash & Janda, 1984; Langlois et al., 2000; Solomon, 1987). Income analyses show a penalty for plainness or obesity and a premium for beauty (Engemann & Owyang, 2005).

An analysis of 100 top-grossing films since 1940 found that attractive characters were portrayed as morally superior to unattractive characters (Smith et al., 1999). But Hollywood modeling doesn't explain why, to judge from their gazing times, even babies prefer attractive over unattractive faces (Langlois et al., 1987). So do some blind people, as University of Birmingham professor John Hull (1990, p. 23) discovered after going blind. A colleague's remarks on a woman's beauty would strangely affect his feelings. He found this "deplorable. . . . What can it matter to me what sighted men think of women . . . yet I do care what sighted men think, and I do not seem able to throw off this prejudice."

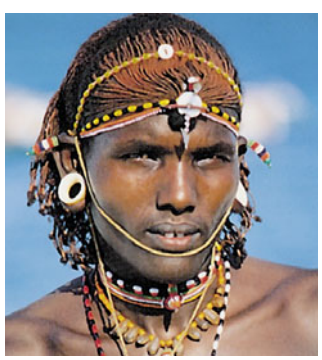


When Neanderthals fall in love.

"Personal beauty is a greater recommendation than any letter of introduction."

—Aristotle, *Apothegems*, 330 B.C.E.


Victor Englebert/Photo Researchers


Margaret Gowan/Tony Stone Worldwide


Nancy Brown/The Image Bank

In the eye of the beholder
Conceptions of attractiveness vary by culture. Moreover, the current concept of attractiveness in Morocco, Kenya, and Scandinavia may well change in the future.

© ABC TV, Courtesy: Everett Collection

Extreme makeover In affluent, beauty-conscious cultures, increasing numbers of people, such as this woman from the American TV show *Extreme Makeover,* have turned to cosmetic surgery to improve their looks. If money were no concern, might you ever do the same?

For people taught that "beauty is only skin deep" and that "appearances can be deceiving," the power of physical attractiveness seems unfair and unenlightened. Why should it matter? Two thousand years ago the Roman statesman Cicero felt the same way: "The final good and the supreme duty of the wise person is to resist appearance." Cicero might be reassured by two other findings.

Percentage of Men and Women Who "Constantly Think About Their Looks"

	Men	*Women*
Canada	*18%*	*20%*
United States	*17*	*27*
Mexico	*40*	*45*
Venezuela	*47*	*65*

From Roper Starch survey, reported by McCool (1999).

First, people's attractiveness is surprisingly unrelated to their self-esteem and happiness (Diener et al., 1995; Major et al., 1984). One reason may be that, except after comparing themselves with superattractive people, few people (thanks, perhaps, to the mere exposure effect) view themselves as unattractive (Thornton & Moore, 1993). Another reason is that strikingly attractive people are sometimes suspicious that praise for their work may simply be a reaction to their looks. When less attractive people are praised, they are more likely to accept it as sincere (Berscheid, 1981).

Cicero might also find comfort in knowing that attractiveness judgments are relative. The standards by which judges crown Miss Universe hardly apply to the whole planet. Rather, beauty is in the eye of the culture—our standards for beauty reflect our time and place. Hoping to look attractive, people in different cultures have pierced their noses, lengthened their necks, bound their feet, and dyed or painted their skin and hair. They have gorged themselves to achieve a full figure or liposuctioned fat to achieve a slim one, applied chemicals hoping to rid themselves of unwanted hair or to regrow wanted hair, strapped on leather garments to make their breasts seem smaller or surgically filled their breasts with silicone and put on Wonderbras to make them look bigger.

New York Times *columnist Maureen Dowd on liposuction (January 19, 2000): "Women in the 50's vacuumed. Women in the 00's are vacuumed. Our Hoovers have turned on us!"*

For women in North America, the ultra-thin ideal of the Roaring Twenties gave way to the soft, voluptuous Marilyn Monroe ideal of the 1950s, only to be replaced by today's lean yet busy ideal. Americans now spend more on beauty supplies than on education and social services combined. Still not satisfied, they line up for 12 million cosmetic medical treatments each year, including plastic surgery, Botox skin smoothing, and laser hair removal—not even counting procedures for teeth capping or whitening (ASAPS, 2008). But the result of the beauty race since 1970 has been that more and more women feel *un*happy with their appearance (Feingold & Mazella, 1998).

Women have 91 percent of cosmetic procedures (ASAPS, 2008). Women also recall others' appearance better than do men (Mast & Hall, 2006).

AP Photo/ Herman Miller Inc.

Beauty grows with mere exposure Herman Miller, Inc.'s famed Aeron chair initially received high comfort ratings but abysmal beauty ratings. To some it looked like "lawn furniture" or "a giant prehistoric insect" (Gladwell, 2005). But then, with design awards, media visibility, and imitators, the ugly duckling came to be the company's best-selling chair ever and to be seen as beautiful. With people, too, beauty lies partly in the beholder's eye and can grow with exposure.

Some aspects of attractiveness, however, do cross place and time (Cunningham et al., 2005; Langlois et al., 2000). Men in many cultures, from Australia to Zambia, judge women as more attractive if they have a youthful appearance. Women feel attracted to healthy-looking men, but especially to those who seem mature, dominant, and affluent.

Cultural standards aside, attractiveness also depends on our feelings about the person. If led to believe that someone has appealing traits (such as being honest, humorous, and polite rather than rude, unfair, and abusive) people perceive the person as more physically attractive (Lewandowski et al., 2007). In a Rodgers and Hammerstein musical, Prince Charming asks Cinderella, "Do I love you because you're beautiful, or are you beautiful because I love you?" Chances are it's both. As we see our loved ones again and again, their physical imperfections grow less noticeable and their attractiveness grows more apparent (Beaman & Klentz, 1983; Gross & Crofton, 1977). Shakespeare said it in *A Midsummer Night's Dream:* "Love looks not with the eyes, but with the mind." Come to love someone and watch beauty grow.

"Love has ever in view the absolute loveliness of that which it beholds."
—George MacDonald, *Unspoken Sermons,* 1867

Similarity

Let's say that proximity has brought you into contact with someone and that your appearance has made an acceptable first impression. What now influences whether acquaintances develop into friends? For example, as you get to know someone better, is the chemistry better if you are opposites or if you are alike?

It makes a good story—extremely different types living in harmonious union: Rat, Mole, and Badger in *The Wind in the Willows,* Frog and Toad in Arnold Lobel's books. The stories delight us by expressing what we seldom experience, for we tend *not* to like dissimilar people (Rosenbaum, 1986). In real life, opposites retract. Birds that flock together usually *are* of a feather. Friends and couples are far more likely to share common attitudes, beliefs, and interests (and, for that matter, age, religion, race, education, intelligence, smoking behavior, and economic status) than are randomly paired people. Similarity breeds content.

Proximity, attractiveness, and similarity are not the only determinants of attraction. We also like those who like us. This is especially so when our self-image is low. When we believe someone likes us, we feel good and respond to them warmly, which leads them to like us even more (Curtis & Miller, 1986). To be liked is powerfully rewarding.

Indeed, a simple *reward theory of attraction*—that we will like those whose behavior is rewarding to us and that we will continue relationships that offer more rewards than costs—can explain all the findings we have considered so far. When a person lives or works in close proximity with someone else, it costs less time and effort to develop the friendship and enjoy its benefits. Attractive people are aesthetically pleasing, and associating with them can be socially rewarding. Those with similar views reward us by validating our own.

Snapshots

Bill looked at Susan, Susan at Bill. Suddenly death didn't seem like an option. This was love at first sight.

Romantic Love

39-7: How does romantic love typically change as time passes?

Occasionally, people move quickly from initial impressions, to friendship, to the more intense, complex, and mysterious state of romantic love. Elaine Hatfield (1988) has distinguished two types of love: temporary passionate love and a more enduring companionate love.

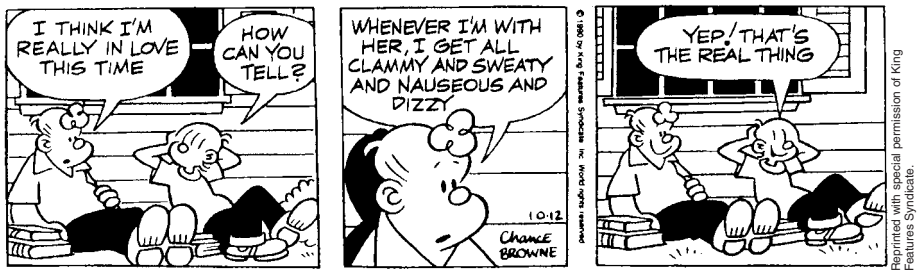
Passionate Love

Noting that arousal is a key ingredient of **passionate love,** Hatfield suggested that the *two-factor theory of emotion* can help us understand this intense positive absorption in another. The theory assumes that (1) emotions have two ingredients—physical arousal plus cognitive appraisal—and that (2) arousal from any source can enhance one emotion or another, depending on how we interpret and label the arousal.

In tests of this theory, college men have been aroused by fright, by running in place, by viewing erotic materials, or by listening to humorous or repulsive monologues. They were then introduced to an attractive woman and asked to rate her (or

passionate love an aroused state of intense positive absorption in another, usually present at the beginning of a love relationship.

HI & LOIS



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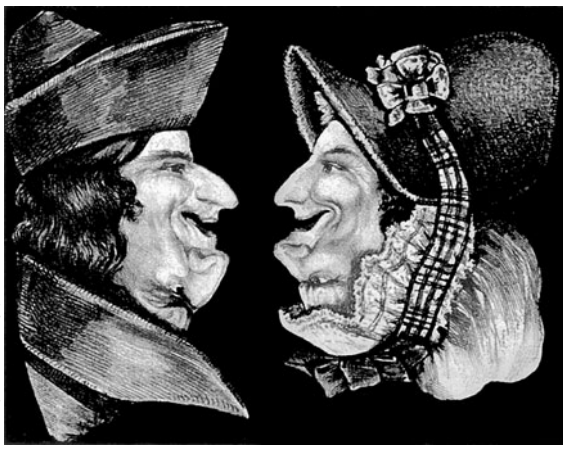


COURTSHIP

Sometimes passionate love becomes enduring companionate love, sometimes not (invert the picture) What, in addition to similar attitudes and interests, predicts long-term loving attachment?

their girlfriend). Unlike unaroused men, those who were stirred up attributed some of their arousal to the woman or girlfriend and felt more attracted to her (Carducci et al., 1978; Dermer & Pyszczynski, 1978; White & Kight, 1984).

Outside the laboratory, Donald Dutton and Arthur Aron (1974, 1989) went to two bridges across British Columbia's rocky Capilano River. One, a swaying footbridge, was 230 feet above the rocks; the other was low and solid. An attractive young female accomplice intercepted men coming off each bridge, sought their help in filling out a short questionnaire, and then offered her phone number in case they wanted to hear more about her project. Far more of those who had just crossed the high bridge—which left their hearts pounding—accepted the number and later called the woman. To be revved up and to associate some of that arousal with a desirable person is to feel the pull of passion. Adrenaline makes the heart grow fonder.

Companionate Love

Although the spark of romantic love often endures, the intense absorption in the other, the thrill of the romance, the giddy "floating on a cloud" feeling typically fades. Does this mean the French are correct in saying that "love makes the time pass and time makes love pass"? Or can friendship and commitment keep a relationship going after the passion cools?

Hatfield noted that as love matures it becomes a steadier **companionate love**—a deep, affectionate attachment. There may be adaptive wisdom to this change from passion to attachment (Reis & Aron, 2008). Passionate love often produces children, whose survival is aided by the parents' waning obsession with one another. Social psychologist Ellen Berscheid and her colleagues (1984) observed that the failure to appreciate passionate love's limited half-life can doom a relationship: "If the inevitable odds against eternal passionate love in a relationship were better understood, more people might choose to be satisfied with the quieter feelings of satisfaction and contentment." Indeed, recognizing the short duration of passionate love, some societies have deemed such feelings an irrational reason for marrying. Better, such cultures say, to choose (or have someone choose for you) a partner with a compatible background and interests. Non-Western cultures, where people rate love less important for marriage, do have lower divorce rates (Levine et al., 1995).

Love is an ancient thing In 2007, a 5000- to 6000-year-old "Romeo and Juliet" young couple was unearthed locked in an embrace, near Rome.

One key to a gratifying and enduring relationship is **equity:** Both partners receive in proportion to what they give. When equity exists—when both partners freely give and receive, when they share decision making—their chances for sustained and satisfying companionate love are good (Gray-Little & Burks, 1983; Van Yperen & Buunk, 1990). In one national survey, "sharing household chores" ranked third, after "faithfulness" and a "happy sexual relationship," on a list of nine things people associated with successful marriages. "I like hugs. I like kisses. But what I really love is help with the dishes," summarized the Pew Research Center (2007).

Another vital ingredient of loving relationships is **self-disclosure,** the revealing of intimate details about ourselves—our likes and dislikes, our dreams and worries, our proud and shameful moments. "When I am with my friend," noted the Roman statesman Seneca, "me thinks I am alone, and as much at liberty to speak anything as to think it." Self-disclosure breeds liking, and liking breeds self-disclosure (Collins & Miller, 1994). As one person reveals a little, the other reciprocates, the first then reveals more, and on and on, as friends or lovers move to deeper intimacy. Each increase in intimacy rekindles passion (Baumeister & Bratslavsky, 1999).

One experiment marched pairs of volunteer students through 45 minutes of increasingly self-disclosing conversation—from "When did you last sing to yourself?" to "When did you last cry in front of another person? By yourself?" By the experiment's end, those experiencing the escalating intimacy felt remarkably close to their conversation partner, much closer than others who had spent the time with small-talk questions, such as "What was your high school like?" (Aron et al., 1997). Given self-disclosing intimacy plus mutually supportive equality, the odds favor enduring companionate love.

"When two people are under the influence of the most violent, most insane, most delusive, and most transient of passions, they are required to swear that they will remain in that excited, abnormal, and exhausting condition continuously until death do them part."

—George Bernard Shaw, "Getting Married," 1908

companionate love the deep affectionate attachment we feel for those with whom our lives are intertwined.

equity a condition in which people receive from a relationship in proportion to what they give to it.

self-disclosure revealing intimate aspects of oneself to others.

altruism unselfish regard for the welfare of others.

Altruism

39-8: When are we most—and least—likely to help?

Carl Wilkens, a Seventh Day Adventist missionary, was living with his family in Kigali, Rwanda, when Hutu militia began to slaughter the Tutsi in 1994. The U.S. government, church leaders, and friends all implored Wilkens to leave. He refused. After evacuating his family, and even after every other American had left Kigali, he alone stayed and contested the 800,000-person genocide. When the militia came to kill him and his Tutsi servants, Wilkens' Hutu neighbors deterred them. Despite repeated death threats, he spent his days running roadblocks to take food and water to orphanages and to negotiate, plead, and bully his way through the bloodshed, saving lives time and again. "It just seemed the right thing to do," he later explained (Kristof, 2004).

Such selfless goodness exemplifies **altruism**—the unselfish regard for the welfare of others. Altruism became a major concern of social psychologists after an especially vile act of sexual violence. On March 13, 1964, a stalker repeatedly stabbed Kitty Genovese, then raped her as she lay dying outside her Queens, New York, apartment at 3:30 A.M. "Oh, my God, he stabbed me!" Genovese screamed into the early morning stillness. "Please help me!" Windows opened and lights went on as neighbors—38 of them, according to an initial *New York Times* report, though the number was later contested—heard her screams. Her attacker fled and then returned to stab and rape her again. Not until he had fled for good did anyone so much as call the police, at 3:50 A.M.

"Probably no single incident has caused social psychologists to pay as much attention to an aspect of social behavior as Kitty Genovese's murder."

—R. Lance Shotland (1984)

Bystander Intervention

Reflecting on initial reports of the Genovese murder, most commentators were outraged by the bystanders' "apathy" and "indifference." Rather than blaming the onlookers for their inaction, social psychologists John Darley and Bibb Latané (1968b) searched for an explanation. The answer, they suspected, was an important situational factor—the presence of others.

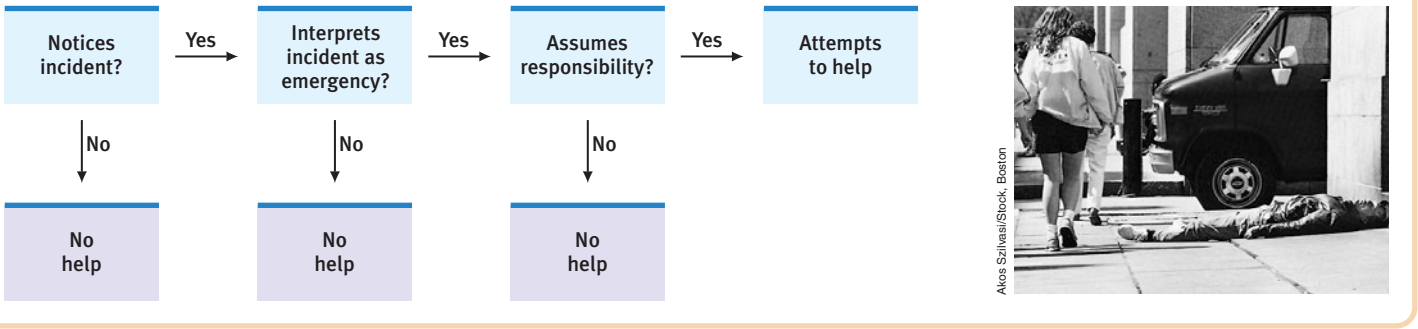


FIGURE 39.8 The decision-making process for bystander intervention Before helping, we must first notice an emergency, then correctly interpret it, and then feel responsible. (From Darley & Latané, 1968b.)

After staging emergencies under various conditions, Darley and Latané assembled their findings into a decision scheme: We will help only if the situation enables us first to *notice* the incident, then to *interpret* it as an emergency, and finally to *assume responsibility* for helping (**FIGURE 39.8**). At each step, the presence of other bystanders can turn us away from the path that leads to helping. In the laboratory and on the street, people in a group of strangers are more likely than solitary individuals to keep their eyes focused on what they themselves are doing or where they are going. If they notice an unusual situation, they may infer from the blasé reactions of the other passersby that the situation is not an emergency. "The person lying on the sidewalk must be drunk," they think, and move on.

But sometimes the emergency is unambiguous and people still fail to help. The witnesses looking out through their windows noticed the incident, correctly interpreted the emergency, and yet failed to assume responsibility. Why? To find out, Darley and Latané (1968a) simulated a physical emergency in their laboratory. University students participated in a discussion over an intercom. Each student was in a separate cubicle, and only the person whose microphone was switched on could be heard. One of the students was an accomplice of the experimenters. When his turn came, he made sounds as though he were having an epileptic seizure and called for help.

How did the other students react? As **FIGURE 39.9** shows, those who believed only they could hear the victim—and therefore thought they bore total responsibility for helping him—usually went to his aid. Those who thought others also could hear were more likely to react as did Kitty Genovese's neighbors. When more people shared responsibility for helping—when there was a *diffusion of responsibility*—any single listener was less likely to help.

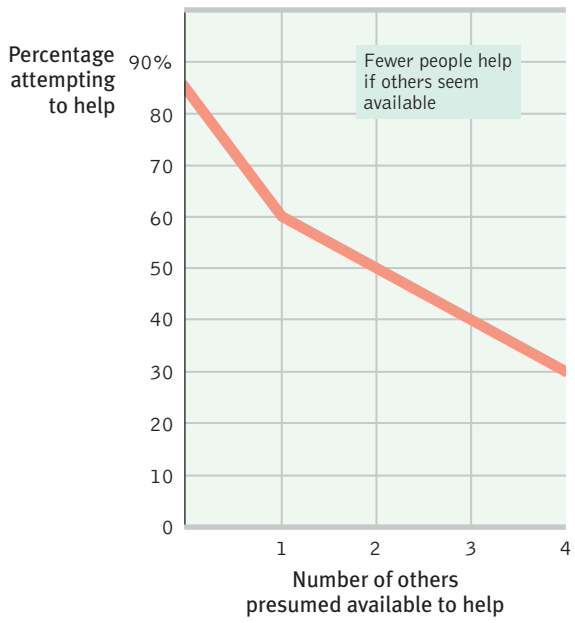


FIGURE 39.9 Responses to a simulated physical emergency When people thought they alone heard the calls for help from a person they believed to be having an epileptic seizure, they usually helped. But when they thought four others were also hearing the calls, fewer than a third responded. (From Darley & Latané, 1968a.)

In hundreds of additional experiments, psychologists have studied the factors that influence bystanders' willingness to relay an emergency phone call, aid a stranded motorist, donate blood, contribute money, give time, and pick up dropped books and pencils (Eagly & Crowley, 1986; Latané & Dabbs, 1975). The major finding that emerged was the **bystander effect**—any particular bystander is less likely to give aid with other bystanders present. When alone with the person in need, about 40 percent help; in the presence of five other bystanders, only 20 percent help.

bystander effect the tendency for any given bystander to be less likely to give aid if other bystanders are present.

social exchange theory the theory that our social behavior is an exchange process, the aim of which is to maximize benefits and minimize costs.

reciprocity norm an expectation that people will help, not hurt, those who have helped them.

social-responsibility norm an expectation that people will help those dependent upon them.

Observations of behavior in tens of thousands of such situations indicate that the *best* odds of our helping occur when

- the person appears to need and deserve help.
- the person is in some way similar to us.
- we have just observed someone else being helpful.
- we are not in a hurry.
- we are in a small town or rural area.
- we are feeling guilty.
- we are focused on others and not preoccupied.
- we are in a good mood.

This last result, that happy people are helpful people, is one of the most consistent findings in all of psychology. No matter how people are cheered—whether by being made to feel successful and intelligent, by thinking happy thoughts, by finding money, or even by receiving a posthypnotic suggestion—they become more generous and more eager to help (Carlson et al., 1988).

"Oh, make us happy and you make us good!"

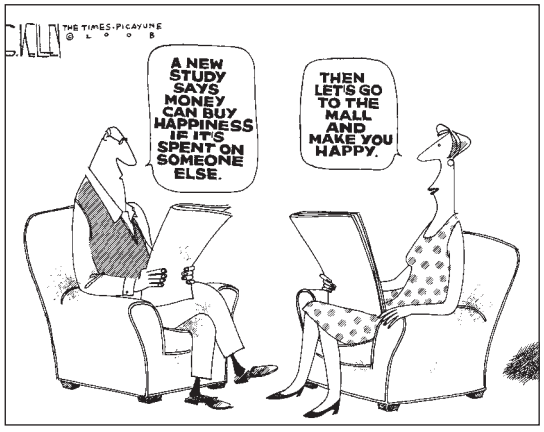
—Robert Browning, *The Ring and the Book*, 1868

The Norms for Helping

Why do we help? One widely held view is that self-interest underlies all human interactions, that our constant goal is to maximize our rewards and minimize our costs. Accountants call it *cost-benefit analysis*. Philosophers call it *utilitarianism*. Social psychologists call it **social exchange theory.** If you are pondering whether to donate blood, you may weigh the costs of doing so (time, discomfort, and anxiety) against the benefits (reduced guilt, social approval, and good feelings). If the rewards you anticipate from helping exceed the costs, you will help.

For most people, helping is intrinsically rewarding. Making charitable donations activates brain areas associated with reward (Harbaugh et al., 2007). That helps explain some findings by Elizabeth Dunn and her colleagues (2008). People who give more money away are happier than those who spend their money almost entirely on themselves. Employees who receive a windfall bonus, for example, are later happier if they have done something for other people with it. In one experiment, researchers gave people an envelope with cash and told them either to spend it on themselves or on others. Which group do you suppose was happiest at the day's end? It was, indeed, those assigned to the spend-it-on-others condition.

But why do we leave tips or give directions to total strangers—people we will never see again? In part, we have been socialized to do so, through norms that prescribe how we *ought* to behave, often to our mutual benefit. The **reciprocity norm,** for example, is the expectation that we should return help, not harm, to those who have helped us. In our relations with others of similar status, the reciprocity norm compels us to give (in favors, gifts, or social invitations) about as much as we receive. We also learn a **social-responsibility norm:** We should help those who need our help—young children and others who cannot give as much as they receive—even if the costs outweigh the benefits. In repeated Gallup surveys, people who each week attend religious services often exhibit the social responsibility norm: They report volunteering more than twice as many hours in helping the poor and infirm than do those who rarely or never attend religious services (Hodgkinson & Weitzman, 1992; Independent Sector, 2002). They also give away three times as much money.



Steve Kelley/Creators Syndicate

conflict a perceived incompatibility of actions, goals, or ideas.

social trap a situation in which the conflicting parties, by each rationally pursuing their self-interest, become caught in mutually destructive behavior.

Conflict and Peacemaking

39-9: How do social traps and mirror-image perceptions fuel social conflict?

We live in surprising times. With astonishing speed, late-twentieth-century democratic movements swept away totalitarian rule in Eastern European countries, and hopes for a new world order displaced the Cold War chill. And yet, the twenty-first century began with terrorist acts and war, and the world continued to spend $2 billion every day for arms and armies—money that could have been used for housing, nutrition, education, and health care. Knowing that wars begin in human minds, psychologists have wondered: What in the human mind causes destructive conflict? How might the perceived threats of social diversity be replaced by a spirit of cooperation?

To a social psychologist, a **conflict** is a perceived incompatibility of actions, goals, or ideas. The elements of conflict are much the same at all levels, from nations at war, to cultural disputes within a society, to individuals in a marital dispute. In each situation, people become enmeshed in a potentially destructive social process that can produce results no one wants. Among the destructive processes are *social traps* and *distorted perceptions.*

Social Traps

In some situations, we support our collective well-being by pursuing our personal interests. As capitalist Adam Smith wrote in *The Wealth of Nations* (1776), "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest."

In other situations, we harm our collective well-being by pursuing our personal interests. Such situations are **social traps.** Consider the simple game matrix in **FIGURE 39.10**. Pretend you are Person 1, and that you and Person 2 will each receive the amount shown after you separately choose either A or B. (You might invite someone to look at the matrix with you and take the role of Person 2.) Which do you choose—A or B?

You and Person 2 are caught in a dilemma, because both sides can win or both can lose, depending on the players' individual choices. If you both choose A, you both benefit, making $5 each. If you both choose B, neither of you makes anything. Nevertheless, on any single trial you would serve your own interests if you choose B: You can't lose, and you might make $10. But the same is true for the other person. Hence, the social trap: As long as you both pursue your own immediate best interest and choose B, you will both end up with nothing—the typical result—when you could have made $5.

Many real-life situations similarly pit our individual interests against our communal well-being. Individual whalers reasoned that the few whales they took would not threaten the species and that if they didn't take them others would anyway. The result: Some species of whales became endangered. Ditto for the buffalo hunters of yesterday and the elephant-tusk poachers of today. Individual car owners and home owners reason, "It would cost me comfort or money to buy a more fuel-efficient car and furnace. Besides, the fossil fuels I burn don't noticeably add to the greenhouse gases." When enough of us reason this way, the collective result threatens disaster—global climate change, rising seas, and more extreme weather.

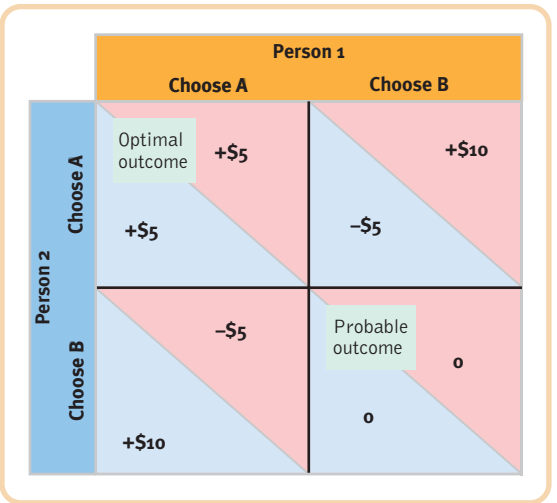


FIGURE 39.10 Social-trap game matrix By pursuing our self-interest and not trusting others, we can end up losers. To illustrate this, imagine playing the game at right. The pink triangles show the outcomes for Person 1, which depend on the choices made by both players. If you were Person 1, would you choose A or B? (This game is called a *non–zero-sum game,* because the outcomes need not add up to zero; both sides can win or both can lose.)

AP Photo/Lisa Poole

Not in my ocean! Many people support alternative energy sources, including wind turbines. But proposals to construct wind farms in real-world neighborhoods elicit debate over the future benefits of clean energy versus the costs of altering treasured ocean views and, possibly, migratory bird routes.

Social traps challenge us to find ways of cooperating for our mutual betterment, through *agreed-upon regulations, better communication,* and *increased awareness of our responsibilities* toward community, nation, and the whole of humanity. Whether playing a laboratory game or the real game of life, people more often cooperate when these three factors are present (Dawes, 1980; Linder, 1982; Sato, 1987).

Enemy Perceptions

Psychologists have noted that those in conflict have a curious tendency to form diabolical images of each other. These distorted images are ironically similar, so similar in fact that we call them **mirror-image perceptions:** As we see "them"—as untrustworthy and evil intentioned—so "they" see us. Each demonizes the other.

Mirror-image perceptions often become self-fulfilling prophecies, feeding a vicious cycle of hostility. If Juan believes Maria is annoyed with him, he may snub her, causing her to act in ways that justify his perception. As with individuals, so with countries. When perceiving Country A as hostile, Country B may react in ways that seem justified. And, seeing their own actions as responses to provocation (tit for tat), not as the causes of what happens, they often hit back harder. In one experiment, University College London volunteers used a mechanical device to press on another volunteer's finger, after feeling pressure on their own finger. Although their task was to reciprocate with the same amount of pressure, they typically responded with about 40 percent more force than they had just experienced. Despite seeking to respond only in kind, their touches soon escalated to hard presses, much as when each child after a fight claims that "I just poked him, but he hit me harder" (Shergill et al., 2003).

In the early twenty-first century, many Americans came to loathe Saddam Hussein. Like the "evil" Saddam Hussein, "some of today's tyrants are gripped by an implacable hatred of the United States of America," declared then-President George W. Bush (2001). "They hate our friends, they hate our values, they hate democracy and freedom and individual liberty. Many care little for the lives of their own people." Hussein (2002) reciprocated the perception, seeing the United States as "an evil tyrant" that, with Satan as its protector, lusted for oil and aggressively attacked those who "defend what is right."

The point is not that truth must lie midway between two such views (one may be more accurate). The point is that enemy perceptions often form mirror images. Moreover, as enemies change, so do perceptions. In American minds and media, the "bloodthirsty, cruel, treacherous" Japanese of World War II later became our "intelligent, hardworking, self-disciplined, resourceful allies" (Gallup, 1972).

Can contact, cooperation, communication, and conciliation transform the antagonisms fed by prejudice and conflicts into attitudes that promote peace? In some cases, the answer is *yes.*

mirror-image perceptions mutual views often held by conflicting people, as when each side sees itself as ethical and peaceful and views the other side as evil and aggressive.

Contact

39-10: How can we transform feelings of prejudice, aggression, and conflict into attitudes that promote peace?

Does it help to put two conflicting parties into close contact? It depends. When such contact is noncompetitive and between parties of equal status, such as retail clerks working the same shift, it typically helps. Initially prejudiced co-workers of different races have, in such circumstances, usually come to accept one another.

This finding is confirmed by a statistical digest of more than 500 studies of face-to-face contact with outgroups (such as ethnic minorities, the elderly, and those with disabilities). Among the quarter-million people studied across 38 nations, contact has been correlated with, or in experimental studies has led to, more positive attitudes (Pettigrew & Tropp, 2006). Some examples:

- With interracial contact, South African Whites' and Blacks' "attitudes [have moved] into closer alignment" (Dixon et al., 2007).
- Heterosexuals' personal contact with gay people correlates with accepting attitudes. In one national survey, those who knowingly had a gay family member or close friend were twice as likely to support gay marriage as those who didn't—55 percent versus 25 percent (Neidorf & Morin, 2007).
- Even indirect contact with a member of an outgroup (via story reading or through a friend who has an outgroup friend) tends to reduce prejudice (Cameron & Rutland, 2006; Pettigrew et al., 2007).

However, mere contact is not always enough. In most desegregated schools, ethnic groups resegregate themselves in the lunchrooms and on the school grounds (Clack et al., 2005; Schofield, 1986). People in each group often think they would welcome more contact with the other group, but they assume the other group does not reciprocate the wish (Richeson & Shelton, 2007). "I don't reach out to them, because I don't want to be rebuffed; they don't reach out to me, because they're just not interested." When such mirror-image misperceptions are corrected, friendships may then form and prejudices melt.

"You cannot shake hands with a clenched fist."
—Indira Gandhi, 1971

Cooperation

To see if enemies could overcome their differences, researcher Muzafer Sherif (1966) first instigated conflict. He placed 22 Oklahoma City boys in two separate areas of a Boy Scout camp. He then put the two groups through a series of competitive activities, with prizes going to the victors. Before long, each group became intensely proud of itself and hostile to the other group's "sneaky," "smart-alecky stinkers." Food wars, ransacked cabins, and fistfights were commonplace. When Sherif brought the two groups together, they avoided one another, except to taunt and threaten.

Nevertheless, within a few days Sherif transformed these young enemies into jovial comrades. He gave them **superordinate goals**—shared goals that overrode their differences and that could be achieved only through cooperation. A planned disruption of the camp water supply necessitated that all 22 boys work together to restore water. Renting a movie in those pre-DVD days required their pooled resources. A stalled truck needed the combined force of all the boys pulling and pushing together to get it moving. Having used isolation and competition to make strangers into enemies, Sherif used shared predicaments and goals to reconcile the enemies and make them friends. What reduced conflict was not mere contact, but *cooperative* contact.

A shared predicament—a fearsome external threat and a superordinate desire to overcome it—likewise had a powerfully unifying effect in the weeks after 9/11. Patriotism soared as Americans felt that "we" were under attack. Gallup-surveyed approval of "our President" (George W. Bush) shot up from 51 percent the week before the attack to a highest-ever level of 90 percent ten days after, just surpassing

Superordinate goals override differences Cooperative efforts to achieve shared goals are an effective way to break down social barriers.

Syracuse Newspapers/The Image Works

the previous approval record of 89 percent enjoyed by his father, George H. W. Bush, at the climax of the 1991 Persian Gulf war (Newport, 2002). In chat groups and everyday speech, even the word *we* (relative to *I*) surged in the immediate aftermath (Pennebaker, 2002).

Cooperation has especially positive effects when it leads people to define a new, inclusive group that dissolves their former subgroups (Dovidio & Gaertner, 1999). Seat the members of two groups not on opposite sides, but alternately around the table. Give them a new, shared name. Have them work together. Such experiences change "us" and "them" into "we." Those once perceived as being in another group now are seen as part of one's own group. One 18-year-old New Jersey man would not be surprised. After 9/11, he explained a shift in his social identity: "I just thought of myself as Black. But now I feel like I'm an American, more than ever" (Sengupta, 2001). In one experiment, White Americans who read a newspaper article about a terrorist threat against all Americans subsequently expressed reduced prejudice against African-Americans (Dovidio et al., 2004).

The unifying effects of cooperative contacts have led thousands of teachers to introduce interracial cooperative learning into their classrooms with great success. Experiments with adolescents from 11 countries confirm that cooperative classroom situations and cooperative learning lead to interracial friendships and may even enhance student achievement (Roseth, Johnson, & Johnson, 2008). Members of interracial groups who work together on projects and play together on athletic teams typically come to feel friendly toward those of another race.

The power of cooperative activity to make friends of former enemies has led psychologists to urge increased international exchange and cooperation (Klineberg, 1984). As we engage in mutually beneficial trade, as we work to protect our common destiny on this fragile planet, and as we become more aware that our hopes and fears are shared, we can change misperceptions that feed conflict into a solidarity based on common interests.

Communication

When real-life conflicts become intense, a third-party mediator—a marriage counselor, labor mediator, diplomat, community volunteer—may facilitate much-needed communication (Rubin et al., 1994). Mediators help each party to voice its viewpoint and to understand the other's. By leading each side to think about the other's underlying needs and goals, the mediator aims to replace a competitive *win-lose* orientation with a cooperative *win-win* orientation that aims at a mutually beneficial resolution. A classic example: Two friends, after quarreling over an orange, agreed to split it. One squeezed his half for juice. The other used the peel from her half to make a cake. If only the two had understood each other's motives, they could have hit on the win-win solution of one having all the juice, the other all the peel.

Conciliation

Understanding and cooperative resolution is most needed, yet least likely, in times of anger or crisis (Bodenhausen et al., 1994; Tetlock, 1988). When conflicts intensify, images become more stereotyped, judgments more rigid, and communication more difficult, or even impossible. Each party is likely to threaten, coerce, or retaliate. In the weeks before the Persian Gulf war, the first President George Bush threatened, in the full glare of publicity, to "kick Saddam's ass." Saddam Hussein communicated in kind, threatening to make Americans "swim in their own blood."

Under such conditions, is there an alternative to war or surrender? Social psychologist Charles Osgood (1962, 1980) advocated a strategy of *Graduated and Reciprocated Initiatives in Tension-Reduction,* nicknamed **GRIT.** In applying GRIT, one side first announces its recognition of mutual interests and its intent to reduce tensions. It then initiates one or more small, conciliatory acts. Without weakening one's retaliatory capability, this modest beginning opens the door for reciprocity by the

superordinate goals shared goals that override differences among people and require their cooperation.

GRIT Graduated and Reciprocated Initiatives in Tension-Reduction—a strategy designed to decrease international tensions.


Chris Bouroncle/AFP/Getty Images

Conciliatory gestures In hopes of encouraging steps down the tension ladder, President Barack Obama in 2009 spoke to the Muslim world from the University of Cairo, proposing "a new beginning" in relations between Muslim nations and the United States.

other party. Should the enemy respond with hostility, one reciprocates in kind. But so, too, with any conciliatory response. Thus, U.S. President John Kennedy's gesture of stopping atmospheric nuclear tests began a series of reciprocated conciliatory acts that culminated in the 1993 atmospheric test-ban treaty.

In laboratory experiments, GRIT has been an effective strategy for increasing trust and cooperation (Lindskold et al., 1978, 1988). Even during intense personal conflict, when communication has been nonexistent, a small conciliatory gesture—a smile, a touch, a word of apology—may work wonders. Conciliations allow both parties to begin edging down the tension ladder to a safer rung where communication and mutual understanding can begin.

And how good that such can happen, for civilization advances not by cultural isolation—maintaining walls around ethnic enclaves—but by tapping the knowledge, the skills, and the arts that are each culture's legacy to the whole human race. Thomas Sowell (1991) observed that, thanks to cultural sharing, every modern society is enriched by a cultural mix. We have China to thank for paper and printing and for the magnetic compass that opened the great explorations. We have Egypt to thank for trigonometry. We have the Islamic world and India's Hindus to thank for our Arabic numerals. While celebrating and claiming these diverse cultural legacies, we can also welcome the enrichment of today's social diversity. We can view ourselves as instruments in a human orchestra. And we can therefore affirm our own culture's heritage while building bridges of communication, understanding, and cooperation across cultural traditions as we think about, influence, and relate to one another.

"Most of us have overlapping identities which unite us with very different groups. We *can* love what we are, without hating what—and who—we are *not*. We can thrive in our own tradition, even as we learn from others."

—Former U.N. Secretary-General Kofi Annan, Nobel Prize Lecture, 2001

Social Relations

Module Review

39-1: What is prejudice? *Prejudice* is a mixture of beliefs (often *stereotypes*), negative emotions, and predispositions to action. Prejudice may be explicit (such as openly and consciously denying a particular ethnic group the right to vote) or implicit (such as feeling fearful when alone in an elevator with a stranger from a different racial or ethnic group).

39-2: What are the social and emotional roots of prejudice? Social inequalities may trigger prejudice as people in power attempt to justify the status quo, which sometimes involves blaming the victim. Favored social groups often rationalize their higher status with the *just-world phenomenon.* Group identifications (*ingroup* versus *outgroup*) leads to *ingroup bias.* Fear and anger feed prejudice, and, when frustrated, we may focus our anger on a *scapegoat.*

39-3: What are the cognitive roots of prejudice? In processing information, we tend to recognize diversity in our own groups but to overestimate similarities in other groups, as in the *other-race effect.* We also notice and remember vivid cases. These trends help create stereotypes.

39-4: What biological factors make us more prone to hurt one another? Biology influences *aggression* at three levels: genetic, neural, and biochemical. Genes influence our temperament, making us more or less likely to respond aggressively when frustrated in specific situations. Neural systems in the brain can facilitate or inhibit aggression. Biochemical influences, such as testosterone and other hormones; alcohol (which disinhibits); and other substances also contribute to aggression.

39-5: What psychological and social-cultural factors may trigger aggressive behavior? The *frustration-aggression principle* states that frustration and other aversive events (such as heat, crowding, and provocation) can evoke hostility. This is especially likely in those who have been rewarded for aggression or have learned aggression from role models, including those seen in the media, who teach social scripts that are later enacted in real life. Enacting violence in video games or viewing it in the media can desensitize people to cruelty and prime them to behave aggressively when provoked, or to view sexual aggression as more acceptable.

39-6: Why do we befriend or fall in love with some people but not with others? Three factors affect our liking for one another. Proximity—geographical nearness—is conducive to attraction, partly because *mere exposure* to novel stimuli enhances liking. Physical attractiveness increases social opportunities and influences the way we are perceived. As acquaintanceship moves toward friendship, similarity of attitudes and interests greatly increases liking.

39-7: How does romantic love typically change as time passes? *Passionate love* is an aroused state that we cognitively label as love. The strong affection of *companionate love,* which often emerges as passionate love subsides, is enhanced by an *equitable* relationship and by intimate *self-disclosure.*

39-8: When are we most—and least—likely to help? *Altruism* is unselfish regard for the well-being of others. We are less likely to help if others are present. This *bystander effect* is especially apparent in situations where the presence of others inhibits our noticing the event, interpreting it as an emergency, or assuming responsibility for offering help. Explanations of our willingness to help others focus on *social exchange theory* (the costs and benefits of helping); the intrinsic rewards of helping others; the *reciprocity norm* (we help those who help us); and the *social-responsibility norm* (we help those who need our help).

39-9: How do social traps and mirror-image perceptions fuel social conflict? *Conflicts* are situations in which people perceive their actions, goals, or ideas to be incompatible. In *social traps,* two or more individuals engage in mutually destructive behavior by rationally pursuing their individual self-interests. People in conflict tend to expect the worst of each other, producing *mirror-image perceptions* that can become self-fulfilling prophecies.

39-10: How can we transform feelings of prejudice, aggression, and conflict into attitudes that promote peace? Enemies sometimes become friends, especially when the circumstances favor equal-status contact, cooperation to achieve *superordinate goals,* understanding through communication, and reciprocated conciliatory gestures.

Rehearse It!

1. When we are frustrated, prejudice provides an outlet for our anger and gives us someone to blame. This effect is best described by
   a. ingroup bias.
   b. scapegoat theory.
   c. vivid-case theory.
   d. the just-world phenomenon.

2. If several well-publicized murders are committed by members of a particular group, we may tend to react with fear and suspicion toward all members of that group. In other words, we
   a. blame the victim.
   b. overgeneralize from vivid, memorable cases.
   c. view the world as just.
   d. rationalize inequality.

3. Aggression is influenced by biology at the genetic, neural, and biochemical levels. Evidence of a biochemical influence on aggression is the finding that
   a. aggressive behavior varies widely from culture to culture.
   b. animals can be bred for aggressiveness.
   c. stimulation of an area of the brain's limbic system produces aggressive behavior.
   d. a higher-than-average level of the hormone testosterone is associated with violent behavior in males.

4. Studies show that parents of delinquent young people tend to use beatings to enforce discipline. This demonstrates that aggression can be
   a. learned through direct rewards.
   b. triggered by exposure to violent media.
   c. learned through observation of aggressive models.

d. caused by hormonal changes at puberty.

5. A conference of social scientists studying the effects of pornography unanimously agreed that violent pornography
   a. has little effect on most viewers.
   b. is the primary cause of reported and unreported rapes.
   c. leads viewers to be more accepting of coercion in sexual relations.
   d. has no effect, other than short-term arousal and entertainment.

6. The aspect of X-rated films that most directly influences men's aggression toward women seems to be the
   a. length of the film.
   b. eroticism portrayed.
   c. depictions of sexual violence.
   d. attractiveness of the actors.

7. The mere exposure effect helps explain why proximity is a powerful predictor of friendship and marriage, and why, for example, people tend to marry someone
   a. about as attractive as themselves.
   b. who lives or works nearby.
   c. with whom they enjoy self-disclosure.
   d. with whom they have an equitable relationship.

8. After vigorous exercise, you meet an attractive person, and you are suddenly seized by romantic feelings for that person. This event supports the two-factor theory of emotion, which assumes that emotions such as passionate love consist of physical arousal plus
   a. a reward.
   b. proximity.
   c. companionate love.
   d. our interpretation of that arousal.

9. Two vital ingredients in the deep, affectionate attachment of companionate love are
   a. equity and self-disclosure.
   b. proximity and privacy.
   c. attractiveness and self-absorption.
   d. altruism and excitement.

10. The bystander effect states that a particular bystander is less likely to give aid if
    a. the victim is similar to the bystander in appearance.
    b. no one else is present.
    c. other people are present.
    d. the incident occurs in a deserted or rural area.

11. Social psychologists have attempted to define the circumstances that facilitate conflict resolution. One way of resolving conflicts and fostering cooperation is by giving rival groups superordinate goals, which are
    a. the goals of friendly competition.
    b. shared goals that override differences.
    c. goals for winning at negotiations.
    d. goals for increasing conflict through reduced contact.

Answers: 1. b, 2. b, 3. d, 4. c, 5. c, 6. c, 7. b, 8. d, 9. a, 10. c, 11. b.

Terms and Concepts to Remember

social psychology, p. 564
prejudice, p. 564
stereotype, p. 564
discrimination, p. 564
just-world phenomenon, p. 566
ingroup, p. 567
outgroup, p. 567
ingroup bias, p. 567
scapegoat theory, p. 568
other-race effect, p. 568
aggression, p. 569
frustration-aggression principle, p. 571
mere exposure effect, p. 576
passionate love, p. 579
companionate love, p. 580
equity, p. 581
self-disclosure, p. 581
altruism, p. 581
bystander effect, p. 583
social exchange theory, p. 583
reciprocity norm, p. 583
social-responsibility norm, p. 583
conflict, p. 584
social trap, p. 584
mirror-image perceptions, p. 585
superordinate goals, p. 586
GRIT, p. 587

Test For Success: Critical Thinking Exercises

By Amy Himsel, El Camino College

1. Stacy, a Chicago Cubs fan who is normally a very calm and softhearted person, becomes wild with joy whenever the White Sox, a rival baseball team, loses a game. Why does Stacy take pleasure in their losses?
2. Brittany, the president of the Psychology Club, needs assistance preparing for an upcoming fund-raising event. She made a plea for help in an e-mail she sent in a mass mailing to all 60 club members. So far, however, nobody has responded—either to help or not help. What might be the problem, and how could Brittany change her approach in the hope of getting people to respond and help?

The Test for Success exercises offer you a chance to apply your critical thinking skills to aspects of the material you have just read. Suggestions for answering these questions can be found in Appendix D at the back of the book.

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

APPENDIX A

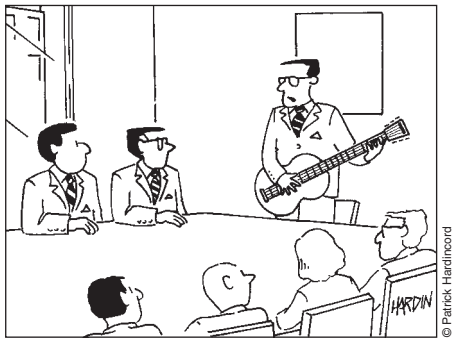
Statistical Reasoning in Everyday Life

In descriptive, correlational, and experimental research, statistics are tools that help us see and interpret what the unaided eye might miss. But statistical understanding benefits more than just researchers. To be an educated person today is to be able to apply simple statistical principles to everyday reasoning. One needn't memorize complicated formulas to think more clearly and critically about data.

A-1: What is the first important point to remember when assessing studies that use statistical reasoning?

Off-the-top-of-the-head estimates often misread reality and then mislead the public. Someone throws out a big, round number. Others echo it, and before long the big, round number becomes public misinformation. A few examples:

- *Ten percent of people are lesbians or gay men.* Or is it 2 to 3 percent, as suggested by various national surveys?
- *We ordinarily use but 10 percent of our brain.* Or is it closer to 100 percent?
- *The human brain has 100 billion nerve cells.* Or is it more like 40 billion, as suggested by extrapolation from sample counts?



"Figures can be misleading—so I've written a song which I think expresses the real story of the firm's performance this quarter."

The point to remember: Doubt big, round, undocumented numbers. Rather than swallowing top-of-the-head estimates, focus on thinking smarter by applying simple statistical principles to everyday reasoning.

Describing Data

A-2: How can we describe data with measures of central tendency and variation?

Once researchers have gathered their data, they must organize them in some meaningful way. One way to do this is to convert the data into a simple *bar graph*, as in FIGURE A.1 on the next page, which displays a distribution of different brands of trucks still on the road after a decade. When reading statistical graphs such as this, take care. It's easy to design a graph to make a difference look big (Figure A.1a) or small (Figure A.1b). The secret lies in how you label the vertical scale *(the Y-axis)*.

The point to remember: Think smart. When viewing figures in magazines and on television, read the scale labels and note their range.

Measures of Central Tendency

The next step is to summarize the data using some *measure of central tendency*, a single score that represents a whole set of scores. The simplest measure is the **mode,** the most frequently occurring score or scores. The most commonly reported is the **mean,** or arithmetic average—the total sum of all the scores divided by the number of scores. On a divided highway, the median is the middle. So, too, with data: The **median** is the midpoint—the 50th percentile. If you arrange all the scores in order from the highest to the lowest, half will be above the median and half will be below it.

mode the most frequently occurring score(s) in a distribution.

mean the arithmetic average of a distribution, obtained by adding the scores and then dividing by the number of scores.

median the middle score in a distribution; half the scores are above it and half are below it.

FIGURE A.1 Read the scale labels An American truck manufacturer offered graph a—with actual brand names included—to suggest the much greater durability of its trucks. Note, however, how the apparent difference shrinks as the vertical scale changes (graph b).

The average person has one ovary and one testicle.

Measures of central tendency neatly summarize data. But consider what happens to the mean when a distribution is lopsided or *skewed.* With income data, for example, the mode, median, and mean often tell very different stories (**FIGURE A.2**). This happens because the mean is biased by a few extreme scores. When Microsoft co-founder Bill Gates sits down in an intimate café, its average (mean) customer instantly becomes a billionaire. But the customer's median wealth remains unchanged. Understanding this, you can see how a British newspaper could accurately run the headline "Income for 62% Is Below Average" (Waterhouse, 1993). Because the bottom *half* of British income earners receive only a *quarter* of the national income cake, most British people, like most people everywhere, make less than the mean. In the United States, Republicans tended to tout the economy's solid growth from 2000 to 2006 using average income; Democrats lamented the economy's lackluster growth using median income (Paulos, 2006). Mean and median tell different true stories.

The point to remember: Always note which measure of central tendency is reported. Then, if it is a mean, consider whether a few atypical scores could be distorting it.

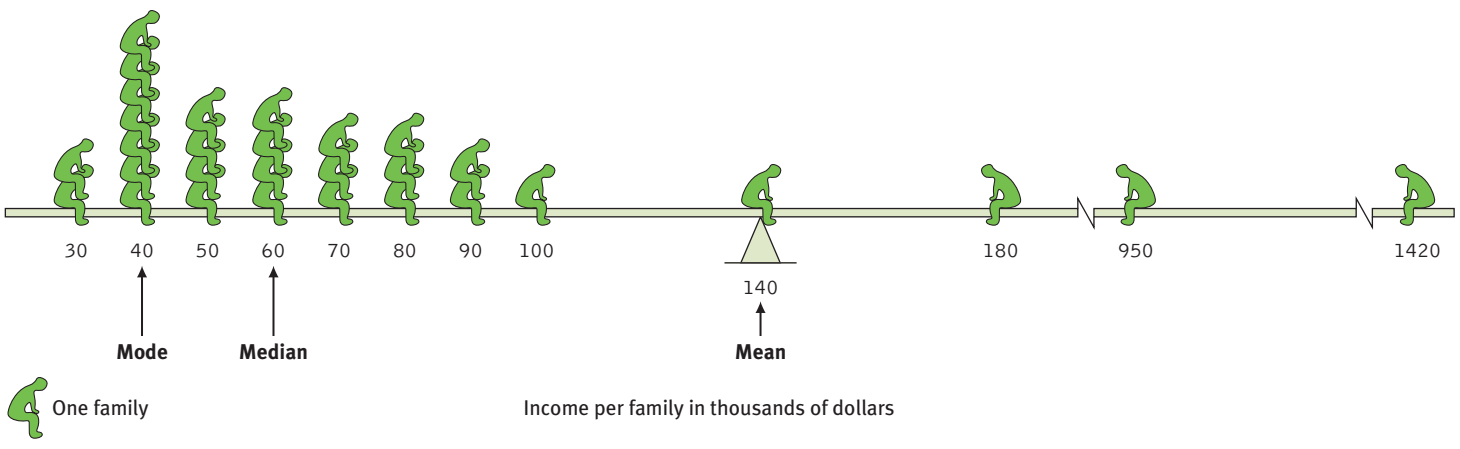


FIGURE A.2 A skewed distribution This graphic representation of the distribution of a village's incomes illustrates the three measures of central tendency—mode, median, and mean. Note how just a few high incomes make the mean—the fulcrum point that balances the incomes above and below—deceptively high.

Measures of Variation

Knowing the value of an appropriate measure of central tendency can tell us a great deal. But the single number omits other information. It helps to know something about the amount of *variation* in the data—how similar or diverse the scores are. Averages derived from scores with low variability are more reliable than averages based on scores with high variability. Consider a basketball player who scored between 13 and 17 points in each of her first 10 games in a season. Knowing this, we would be more confident that she would score near 15 points in her next game than if her scores had varied from 5 to 25 points.

The **range** of scores—the gap between the lowest and highest scores—provides only a crude estimate of variation because a couple of extreme scores in an otherwise uniform group, such as the $950,000 and $1,420,000 incomes in Figure A.2, will create a deceptively large range.

The more useful standard for measuring how much scores deviate from one another is the **standard deviation.** It better gauges whether scores are packed together or dispersed, because it uses information from each score (**TABLE A.1**). The computation assembles information about how much individual scores differ from the mean. If your college or university attracts students of a certain ability level, their intelligence scores will have a relatively small standard deviation compared with the more diverse community population outside your school.

You can grasp the meaning of the standard deviation if you consider how scores tend to be distributed in nature. Large numbers of data—heights, weights, intelligence scores, grades (though not incomes)—often form a symmetrical, *bell-shaped* distribution. Most cases fall near the mean, and fewer cases fall near either extreme. This bell-shaped distribution is so typical that we call the curve it forms the **normal curve.**

A useful property of the normal curve is that roughly 68 percent of the cases fall within one standard deviation on either side of the mean. As **FIGURE A.3** on the next page shows, about 95 percent of cases fall within two standard deviations. Thus, about 68 percent of people taking an intelligence test will score within ±15 points of 100. About 95 percent will score within ±30 points.

"The poor are getting poorer, but with the rich getting richer it all averages out in the long run."

range the difference between the highest and lowest scores in a distribution.

standard deviation a computed measure of how much scores vary around the mean score.

normal curve (*normal distribution*) a symmetrical, bell-shaped curve that describes the distribution of many types of data; most scores fall near the mean (68 percent fall within one standard deviation of it) and fewer and fewer near the extremes.

TABLE A.1 Standard Deviation Is Much More Informative Than Mean Alone

Note that the test scores in Class A and Class B have the same mean (80), but very different standard deviations, which tell us more about how the students in each class are really faring.

Test Scores in Class A

Score	Deviation from the Mean	Squared Deviation
72	−8	64
74	−6	36
77	−3	9
79	−1	1
82	+2	4
84	+4	16
85	+5	25
87	+7	49
Total = 640		Sum of (deviations)^2 = 204

Mean = 640 ÷ 8 = 80

Standard deviation = $\sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}} = \sqrt{\frac{204}{8}} = 5.0$

Test Scores in Class B

Score	Deviation from the Mean	Squared Deviation
60	−20	400
60	−20	400
70	−10	100
70	−10	100
90	+10	100
90	+10	100
100	+20	400
100	+20	400
Total = 640		Sum of (deviations)^2 = 2000

Mean = 640 ÷ 8 = 80

Standard deviation = $\sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}} = \sqrt{\frac{2000}{8}} = 15.8$

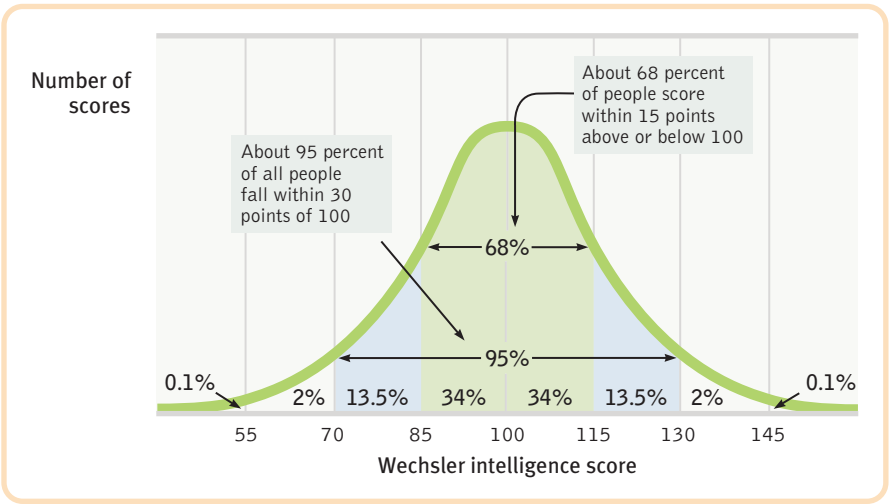


FIGURE A.3 The normal curve Scores on aptitude tests tend to form a normal, or bell-shaped, curve, with most scores falling near the mean. For example, the Wechsler Adult Intelligence Scale calls the mean score 100.

Correlation: A Measure of Relationships

A-3: What does it mean when we say that two things are correlated?

Throughout this book we often ask how strongly two things are related: For example, how closely related are the personality scores of identical twins? How well do intelligence test scores predict achievement? How closely is stress related to disease?

Describing behavior is a first step toward predicting it. When surveys and naturalistic observations reveal that one trait or behavior accompanies another, we say the two *correlate*. A **correlation coefficient** is a statistical measure of a relationship (FIGURE A.4).

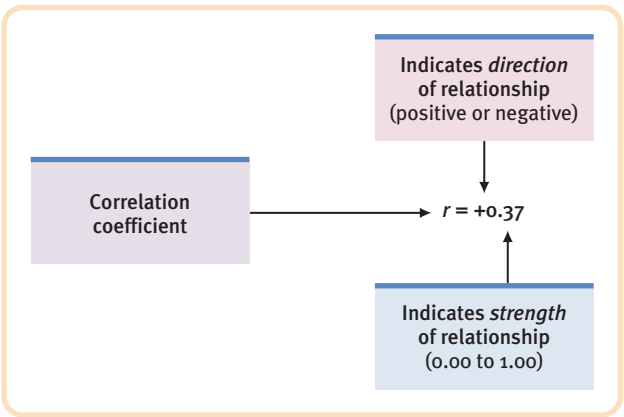


FIGURE A.4 How to read a correlation coefficient

FIGURE A.5 contains three **scatterplots,** illustrating the range of possible correlations from a perfect positive to a perfect negative. (Perfect correlations rarely occur in the real world.) Each dot in a scatterplot represents the scattered values of two variables. A correlation is positive if two sets of scores, such as height and weight, tend to rise or fall together. Saying that a correlation is "negative" says nothing about its strength or weakness. A correlation is negative if two sets of scores relate inversely, one set going up as the other goes down. Toothbrushing and decay correlate negatively. As brushing goes up from zero, tooth decay goes down. A weak correlation, indicating little relationship, has a coefficient near zero.

Statistics can help us see what the naked eye sometimes misses. To demonstrate this for yourself, try an imaginary project. Wondering if tall men are more or less easygoing, you collect two sets of scores: men's heights and men's temperaments. You measure the heights of 20 men, and you have someone else independently assess their temperaments (from zero for extremely calm to 100 for highly reactive).

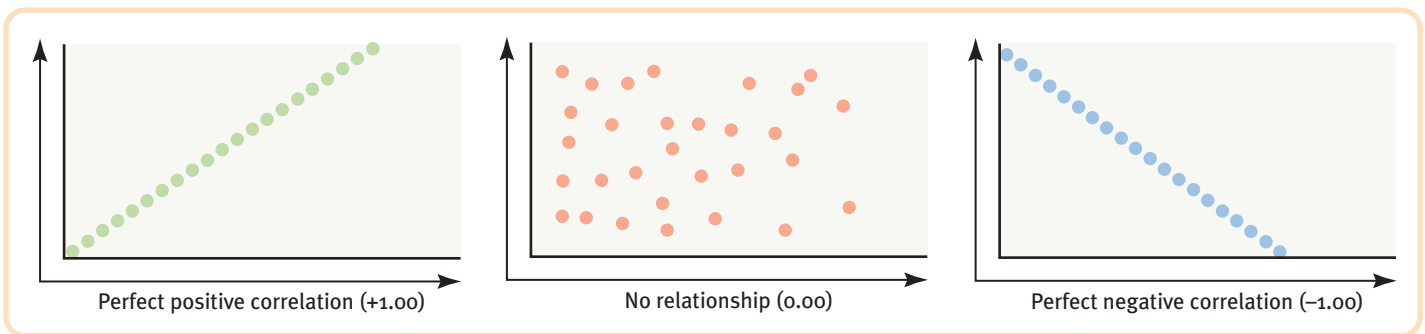


FIGURE A.5 Scatterplots, showing patterns of correlation Correlations can range from +1.00 (scores on one measure increase in direct proportion to scores on another) to –1.00 (scores on one measure decrease precisely as scores rise on the other).

With all the relevant data right in front of you (**TABLE A.2**), can you tell whether there is (1) a positive correlation between height and reactive temperament, (2) very little or no correlation, or (3) a negative correlation?

Comparing the columns in Table A.2, most people detect very little relationship between height and temperament. In fact, the correlation in this imaginary example is moderately positive, +0.63, as we can see if we display the data as a scatterplot. In **FIGURE A.6**, moving from left to right, the upward, oval-shaped slope of the cluster of points shows that our two imaginary sets of scores (height and reactivity) tend to rise together.

If we fail to see a relationship when data are presented as systematically as in Table A.2, how much less likely are we to notice them in everyday life? To see what is right in front of us, we sometimes need statistical illumination. We can easily see evidence of gender discrimination when given statistically summarized information about job level, seniority, performance, gender, and salary. But we often see no discrimination when the same information dribbles in, case by case (Twiss et al., 1989).

TABLE A.2 Height and Temperament of 20 Men

Person	Height in Inches	Temperament
1	80	75
2	63	66
3	61	60
4	79	90
5	74	60
6	69	42
7	62	42
8	75	60
9	77	81
10	60	39
11	64	48
12	76	69
13	71	72
14	66	57
15	73	63
16	70	75
17	63	30
18	71	57
19	68	84
20	70	39

The point to remember: Although the correlation coefficient tells us nothing about cause and effect, it can help us see the world more clearly by revealing the actual extent to which two things relate.

correlation coefficient a statistical measure of the extent to which two factors vary together, and thus of how well either factor predicts the other. Scores with a *positive correlation coefficient* move up and down together (as with high school and college GPAs). A *negative correlation coefficient* indicates that one score falls as the other rises (as in the relationship between self-esteem and depression).

scatterplots a graphed cluster of dots, each of which represents the values of two variables. The slope of the points suggests the direction of the relationship between the two variables. The amount of scatter suggests the strength of the correlation (little scatter indicates high correlation).

A-4: What is regression toward the mean?

Correlations not only make visible the relationships we might otherwise miss, they also restrain our "seeing" nonexistent relationships. A perceived correlation that does not really exist is an *illusory correlation*. When we believe there is a relationship

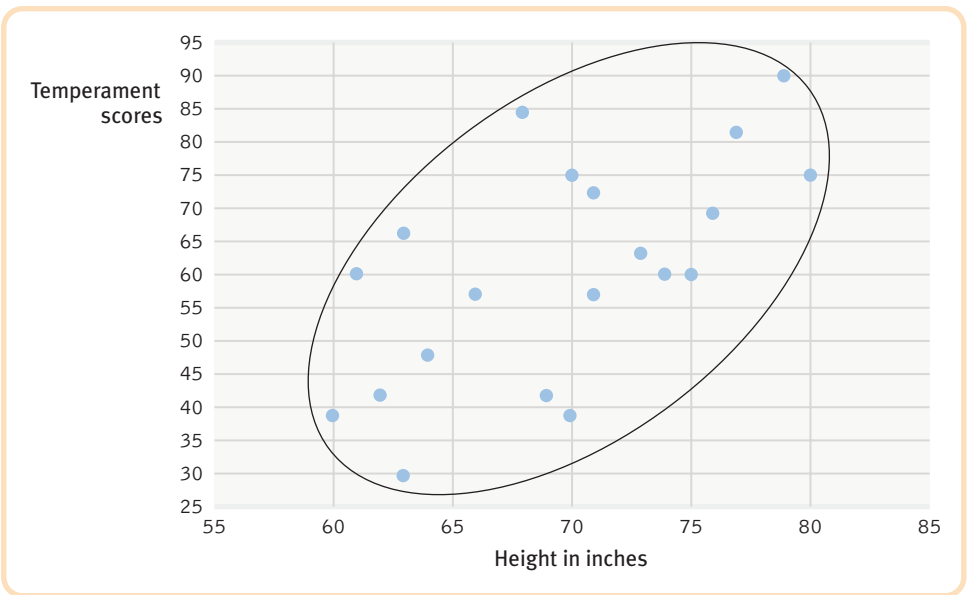


FIGURE A.6 Scatterplot for height and temperament This display of data from 20 imagined men (each represented by a data point) reveals an upward slope, indicating a positive correlation. The considerable scatter of the data indicates the correlation is much lower than +1.0.

between two things, we are likely to notice and recall instances that confirm our belief. If we believe that dreams are forecasts of actual events, we may notice and recall confirming instances more than disconfirming instances. The result is an illusory correlation.

Illusory correlations feed an illusion of control—that chance events are subject to our personal control. Gamblers, remembering their lucky rolls, may come to believe they can influence the roll of the dice by again throwing gently for low numbers and hard for high numbers. The illusion that uncontrollable events correlate with our actions is also fed by a statistical phenomenon called **regression toward the mean.** Average results are more typical than extreme results. Thus, after an unusual event, things tend to return toward their average level; extraordinary happenings tend to be followed by more ordinary ones.

The point may seem obvious, yet we regularly miss it: We sometimes attribute what may be a normal regression (the expected return to normal) to something we have done. Consider:

- Students who score much lower or higher on an exam than they usually do are likely, when retested, to return to their average.
- Unusual ESP subjects who defy chance when first tested nearly always lose their "psychic powers" when retested (a phenomenon parapsychologists have called the *"decline effect"*).
- Coaches often yell at their players after an unusually bad first half. They may then feel rewarded for having done so when the team's performance improves (returns to normal) during the second half.

"Once you become sensitized to it, you see regression everywhere."
—Psychologist Daniel Kahneman (1985)

Failure to recognize regression is the source of many superstitions and of some ineffective practices as well. When day-to-day behavior has a large element of chance fluctuation, we may notice that others' behavior improves (regresses toward average) after we criticize them for very bad performance, and that it worsens (regresses toward average) after we warmly praise them for an exceptionally fine performance. Ironically, then, regression toward the average can mislead us into feeling rewarded for having criticized others and into feeling punished for having praised them (Tversky & Kahneman, 1974).

The point to remember: When a fluctuating behavior returns to normal, there is no need to invent fancy explanations for why it does so. Regression toward the mean is probably at work.

Making Inferences

A-5: What principles can guide our making generalizations from samples and deciding whether differences are significant?

Data are "noisy." The average score in one group (breast-fed babies) could conceivably differ from the average score in another group (formula-fed babies) not because of any real difference but merely because of chance fluctuations in the people sampled. How confidently, then, can we infer that an observed difference accurately estimates the true difference? For guidance, we can ask how reliable and significant the differences are.

When Is an Observed Difference Reliable?

In deciding when it is safe to generalize from a sample, we should keep three principles in mind.

1. **Representative samples are better than biased samples.** The best basis for generalizing is not from the exceptional and memorable cases one finds at the extremes but from a representative sample of cases. Research never randomly samples the whole human population. Thus, it pays to keep in mind what population a study has sampled. (To see how an unrepresentative sample can lead you astray, see Close-Up: Cross-Sectional and Longitudinal Studies.)

regression toward the mean the tendency for extreme or unusual scores or events to fall back (regress) toward the average.

Close-Up:

Cross-Sectional and Longitudinal Studies

A-6: What are cross-sectional studies and longitudinal studies, and why is it important to know which method was used?

When interpreting research results, smart thinkers consider how researchers arrived at their conclusions. One way studies vary is in the time period for gathering data.

In **cross-sectional studies,** researchers compare different groups at the same time. For example, they might compare intelligence test scores among people in differing age groups. In those studies, older adults, on average, give fewer correct answers than do younger adults. This could suggest that mental ability declines with age, and indeed, that was the conclusion drawn from many early cross-sectional studies of intelligence.

In **longitudinal studies,** researchers study and restudy the same group at different times in their life span. After colleges began giving intelligence tests to entering students about 1920, several psychologists saw their chance to study intelligence longitudinally. What they expected to find was a decrease in intelligence after about age 30 (Schaie & Geiwitz, 1982). What they actually found was a surprise: Until late in life, intelligence remained stable. On some tests, it even increased.

Why did these new results differ from the earlier cross-sectional findings? In retrospect, researchers realized that cross-sectional studies that compared 70-year-olds and 30-year-olds were comparing people not only of two different ages but also of two different eras. They were comparing generally less-educated people (born, say, in the early 1900s) with better-educated people (born after 1950); people raised in large families with people raised in smaller families; people from less-affluent families with people from more-affluent families.

Others have since pointed out that longitudinal studies have their own pitfalls. Participants who survive to the end of longitudinal studies may be the healthiest (and brightest) people. When researchers adjust for the loss of participants, as did one study following more than 2000 people over 75 in Cambridge, England, they find a steeper intelligence decline, especially as people age after 85 (Brayne et al., 1999).

The point to remember: When interpreting research results, pay attention to the methodology used, such as whether it was a longitudinal or cross-sectional study.

cross-sectional study a study in which people of different ages are compared with one another.

longitudinal study research in which the same people are restudied and retested over a long period of time.

2. **Less-variable observations are more reliable than those that are more variable.** As we noted in the example of the basketball player whose game-to-game points were consistent, an average is more reliable when it comes from scores with low variability.
3. **More cases are better than fewer.** An eager prospective student visits two university campuses, each for a day. At the first, the student randomly attends two classes and discovers both instructors to be witty and engaging. At the next campus, the two sampled instructors seem dull and uninspiring. Returning home, the student (discounting the small sample size of only two teachers at each institution) tells friends about the "great teachers" at the first school, and the "bores" at the second. Again, we know it but we ignore it: *Averages based on many cases are more reliable* (less variable) than averages based on only a few cases.

The point to remember: Don't be overly impressed by a few anecdotes. Generalizations based on a few unrepresentative cases are unreliable.

When Is a Difference Significant?

Statistical tests also help us determine whether differences are meaningful. Here is the underlying logic: When averages from two samples are each reliable measures of their respective populations (as when each is based on many observations that have small variability), then their *difference* is likely to be reliable as well. (Example: The lower the variability in women's and in men's aggression scores, the more confidence we would have that any observed gender difference is reliable.) And when the difference between the sample averages is *large,* we have even more confidence that the difference between them reflects a real difference in their populations.

In short, when the sample averages are reliable, and when the difference between them is relatively large, we say the difference has **statistical significance.** This means that the observed difference is probably not due to chance variation between the samples.

statistical significance a statistical statement of how likely it is that an obtained result occurred by chance.

In judging statistical significance, psychologists are conservative. They are like juries who must presume innocence until guilt is proven. For most psychologists, proof beyond a reasonable doubt means not making much of a finding unless the odds of its occurring by chance are less than 5 percent (an arbitrary criterion).

When reading about research, you should remember that, given large enough or homogeneous enough samples, a difference between them may be "statistically significant" yet have little practical significance. For example, comparisons of intelligence test scores among hundreds of thousands of first-born and later-born individuals indicate a highly significant tendency for first-born individuals to have higher average scores than their later-born siblings (Kristensen & Bjerkedal, 2007; Zajonc & Markus, 1975). But because the scores differ by only one to three points, the difference has little practical importance. Such findings have caused some psychologists to advocate alternatives to significance testing (Hunter, 1997). Better, they say, to use other ways to express a finding's *effect* size—its magnitude and reliability.

The point to remember: Statistical significance indicates the *likelihood* that a result will happen by chance. But this does not say anything about the *importance* of the result.

Statistical Reasoning in Everyday Life

Module Review

A-1: What is the first important point to remember when assessing studies that use statistical reasoning? Doubt big, round, undocumented numbers. Think smarter by applying simple statistical reasoning.

A-2: How can we describe data with measures of central tendency and variation? Three measures of central tendency are the *mode* (the most frequently occurring score), the *mean* (the arithmetic average), and the *median* (the middle score in a group of data). Measures of variation tell us how similar or diverse data are. A *range* describes the gap between the highest and lowest scores. The more useful measure, the *standard deviation,* states how much scores vary around the mean, or average, score. The *normal curve* is a bell-shaped curve that describes the distribution of many types of data.

A-3: What does it mean when we say that two things are correlated? A *correlation coefficient* is a statistical measure that tells us the extent to which two things relate. In *scatterplots,* the amount of scatter suggests the correlation's strength, and the slope of the points suggests the direction of the relationship. Correlation coefficients cannot tell cause and effect, but they do tell us how well one variable predicts the other, and they also restrain us from seeing nonexistent relationships.

A-4: What is regression toward the mean? *Regression toward the mean* is the tendency of extreme scores to return to normal.

A-5: What principles can guide our making generalizations from samples and deciding whether differences are significant? Three principles are worth remembering: (1) Representative samples are better than biased samples. (2) Less-variable observations are more reliable than those that are more variable. (3) More cases are better than fewer. We can assume that a result is *statistically significant*—that it did not occur by chance alone—when averages from two samples are each reliable measures of their own populations, and the difference between them is relatively large.

A-6: What are cross-sectional studies and longitudinal studies, and why is it important to know which method was used? *Cross-sectional studies* compare people of different ages at the same time; *longitudinal studies* retest the same people over time. The two methods give different perspectives. Cross-sectional studies show the effects of time and environment on many different individuals; longitudinal studies show those effects on the same people.

Rehearse It!

1. Which of the three measures of central tendency is most easily distorted by a few very large or very small scores?
   a. The mode
   b. The mean
   c. The median
   d. They are all equally vulnerable to distortion from atypical scores.

2. The standard deviation is the most useful measure of variation in a set of data because it tells us
   a. the difference between the highest and lowest scores in the set.
   b. the extent to which the sample being used deviates from the bigger population it represents.
   c. how much individual scores differ from the mode.
   d. how much individual scores differ from the mean.

3. A correlation coefficient is a statistical measure of the extent to which two factors, such as two sets of scores, vary together. In a _____ correlation, the scores would travel up and down together; in a(n) _____ correlation, one score would fall as the other rises.
   a. positive; negative
   b. positive; illusory
   c. negative; inverse
   d. strong; weak

4. When sample averages are _____ and the difference between them is _____, we can say the difference has statistical significance.
   a. reliable; large
   b. reliable; small
   c. due to chance; large
   d. due to chance; small

Answers: 1. b, 2. d, 3. a, 4. a.

Terms and Concepts to Remember

mode, p. A-1
mean, p. A-1
median, p. A-1
range, p. A-3
standard deviation, p. A-3
normal curve, p. A-3
correlation coefficient, p. A-4
scatterplots, p. A-4
regression toward the mean, p. A-6
cross-sectional study, p. A-7
longitudinal study, p. A-7
statistical significance, p. A-7

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

APPENDIX B

Psychology at Work

Personnel Psychology

Organizational Psychology

Human Factors Psychology

The healthy life, said Sigmund Freud, is filled by love and by work. For most of us, work is life's biggest single waking activity. To live is to work. Work supports us. Work connects us. Work defines us. Meeting someone for the first time, and wondering "Who are you?" we may ask, "So, what do you do?"

If we feel dissatisfied with our work-related pay, relationships, or identity, we may change where or for whom we work, as 16 percent of Australians did in just the year 2000 (Trewin, 2001). Most people therefore have neither a single vocation nor a predictable career path. Two decades from now, most of you reading this book will be doing work you cannot now imagine. To prepare you and others for this unknown future, many colleges and universities focus less on training your job skills and more on enlarging your capacities for understanding, thinking, and communicating in any work environment.

Amy Wrzesniewski and her colleagues (1997, 2001) have identified person-to-person variations in people's attitudes toward their work. Across various occupations, some people view their work as a *job,* an unfulfilling but necessary way to make money. Others view their work as a *career,* an opportunity to advance from one position to a better position. The rest—those who view their work as a *calling,* a fulfilling and socially useful activity—report the highest satisfaction with their work and with their lives. Other research indicates that people have reported markedly lower well-being if unemployed (**FIGURE B.1**). Idleness may sound like bliss, but purposeful work enriches our lives.

This finding would not surprise Mihaly Csikszentmihalyi (1990, 1999), who has observed that people's quality of life increases when they are purposefully engaged. Between the anxiety of being overwhelmed and stressed, and the apathy of being underwhelmed and bored, lies a zone in which people experience **flow.** Csikszentmihalyi (chick-SENT-me-hi) formulated the flow concept after studying artists who spent hour after hour painting or sculpting with enormous concentration. Immersed in a project, they worked as if nothing else mattered, and then, when finished, they promptly forgot about it. The artists seemed driven less by the external rewards of producing art—money, praise, promotion—than by the intrinsic rewards of creating the work. Internet-related distractions can disrupt such flow. It takes time to refocus mental concentration after the distraction of an e-mail or instant message.

Sometimes, noted Gene Weingarten (2002), a humor writer knows "when to just get out of the way." Here are some sample job titles from the U.S. Department of Labor Dictionary of Occupational Titles: *Animal impersonator, human projectile, banana ripening-room supervisor, impregnator, impregnator helper, dope sprayer, finger waver, rug scratcher, egg smeller, bottom buffer, cookie breaker, brain picker, hand pouncer, bosom presser, and mother repairer.*

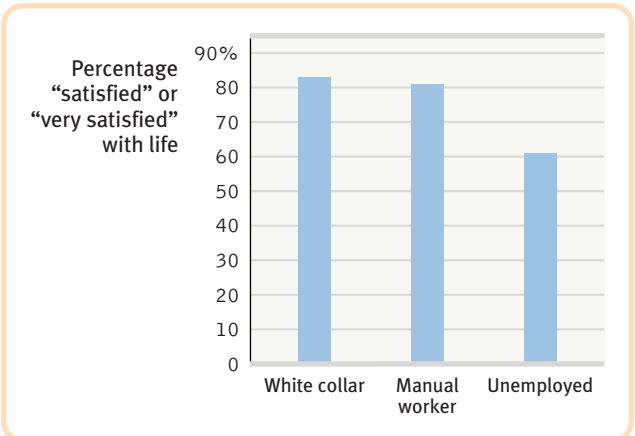


FIGURE B.1 The bane of unemployment To want work but not have it is to feel less satisfied with life. These data are from 169,776 adults in 16 nations (Inglehart, 1990).

flow a completely involved, focused state of consciousness, with diminished awareness of self and time, resulting from optimal engagement of one's skills.

Have you ever noticed that when you are immersed in an activity, time flies? And that when you are watching the clock, it seems to move more slowly? French researchers have confirmed that the more we attend to an event's duration, the longer it seems to last (Couli et al., 2004).

Csikszentmihalyi's later observations—of dancers, chess players, surgeons, writers, parents, mountain climbers, sailors, and farmers; of Australians, North Americans, Koreans, Japanese, and Italians; of people from their teens to their golden years—confirmed an overriding principle: It's exhilarating to flow with an activity that fully engages our skills. Flow experiences boost our sense of self-esteem, competence, and well-being. When the researchers beeped people at random intervals and asked them to report what they were doing and how much they were enjoying themselves, those who were vegetating usually reported little sense of flow and little satisfaction. People reported more positive feelings when interrupted while doing something active, something that engaged their skills, be it play or work.

In industrialized nations, work has been changing, from farming to manufacturing to *knowledge work*. More and more work is *outsourced* to temporary employees and consultants who communicate electronically from virtual workplaces in remote locations. (This book and its teaching package are developed and produced by a team of people in a dozen cities, from Alaska to Florida.) As work changes, will our attitudes toward our work also change? Will our satisfaction with work increase or decrease? Will the *psychological contract*—the subjective sense of mutual obligations between workers and employers—become more or less trusting and secure? These are among the questions that fascinate psychologists who study work-related behavior.

industrial-organizational (I/O) psychology the application of psychological concepts and methods to optimizing human behavior in workplaces.

personnel psychology a subfield of I/O psychology that focuses on employee recruitment, selection, placement, training, appraisal, and development.

organizational psychology a subfield of I/O psychology that examines organizational influences on worker satisfaction and productivity and facilitates organizational change.

human factors psychology a branch of psychology that explores how people and machines interact and how machines and physical environments can be made safe and easy to use.

Industrial-organizational (I/O) psychology is a fast-growing profession that applies psychology's principles to the workplace (see Close-Up: I/O Psychology at Work). Here we consider three main subfields:

- **Personnel psychology,** which applies psychology's methods and principles to selecting and evaluating workers. Personnel psychologists match people with jobs, by identifying and placing well-suited candidates.
- **Organizational psychology,** which considers how work environments and management styles influence worker motivation, satisfaction, and productivity. Organizational psychologists modify jobs and supervision in ways that boost morale and productivity.
- **Human factors psychology,** which explores how machines and environments can be optimally designed to fit human abilities and expectations. Human factors psychologists help to design appliances, machines, Web sites, and work settings that fit our natural perception.

Close-Up:

I/O Psychology at Work

As scientists, consultants, and management professionals, industrial-organizational psychologists are found working in varied areas:

PERSONNEL PSYCHOLOGY

Selecting and placing employees
- Developing and validating assessment tools for selecting, placing, and promoting workers
- Analyzing job content
- Optimizing worker placement

Training and developing employees
- Identifying needs
- Designing training programs
- Evaluating training programs

Appraising performance
- Developing criteria
- Measuring individual performance
- Measuring organizational performance

ORGANIZATIONAL PSYCHOLOGY

Developing organizations
- Analyzing organizational structures
- Maximizing worker satisfaction and productivity
- Facilitating organizational change

Enhancing quality of worklife
- Expanding individual productivity
- Identifying elements of satisfaction
- Redesigning jobs

HUMAN FACTORS (ENGINEERING) PSYCHOLOGY
- Designing optimum work environments
- Optimizing person-machine interactions
- Developing systems technologies

Source: Adapted from the Society of Industrial and Organizational Psychology (siop.org).

Personnel Psychology

B-1: How do personnel psychologists help organizations with employee selection, work placement, and performance appraisal?

Psychologists can assist organizations at various stages of selecting and assessing employees. They may help identify needed job skills, decide upon selection methods, recruit and evaluate applicants, introduce and train new employees, and appraise their performance.

Harnessing Strengths

As a recently hired AT&T human resources executive, psychologist Mary Tenopyr (1997) was assigned to solve a problem: Customer service representatives were failing at a high rate. Tenopyr's solution was a data-driven test that better identified likely-to-succeed customer representatives. To develop this new selection instrument, she

1. asked new applicants to respond to various questions (without as yet making any use of their responses).
2. followed up later to assess which of the applicants excelled on the job.
3. identified the individual items on the earlier test that best predicted who would succeed.

Personnel selection techniques such as this one aim to match people's strengths with work that enables them and their organization to flourish. Marry the strengths of people with the tasks of organizations and the result is often prosperity and profit for the organization and greater satisfaction for workers (see Close-Up: Discovering Your Strengths).

Close-Up:

Discovering Your Strengths

Your strengths are any enduring qualities that can be productively applied. Are you naturally curious? Persuasive? Charming? Persistent? Competitive? Analytical? Empathic? Organized? Articulate? Neat? Mechanical? Any such trait, if matched with suitable work, can function as a strength (Buckingham, 2007). To identify your strengths and pinpoint types of work that will likely prove satisfying and successful, Gallup researchers Marcus Buckingham and Donald Clifton (2001) have suggested asking yourself:

- What activities give me pleasure? (Bringing order out of chaos? Playing host? Helping others? Challenging sloppy thinking?)
- What activities leave me wondering, "When can I do this again?" (Rather than "When will this be over?")
- What sorts of challenges do I relish? (And which do I dread?)
- What sorts of tasks do I learn easily? (And which do I struggle with?)

Artistic strengths At age 21, Henri Matisse was a sickly and often depressed lawyer's clerk. When his mother gave him a box of paints to cheer him up one day, he felt the darkness lift and his energy surge. He began to fill his days with painting and drawing and went on to art school and a life as one of the world's great painters. For Matisse, doing art felt like "a comfortable armchair." That is how exercising our strengths often feels.

Satisfied and successful people devote far less time to correcting their deficiencies than to accentuating their strengths. Top performers are "rarely well rounded"; instead, they have sharpened their existing skills (Buckingham & Clifton, 2001, p. 26). Given the persistence of our traits and temperaments, we should focus not on our deficiencies, but rather on identifying and employing our talents. There may be limits to the benefits of assertiveness training if you are shy, for public speaking courses if you tend to be nervous and soft-spoken, or for drawing classes if you express your artistic side in stick figures.

But identifying your talents can help you recognize the activities you learn quickly and find absorbing. Knowing your strengths, you can develop them further.

As Robert Louis Stevenson said in *Familiar Studies of Men and Books* (1882), "To be what we are, and to become what we are capable of becoming, is the only end of life."

Gallup researchers Marcus Buckingham and Donald Clifton (2001) have argued that the first step to a stronger organization is instituting a strengths-based selection system. Thus, as a manager, you would first identify a group of the most effective people in any role—the ones you would want to hire more of—and compare their strengths with those of a group of the least effective people in that role.

In defining these groups, you would try to measure performance as objectively as possible. In one Gallup study of more than 5000 telecommunications customer-service representatives, those evaluated most favorably by their managers were strong in "harmony" and "responsibility," while those actually rated most effective by customers were strong in energy, assertiveness, and eagerness to learn.

Consider an example. Suppose you needed to hire new people in software development, and you have discovered that your best software developers are analytical, disciplined, and eager to learn. When writing your employment ads, you would focus less on experience than on the strengths you have identified: "Do you take a logical and systematic approach to problem solving *[analytical]*? Are you a perfectionist who strives for timely completion of your projects *[disciplined]*? Do you want to learn to use Java, C++, and PHP *[eager to learn]*? If you can say *yes* to these questions, then please call . . ."

Identifying people's strengths and matching strengths to work is a first step toward workplace effectiveness. Personnel managers use various tools to assess applicants' strengths and decide who is best-suited to the job (Sackett & Lievens, 2008), including ability tests, personality tests, and behavioral observations. Here we focus on the job interview.

Do Interviews Predict Performance?

Interviewers tend to feel confident in their ability to predict long-term job performance from an unstructured, get-acquainted interview. What's therefore shocking is how error-prone those predictions are.

Whether predicting job or graduate school success, interviewers' judgments are weak predictors. From their review of 85 years of personnel-selection research, I/O psychologists Frank Schmidt and John Hunter (1998; Schmidt, 2002) determined that for all but less-skilled jobs, general mental ability best predicts on-the-job performance. Subjective overall evaluations from informal interviews are more useful than handwriting analysis (which is worthless). But informal interviews are less informative than aptitude tests, work samples, job knowledge tests, and past job performance. If there's a contest between what our gut tells us about someone and what test scores, work samples, and past performance tell us, we should distrust our gut.

"Interviews are a terrible predictor of performance."

—Laszlo Bock, Google's Vice President, People Operations, 2007

The Interviewer Illusion

Interviewers often overrate their discernment, a phenomenon psychologist Richard Nisbett (1987) labeled the *interviewer illusion*. "I have excellent interviewing skills, so I don't need reference checking as much as someone who doesn't have my ability to read people," is a comment sometimes heard by I/O consultants. Four factors explain this gap between interviewers' intuition and the resulting reality:

- *Interviews disclose the interviewee's good intentions, which are less revealing than habitual behaviors* (Ouellette & Wood, 1998). Intentions matter. People can change. But the best predictor of the person we will be is the person we have been. Wherever we go, we take ourselves along.
- *Interviewers more often follow the successful careers of those they have hired than the successful careers of those they have rejected and lost track of.* This missing feedback prevents interviewers from getting a reality check on their hiring ability.
- *Interviewers presume that people are what they seem to be in the interview situation.* When meeting others, we discount the enormous influence of varying situations and mistakenly presume that what we see is what we will get. But

mountains of research on everything from chattiness to conscientiousness reveal that how we behave reflects not only our enduring traits, but also the details of the particular situation (such as wanting to impress in a job interview).

- *Interviewers' preconceptions and moods color how they perceive interviewees' responses* (Cable & Gilovich, 1998; Macan & Dipboye, 1994). If interviewers instantly like a person who perhaps is similar to themselves, they may interpret the person's assertiveness as indicating "confidence" rather than "arrogance." If told certain applicants have been prescreened, interviewers are disposed to judge them more favorably.

"Between the idea and reality . . . falls the shadow."
—T. S. Eliot, *The Hollow Men*, 1925

Traditional *unstructured interviews* do provide a sense of someone's personality—their expressiveness, warmth, and verbal ability, for example. But this information reveals less about the person's behavior toward others in different situations than most people suppose. Hoping to improve prediction and selection, personnel psychologists have put people in simulated work situations, scoured sources for information on past performance, aggregated evaluations from multiple interviews, administered tests, and developed job-specific interviews.

Structured Interviews

Unlike casual conversation aimed at getting a feel for someone, **structured interviews** offer a disciplined method of collecting information. A personnel psychologist may analyze a job, script questions, and train interviewers. The interviewers then put the same questions, in the same order, to all applicants, and rate each applicant on established scales.

In an unstructured interview, someone might ask, "How organized are you?" "How well do you get along with people?" or "How do you handle stress?" Street-smart applicants know how to score high: "Although I sometimes drive myself too hard, I handle stress by prioritizing and delegating, and by making sure I leave time for sleep and exercise."

By contrast, structured interviews pinpoint strengths (attitudes, behaviors, knowledge, and skills) that distinguish high performers in a particular line of work. The process includes outlining job-specific situations and asking candidates to explain how they would handle them, and how they handled similar situations in their prior employment. "Tell me about a time when you were caught between conflicting demands, without time to accomplish both. How did you handle that?"

To reduce memory distortions and bias, the interviewer takes notes and makes ratings as the interview proceeds and avoids irrelevant and follow-up questions. The structured interview therefore feels less warm, but that can be explained to the applicant: "This conversation won't typify how we relate to each other in this organization."

A review of 150 findings revealed that structured interviews had double the predictive accuracy of unstructured seat-of-the-pants interviews (Schmidt & Hunter, 1998; Wiesner & Cronshaw, 1988). Structured interviews also reduce bias, such as against overweight applicants (Kutcher & Bragger, 2004). Thanks partly to its greater reliability and partly to its job-analysis focus, the predictive power of one structured interview is roughly equal to that of the average judgment from three or four unstructured interviews (Huffcutt et al., 2001; Schmidt & Zimmerman, 2004).

Appraising Performance

Performance appraisal serves organizational purposes: It helps decide who to retain and lay off, how to appropriately reward and pay people, and how to better harness employee strengths, sometimes with job shifts or promotions. Performance appraisal also serves individual purposes: Feedback affirms workers' strengths and helps motivate needed improvements.

structured interviews interview process that asks the same job-relevant questions of all applicants, each of whom is rated on established scales.

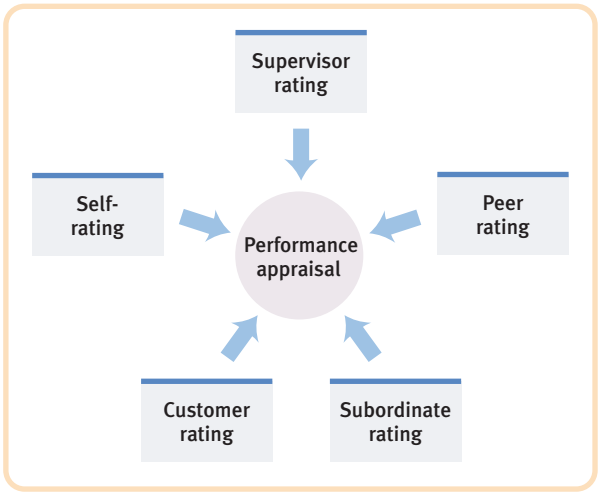


FIGURE B.2 360-degree feedback With multisource 360-degree feedback, one's knowledge, skills, and behaviors are rated by self and surrounding others. Professors, for example, may be rated by their department chairs, their students, and their colleagues. After receiving all these ratings, professors discuss the 360-degree feedback with their department chair.

Performance appraisal methods include

- *checklists* on which supervisors simply check specific behaviors that describe the worker ("always attends to customers' needs," "takes long breaks").
- *graphic rating scales* on which a supervisor checks, perhaps on a five-point scale, how often a worker is dependable, productive, and so forth.
- *behavior rating scales* on which a supervisor checks scaled behaviors that describe a worker's performance. If rating the extent to which a worker "follows procedures," the supervisor might mark the employee somewhere between "often takes shortcuts" and "always follows established procedures" (Levy, 2003).

In some organizations, performance feedback comes not only from supervisors but also from all organizational levels. If you join an organization that practices *360-degree feedback* (**FIGURE B.2**), you will rate yourself, your manager, and your other colleagues, and you will be rated by your manager, other colleagues, and customers (Green, 2002). The net result is often more open communication and more complete appraisal.

To recap, personnel psychologists assist organizations in analyzing jobs, recruiting well-suited applicants, selecting and placing employees, and appraising their performance (**FIGURE B.3**).

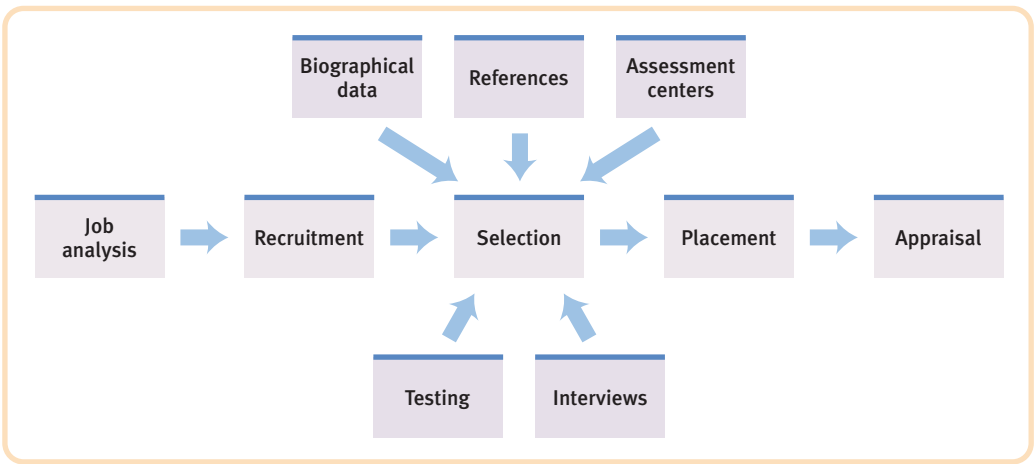


FIGURE B.3 Personnel psychologists' tasks Personnel psychologists consult in human resources activities, from job definition to employee appraisal.

Organizational Psychology

B-2: What is the role of organizational psychologists?

The appraisal of work and the matching of talents to work matter, but so does overall motivation. Before considering how organizational psychologists assist with efforts to motivate employees and keep them engaged, let's take a closer look at why any employee might want to pursue high standards or difficult goals.

Think of someone you know who strives to succeed by excelling at any task where evaluation is possible. Now think of someone who is less driven. Psychologist Henry Murray (1938) defined the first person's **achievement motivation** as a desire for significant accomplishment, for mastering skills or ideas, for control, and for rapidly attaining a high standard.

As you might expect from their persistence and eagerness for realistic challenges, people with high achievement motivation do achieve more. One study followed the lives of 1528 California children whose intelligence test scores were in the top 1 percent. Forty years later, when researchers compared those who were most and least successful professionally, they found a motivational difference. Those most

achievement motivation a desire for significant accomplishment; for mastery of things, people, or ideas; for rapidly attaining a high standard.

Ken Heyman/Woodfin Camp & Associates

Disciplined motivation feeds achievement Aware that he was far behind other students when beginning his graduate education in psychology, B. F. Skinner devised a daily discipline of rising at 6:00 A.M., studying until breakfast, then going to classes, labs, and the library. After dinner he studied some more, leaving no more than 15 unscheduled minutes each day, and later continued a disciplined daily routine as he became one of the twentieth century's most influential psychologists.

successful were more ambitious, energetic, and persistent. As children, they had more active hobbies. As adults, they participated in more groups and favored being sports participants to being spectators (Goleman, 1980). Gifted children are able learners. Accomplished adults are tenacious doers.

In other studies of both secondary school and university students, self-discipline has been a better predictor of school performance, attendance, and graduation honors than intelligence scores have been. "Discipline outdoes talent," concluded researchers Angela Duckworth and Martin Seligman (2005, 2006), and it explains why girls get higher school grades than equally capable boys.

But discipline also refines talent. By their early twenties, top violinists have accumulated some 10,000 lifetime practice hours—double the practice time of other violin students aiming to be teachers (Ericsson et al., 2001, 2006, 2007). From his studies, Herbert Simon (1998), a psychologist who won a Nobel Prize in Economics, formed what has been called the *10-year rule:* That world-class experts in a field typically have invested "at least 10 years of hard work—say, 40 hours a week for 50 weeks a year." A study of outstanding scholars, athletes, and artists found that all were highly motivated and self-disciplined, willing to dedicate hours every day to the pursuit of their goals (Bloom, 1985). These superstar achievers were distinguished not so much by their extraordinary natural talent as by their extraordinary daily discipline. Great achievement, it seems, mixes a teaspoon of inspiration with a gallon of perspiration.

What distinguishes extremely successful individuals from their equally talented peers, note Duckworth and Seligman, is *grit*—passionate dedication to an ambitious, long-term goal. Although intelligence is distributed in a bell-shaped (normal) curve, achievements are not. That tells us that achievement involves much more than raw ability. And that is why organizational psychologists seek ways to engage and motivate ordinary people doing ordinary jobs.

"The only place success comes before work is in the dictionary."

—Former Green Bay Packers football coach Vince Lombardi

Satisfaction and Engagement

Because work is such a big part of life, employee satisfaction is a priority concern for I/O psychologists. Satisfaction with work feeds satisfaction with life (see Close-Up: Doing Well While Doing Good on the next page). Moreover, studies confirm that decreased job stress feeds improved health.

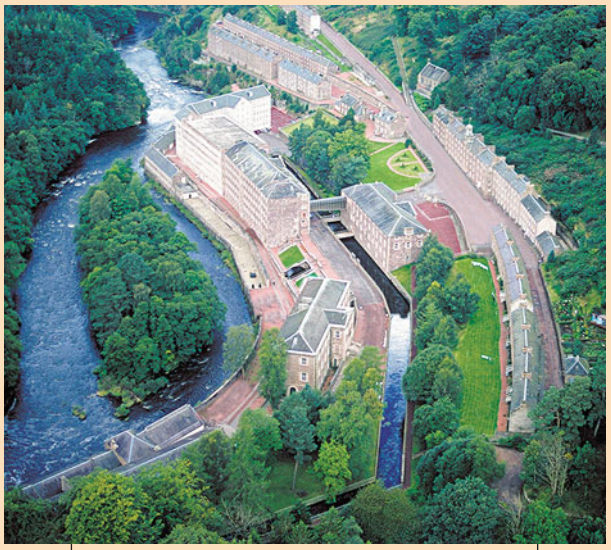
Does employee satisfaction also contribute to successful organizations? Positive moods at work do contribute to creativity, persistence, and helpfulness (Brief & Weiss, 2002). But are engaged, happy workers also less often absent? Less likely to quit? Less prone to theft? More punctual? More productive? Conclusive evidence of satisfaction's benefits is, some have said, the holy grail of I/O psychology. Statistical digests of prior research have found a modest positive correlation between individual job satisfaction and performance (Judge et al., 2001; Parker et al., 2003).

Close-Up:

Doing Well While Doing Good: "The Great Experiment"

At the end of the 1700s, the more than 1000 workers in the cotton mill at New Lanark, Scotland—many of them children drawn from Glasgow's poorhouses—worked 13-hour days and lived in grim conditions. Their education and sanitation were neglected, theft and drunkenness were commonplace, and most families occupied just one room.

On a visit to Glasgow, Welsh-born Robert Owen—an idealistic young cotton-mill manager—chanced to meet and fall in love with the mill owner's daughter. After their marriage, Owen, with several partners, purchased the mill and on the first day of the 1800s took control as its manager. Before long, he began what he said was "the most important experiment for the happiness of the human race that had yet been instituted at any time in any part of the world" (Owen, 1814). The exploitation of child and adult labor was, he observed, producing unhappy and inefficient workers. Believing that better working and living conditions could pay economic dividends, he undertook (with some resistance from his partners, whom he ultimately bought out) numerous innovations: a nursery for preschool children, education (with encouragement rather than corporal punishment), Sundays off, health care, paid sick days, unemployment pay for days when the mill could not operate, and a company store selling goods at reduced prices.



Courtesy of New Lanark World Heritage Site

The great experiment New Lanark Mills, which today is preserved as a World Heritage Site (www.newlanark.org), provided an influential demonstration of how industries could do well while doing good. In its heyday, New Lanark was visited by many European royals and reformers who came to observe its vibrant work force and prosperous business.

Owen also innovated a goals and worker-assessment program that included detailed records of daily productivity and costs. By each employee's workstation, one of four colored boards indicated that person's performance for the previous day. Owen could walk through the mill and at a glance see how individuals were performing. There was, he said, "no beating, no abusive language. . . . I merely looked at the person and then at the color. . . . I could at once see by the expression [which color] was shown."

The commercial success that followed was essential to sustaining what became a movement toward humanitarian reforms. By 1816, with decades of profitability still ahead, Owen believed he had demonstrated "that society may be formed so as to exist without crime, without poverty, with health greatly improved, with little if any misery, and with intelligence and happiness increased a hundredfold." Although his Utopian vision has not been fulfilled, Owen's great experiment did lay the groundwork for employment practices that have today become accepted in much of the world.

In one analysis of 4500 employees at 42 British manufacturing companies, the most productive workers tended to be those in satisfying work environments (Patterson et al., 2004). But does satisfaction *produce* better job performance? The debate continues.

Nevertheless, some organizations do have a knack for cultivating more engaged and productive employees. In the United States, the *Fortune* "100 Best Companies to Work For" have also produced markedly higher-than-average returns for their investors (Fulmer et al., 2003). Other positive data come from the biggest-ever study, an analysis of Gallup data from more than 198,000 employees (**TABLE B.1**) in nearly 8000 business units of 36 large companies (including some 1100 bank branches, 1200 stores, and 4200 teams or departments). James Harter, Frank Schmidt, and Theodore Hayes (2002) explored correlations between various measures of organizational success and *employee engagement*—the extent of workers' involvement, enthusiasm, and identification with their organizations. They found that engaged workers (compared with not-engaged workers, who are just putting in time) know what's expected of them, have what they need to do their work, feel fulfilled in their work, have regular opportunities to do what they do best, perceive that they are part of something significant, and have opportunities to learn and develop. They also found that business units with engaged employees have more loyal customers, less turnover, higher productivity, and greater profits. A follow-up analysis compared

Three types of employees *(Crabtree, 2005):*
Engaged: *working with passion and feeling a profound connection to their company or organization.*
Not-engaged: *putting in the time, but investing little passion or energy into their work.*
Actively disengaged: *unhappy workers undermining what their colleagues accomplish.*

TABLE B.1 The Gallup Workplace Audit

Overall satisfaction—On a 5-point scale, where 5 is extremely satisfied and 1 is extremely dissatisfied, how satisfied are you with *(name of company)* as a place to work? _____ On a scale of 1 to 5, where 1 is strongly disagree and 5 is strongly agree, please indicate your agreement with the following items.

1. I know what is expected from me at work.
2. I have the materials and equipment I need to do my work right.
3. At work, I have the opportunity to do what I do best every day.
4. In the last seven days, I have received recognition or praise for doing good work.
5. My supervisor, or someone at work, seems to care about me as a person.
6. There is someone at work who encourages my development.
7. At work, my opinions seem to count.
8. The mission/purpose of my company makes me feel my job is important.
9. My associates (fellow employees) are committed to doing quality work.
10. I have a best friend at work.
11. In the last six months, someone at work has talked to me about my progress.
12. This last year, I have had opportunities at work to learn and grow.

companies with top-quartile versus below-average employee engagement levels. Over a three-year period, earnings grew 2.6 times faster for the companies with highly engaged workers (Ott, 2007).

Managing Well

Every leader dreams of managing in ways that enhance people's satisfaction, engagement, and productivity and their organization's success. Effective leaders harness job-relevant strengths, set goals, and choose an appropriate leadership style.

Harnessing Job-Relevant Strengths

"The major challenge for CEOs over the next 20 years will be the effective deployment of human assets," observed Marcus Buckingham (2001). That challenge is "about psychology. It's about getting [individuals] to be more productive, more focused, more fulfilled than [they were] yesterday." To do so, he and others have maintained, effective leaders want first to select the right people. Then, they aim to discern their employees' natural talents, adjust their work roles to suit their talents, and develop those talents into great strengths (**FIGURE B.4**). For example, should every professor at a given college or university be expected to teach the same load, advise the same number of students, serve on the same number of committees, and engage in the same amount of research? Or should each job description be tailored to harness a specific person's unique strengths?

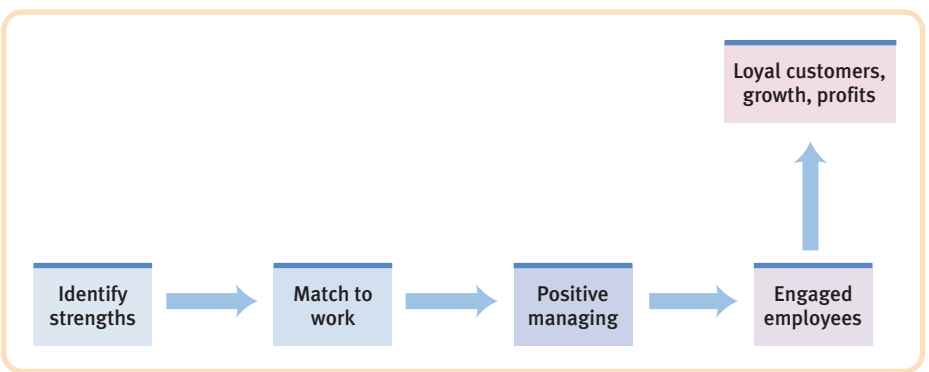


FIGURE B.4 On the right path The Gallup Organization path to organizational success (adapted from Fleming, 2001).

Ezra Shaw/Getty Images

Positive coaching Larry Brown, an adviser to the youth sports organization The Positive Coaching Alliance, was observed during practices to offer his players 4 to 5 positive comments for every negative comment (Insana, 2005). In 2004, his underdog Detroit Pistons won the National Basketball Association championship.

As noted earlier in the discussion of personnel psychologists, our temperament and our traits tend to follow us throughout our lives. Managers who excel spend less time trying to instill talents that are not there and more time developing and drawing out what is there. Kenneth Tucker (2002) has noted that great managers

- start by helping people identify and measure their talents.
- match tasks to talents and then give people freedom to do what they do best.
- care how their people feel about their work.
- reinforce positive behaviors through recognition and reward.

Thus, rather than focusing on weaknesses and packing people off to training seminars to fix those problems, good managers focus training time on educating people about their strengths and building upon them (which means not promoting people into roles ill-suited to their strengths). In Gallup surveys, 77 percent of engaged workers, and only 23 percent of not-engaged workers, strongly agreed that "my supervisor focuses on my strengths or positive characteristics" (Krueger & Killham, 2005).

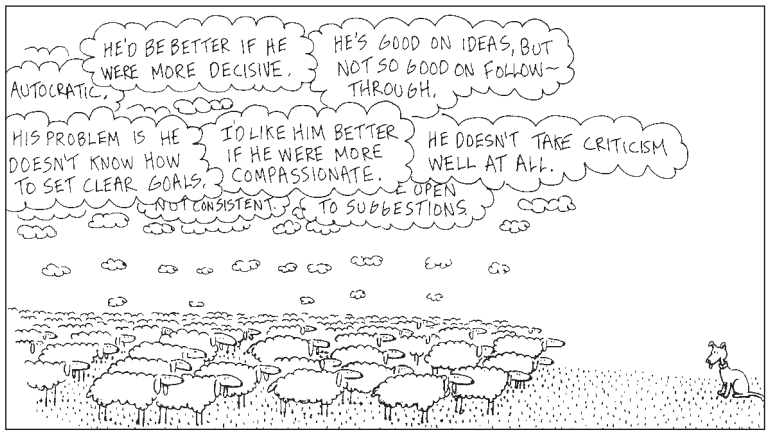
Celebrating engaged and productive employees in every organizational role builds upon a basic principle of operant conditioning: To teach a behavior, catch a person doing something right and reinforce it. It sounds simple, but many managers are like parents who, when a child returns home with perfect scores, focus on the one low score in a troublesome biology class and ignore the rest. "Sixty-five percent of Americans received NO praise or recognition in the workplace last year," reported the Gallup Organization (2004).

Setting Specific, Challenging Goals

In everyday life, our achievement goals sometimes involve approaching high levels of mastery or performance (perhaps mastering the material for this class and getting a high grade) and sometimes involve avoiding failure (Elliot & McGregor, 2001). In many situations, specific, challenging goals motivate achievement, especially when combined with progress reports (Johnson et al., 2006; Latham & Locke, 2007). Thus, a specific, measurable objective—"finish gathering information for the history paper by Friday"—serves to direct our attention, promote our effort, motivate persistence, and stimulate creative strategies.

Work is more focused and on-time completion becomes more likely when our goal statements include *subgoals* and *implementation intentions*—action plans that specify when, where, and how we will march toward achieving those goals (Burgess et al., 2004; Fishbach et al., 2006; Koestner et al., 2002). Before beginning each new edition of this book, for example, my editor, my associates, and I *manage by objectives*—we agree on target dates for the completion, reviewing, and editing of each draft manuscript. To motivate high productivity, effective leaders work with people to define explicit goals, subgoals, and implementation plans, and then provide feedback on progress.

Choosing an Appropriate Leadership Style



Leadership varies from a boss-focused directive style to a democratic style that empowers workers in setting goals and strategies. Which works best may depend on the situation and the leader. The best leadership style for leading a discussion may not be the best style for leading troops on a charge (Fiedler, 1981). Moreover, different leaders are suited to different styles. Some excel at **task leadership**—setting standards, organizing work, and focusing attention on goals. Being goal-oriented, task leaders are good at keeping a group centered on its mission. Typically, they have a directive style, which can work well if the leader is bright enough to give good orders (Fiedler, 1987).

Other managers excel at **social leadership**—explaining decisions, mediating conflicts, and building high-achieving teams (Evans & Dion, 1991). Social leaders often have a democratic style: They delegate authority and welcome the participation of team members. Many experiments show that social leadership is good for morale. Subordinates usually feel more satisfied and motivated and perform better when they participate in decision making (Cawley et al., 1998; Pereira & Osburn, 2007).

Because effective leadership styles vary with the situation and the person, the once-popular *great person theory of leadership*—that all great leaders share certain traits—now seems overstated (Vroom & Jago, 2007; Wielkiewicz & Stelzner, 2005). The same coach may seem great or inferior depending on the strength of the team and its competition. But a leader's personality does matter (Zaccaro, 2007). Effective leaders tend to be neither extremely assertive (impairing social relationships) or unassertive (limiting task leadership) (Ames & Flynn, 2007). Effective leaders of laboratory groups, work teams, and large corporations also tend to exude *charisma,* a blend of goal-based *vision,* clear *communication,* and optimism that *inspires* others to follow (House & Singh, 1987; Shamir et al., 1993). In one study of 50 Dutch companies, the highest morale was at those firms with chief executives who most inspired their colleagues "to transcend their own self-interests for the sake of the collective" (de Hoogh et al., 2004). *Transformational leadership* of this kind motivates others to identify with and commit themselves to the group's mission. Transformational leaders, many of whom are natural extraverts, articulate high standards, inspire people to share their vision, and offer personal attention (Bono & Judge, 2004). The frequent result is more engaged, trusting, and effective workers (Turner et al., 2002). Women more than men tend to exhibit transformational leadership qualities. Alice Eagly (2007) believes this helps explain why companies with women in top management have recently tended to enjoy superior financial results, even after controlling for such variables as company size.

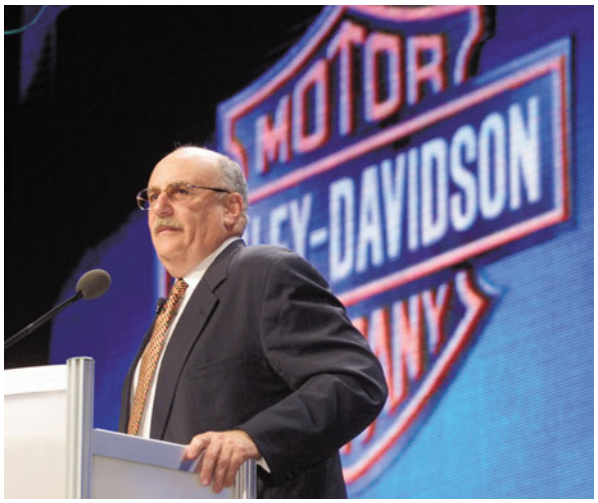
"Good leaders don't ask more than their constituents can give, but they often ask—and get—more than their constituents intended to give or thought it was possible to give."
—John W. Gardner, *Excellence,* 1984

Peter Smith and Monir Tayeb (1989) compiled data from studies in India, Taiwan, and Iran indicating that effective managers—whether in coal mines, banks, or government offices—often exhibit a high degree of *both* task and social leadership. As achievement-minded people, effective managers certainly care about how well work is done, yet at the same time they are sensitive to their subordinates' needs. In one national survey of American workers, those in family-friendly organizations offering flexible-time hours reported feeling greater loyalty to their employers (Roehling et al., 2001).

Many successful businesses have also increased employee participation in making decisions, a management style common in Sweden and Japan and increasingly elsewhere (Naylor, 1990; Sundstrom et al., 1990). Although managers often think better of work they have directly supervised, studies reveal a *voice effect:* If given a chance to voice their opinion during a decision-making process, people will respond more positively to the decision (van den Bos & Spruijt, 2002). And, as we noted earlier, positive, engaged employees are a mark of thriving organizations.

task leadership goal-oriented leadership that sets standards, organizes work, and focuses attention on goals.

social leadership group-oriented leadership that builds teamwork, mediates conflict, and offers support.



Sharing vision and decisions As CEO, Jeffrey Bleustein helped Harley-Davidson thrive, in part by replacing the organization's command-and-control management style with one based on company-wide consensus planning and decision making.

The rags-to-riches Harley-Davidson story illustrates the potential of inviting workers to participate in decision making (Teerlink & Ozley, 2000). In 1987, the struggling company began transforming its *command-and-control* management process to a *joint-vision process*. The aim: "To push decision making, planning, and strategizing from a handful of people at the top, down throughout the organization. We wanted all the employees to think every day about how to improve the company," reported CEO Jeffrey Bleustein (2002). In the mid-1990s, Harley signed a cooperative agreement with its unions that included them "in decision making in virtually every aspect of the business." Consensus decision making can take longer, but "when the decision is made, it gets implemented quickly and the commitment is by the group," said Bleustein. The result has been more engaged workers and also more satisfied stockholders. Every $1 of Harley-Davidson stock purchased at the beginning of 1988 was worth $40 by mid-2009.

* * *

We have considered *personnel psychology* (the I/O subfield that focuses on employee selection, placement, appraisal, and development). And we have considered *organizational psychology* (the I/O subfield that focuses on worker satisfaction and productivity, and on organizational change). Finally, we turn to *human factors psychology*, which explores the human-machine interface.

Human Factors Psychology

B-3: How do human factors psychologists work to create user-friendly machines and work settings?

Designs sometimes neglect the human factor. Psychologist Donald Norman, an MIT alumnus with a Ph.D., bemoaned the complexity of assembling his new high-definition TV, receiver, speakers, digital recorder, DVD player, VCR, and seven remotes into a usable home theater system: "I was VP of Advanced Technology at Apple. I can program dozens of computers in dozens of languages. I understand television, really, I do. . . . It doesn't matter: I am overwhelmed."

How much easier life might be if engineers would routinely work with *human factors psychologists* to test their designs and instructions on real people. Human factors psychologists help to design appliances, machines, and work settings that fit our natural perceptions and inclinations. ATM machines are internally more complex than VCRs ever were, yet, thanks to human factors psychologists working with engineers, ATMs are easier to operate. TiVo has solved the TV-recording problem with a simple select-and-click menu system ("record that one"). Apple has similarly engineered easy usability with the iPod and iPhone.

Norman (2001) hosts a Web site (www.jnd.org) that illustrates good designs that fit people (see **FIGURE B.5**). Human factors psychologists also work at designing safe and efficient environments. An ideal kitchen layout, researchers have found, stores needed items close to their usage point and near eye level. It locates work areas to enable doing tasks in order, such as placing a refrigerator, stove, and sink in a triangle or L-shaped area. It creates counters that enable hands to work at or slightly below elbow height (Boehm-Davis, 2005).

Understanding human factors can do more than enable us to design for reduced frustration; it can help prevent accidents and avoid disaster (Boehm-Davis, 2005). Two-thirds of commercial air accidents, for example, have been caused by human error (Nickerson, 1998). After beginning commercial flights in the late 1960s, the Boeing 727 was involved in several landing accidents caused by pilot error. Psychologist Conrad Kraft (1978) noted a common setting for these accidents: All took place at night, and all involved landing short of the runway after crossing a dark

FIGURE B.5 Designing products that fit people Human factors psychologist Donald Norman offers these and other examples of effectively designed new products (see www.jnd.org). The Ride On Carry On foldable chair attachment, "designed by a flight attendant mom," enables a small suitcase to double as a stroller. The Oxo measuring cup allows the user to see the quantity from above. The Chatsford Tea Pot comes with a built-in strainer.

stretch of water or unilluminated ground. Kraft reasoned that, beyond the runway, city lights would project a larger retinal image if on a rising terrain. This would make the ground seem farther away than it was. By re-creating these conditions in flight simulations, Kraft discovered that pilots were deceived into thinking they were flying higher than their actual altitudes. Aided by Kraft's finding, the airlines began requiring the co-pilot to monitor the altimeter—calling out altitudes during the descent—and the accidents diminished.

Later Boeing psychologists worked on other human factors problems (Murray, 1998): How should airlines best train and manage mechanics to reduce the maintenance errors that underlie about 50 percent of flight delays and 15 percent of accidents? What illumination and typeface would make on-screen flight data easiest to read? How could warning messages be most effectively worded—as an action statement ("Pull Up") rather than a problem statement ("Ground Proximity")?

In studying human factors issues, psychologists' most powerful tool is theory-aided research. If an organization wonders what sort of Web design (Emphasizing content? Speed? Graphics?) would most effectively draw in visitors and entice them to return, the psychologist will want to test responses to several alternatives. If NASA (National Aeronautics and Space Administration) wonders what sort of spacecraft design would best facilitate sleeping, work, and morale, their human factors psychologists will also want to test the alternatives (**FIGURE B.6** on the next page).

Consider, finally, the available *assistive listening* technologies in various theaters, auditoriums, and places of worship. One technology, commonly available in the United States, requires a headset attached to a pocket-sized receiver that detects infrared or FM signals from the room's sound system. The well-meaning people who design, purchase, and install these systems correctly understand that the technology puts sound directly into the user's ears. Alas, few people with hearing loss undergo

The human factor in safe landings Advanced cockpit design and rehearsed emergency procedures aided pilot Chesley "Sully" Sullenberger, a U.S. Air Force Academy graduate who studied psychology and human factors. In January 2009, Sullenberger's instantaneous decisions safely guided his disabled airliner onto New York City's Hudson River, where all 155 of the passengers and crew were evacuated safely.

Courtesy of NASA

FIGURE B.6 How not to go mad while going to Mars Future astronauts headed to Mars will be confined in conditions of monotony, stress, and weightlessness for months on end. To help design and evaluate a workable human environment, such as for this Transit Habitation (Transhab) Module, NASA engages human factors psychologists (Weed, 2001; Wichman, 1992).

the hassle and embarrassment of locating, requesting, wearing, and returning a conspicuous headset. Most such units therefore sit in closets. Britain, the Scandinavian countries, and Australia have instead installed *loop systems* (see www.hearingloop.org) that broadcast customized sound directly through a person's own hearing aid. When suitably equipped, a hearing aid can be transformed by a discrete touch of a switch into an in-the-ear loudspeaker. Offered convenient, inconspicuous, personalized sound, many more people elect to use assistive listening.

Designs that enable safe, easy, and effective interactions between people and technology often seem obvious after the fact. Why, then, aren't they more common? Technology developers sometimes mistakenly assume that others share their expertise—that what's clear to them will similarly be clear to others (Camerer et al., 1989; Nickerson, 1999). When people rap their knuckles on a table to convey a familiar tune (try this with a friend), they often expect their listener to recognize it. But for the listener, this is a near-impossible task (Newton, 1991). When you know a thing, it's hard to mentally simulate what it's like not to know, and that is called the *curse of knowledge*.

The point to remember: Designers and engineers should consider human abilities and behaviors by designing things to fit people, user-testing their inventions before production and distribution, and being mindful of the curse of knowledge.

Psychology at Work

Module Review

B-1: How do personnel psychologists help organizations with employee selection, work placement, and performance appraisal? *Personnel psychologists* help devise selection methods for new employees, recruit and evaluate applicants, design and evaluate training programs, identify people's strengths, analyze job content, and appraise individual and organizational performance. Subjective interviews foster the interviewer illusion; *structured interviews* pinpoint job-relevant strengths and are better predictors of performance.

B-2: What is the role of organizational psychologists? *Organizational psychologists* examine influences on workers' *achievement motivation,* satisfaction, and productivity, and they facilitate organizational change. Employee engagement tends to correlate with organizational success. Leadership style may be goal oriented *(task leadership)*, group oriented *(social leadership)*, or some combination of the two.

B-3: How do human factors psychologists work to create user-friendly machines and work settings? *Human factors psychologists* contribute to safety and improved design by exploring ways that machines and physical environments can be adapted to human behaviors. They encourage developers and designers to consider human perceptual abilities, to test users to reveal perception-based problems, and to avoid the curse of knowledge.

Rehearse It!

1. People who view their work as a calling often experience _____, a focused state of consciousness, with diminished awareness of themselves and of time.
   a. stress
   b. apathy
   c. flow
   d. facilitation

2. The three main divisions within I/O psychology are _____, _____, and _____ psychology.
   a. motivational; management; small group
   b. personnel; organizational; human factors
   c. motivational; personnel; human factors
   d. personnel; management; small group

3. A personnel psychologist scripted a set of questions to ask all applicants for a job opening. She then trained the firm's interviewers to ask only these questions, to take notes, and to rate applicants' responses. This technique is known as a(n)
   a. structured interview.
   b. unstructured interview.
   c. performance appraisal checklist.
   d. behavior rating scale.

4. In your job, you rate your own performance, your manager's, and your peers'. Your manager, your peers, and your customers also rate your performance. Your organization is using a form of performance appraisal called
   a. flow procedure.
   b. graphic feedback.
   c. structured interviews.
   d. 360-degree feedback.

5. Task leadership is goal-oriented, whereas social leadership is group-oriented. Research indicates that effective managers exhibit
   a. only task leadership.
   b. only social leadership.
   c. both task and social leadership, depending on the situation and the person.
   d. task leadership for building teams and social leadership for setting standards.

6. To reduce users' frustration and to avoid accidents, human factors psychologists help organizations avoid the curse of knowledge, which is
   a. the idea that a little bit of knowledge is dangerous for the user.
   b. users' tendencies to override machines and resort to familiar habits.
   c. engineers' and designers' tendencies to assume that users are idiots and need overly detailed instructions.
   d. engineers' and designers' tendencies to assume that others share their knowledge.

Answers: 1. c, 2. b, 3. a, 4. d, 5. c, 6. d.

Terms and Concepts to Remember

flow, p. B-1
industrial-organizational (I/O) psychology, p. B-2
personnel psychology, p. B-2
organizational psychology, p. B-2
human factors psychology, p. B-2
structured interviews, p. B-5
achievement motivation, p. B-6
task leadership, p. B-11
social leadership, p. B-11

Multiple-choice **self-tests** and more may be found at www.worthpublishers.com/myers.

APPENDIX C

Careers in Psychology

Jennifer Zwolinski
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What can you do with a degree in psychology? Lots!

As a psychology major, you will graduate with a scientific mind-set and an awareness of basic principles of human behavior (biological mechanisms, development, cognition, psychological disorders, social interaction). This background will prepare you for success in many areas, including business, the helping professions, health services, marketing, law, sales, and teaching. You may even go on to graduate school for specialized training to become a psychology professional. This appendix describes the various levels of psychology education and some jobs available at those levels; psychology's specialized subfields; and ways you can improve your chances of admission to graduate school.[1]

Preparing for a Career in Psychology

Psychology is the second most popular major in the United States, second only to business (Princeton Review, 2005). Recent data show that more than 88,000 psychology majors graduate annually from U.S. colleges and universities (National Center for Education Statistics, 2007a,b). An undergraduate degree in psychology can prepare you for a broad array of jobs in numerous fields after graduation. For a career that is more closely related to the field of psychology, you will need a graduate degree.

The Bachelor's Degree

If you major in psychology, you will have several possible career paths to follow (Cannon, 2005). First, you might consider employment after graduation in a variety of professional settings. Most students who graduate with psychology majors find work in for-profit organizations, especially in management, sales, and administration. **TABLE C.1** on the next page shows the top 10 occupations that employ people with a bachelor's degree in psychology.[2] If you choose to work more directly in the field of psychology, a bachelor's degree will qualify you to work as an assistant to psychologists, researchers, or other professionals in community mental health centers, vocational rehabilitation offices, and correctional programs (U.S. Bureau of Labor Statistics, 2008). A second option for psychology majors after graduation is to pursue a graduate degree in psychology. Approximately 42 percent of U.S. psychology majors go on to graduate school in psychology (Fogg et al., 2004). A third option is to pursue advanced training in other disciplines, such as law, business, education, or medicine.

Clearly, psychology majors are marketable beyond the boundaries of psychology. Their sought-after skills include an ability to work and get along with others, a desire and willingness to learn new things, adaptability to changing situations, and a capacity for problem solving (Landrum, 2001). Psychology majors also have a number of methodological skills that result from the focus on the scientific study of

[1]Although this text covers the world of psychology for students in many countries, this appendix draws primarily from available U.S. data. Its descriptions of psychology's subfields and its suggestions for preparing to enter the profession are, however, also applicable in many other countries.

[2]For a more comprehensive list of job titles, see Appleby (2006).

TABLE C.1 Top 10 U.S. Occupations That Employ People With a Bachelor's Degree in Psychology

1. Top- and mid-level managers, executives, administrators
2. Sales occupations, including retail
3. Social workers
4. Other management-related occupations
5. Personnel, training, labor relations specialists
6. Other administrative occupations
7. Insurance, securities, real estate, business services
8. Other marketing and sales occupations
9. Registered nurses, pharmacists, therapists, physician assistants
10. Accountants, auditors, other financial specialists

Source: Fogg et al. (2004).

human and animal behavior. The study of statistics and research methodology contributes to a scientific mind-set that emphasizes exploring and managing uncertainty, critical and analytical skills, and logical thinking abilities. The ability to analyze data using statistics, conduct database searches, and integrate multiple sources of information would be helpful in a number of professional settings. Prospective employers will also appreciate the excellent written and oral communication skills among students who present their research projects at conferences and master American Psychological Association (APA) style.

There are some things that all psychology majors can do to maximize success in the job market. Employers who hire people with only a bachelor's degree tend to favor individuals with strong interpersonal skills and practical experience as well as a good education (Cannon, 2005). Betsy Morgan and Ann Korschgen (1998) have offered the following helpful tips for increasing your chances of getting a job after graduation. Many of these tools will benefit students who plan to apply to graduate school as well.

1. *Get to know your instructors.* Talk with them about the field of psychology and get their advice on your career plan. Ask them to support you on an independent study internship or research project. By learning more about your skills and future aims, faculty members can help you accomplish your goals. This may even result in an enthusiastic reference for future employment.
2. *Take courses that support your interests.* Although the psychology major offers a range of skills that will benefit you in the job market, don't assume the psychology curriculum will offer all the skills necessary to get a job in your area of interest. Add courses to increase your knowledge base and skills. This will also show prospective employers that your specific interests are in line with the demands of the job.
3. *Familiarize yourself with available resources, such as campus career services and alumni.* Career services can help you identify and market your job skills and emphasize the knowledge and abilities you have in your resume. They can also help you to network with other alumni who are working in your area of interest and who can help you to prepare for the career that you want.
4. *Participate in at least one internship experience.* Many employers want students to gain relevant experience outside the classroom. Internships are offered during the school year as well as the summer break. Some are paid and others are not, but you may be able to earn course credit while completing your internship. In addition to gaining relevant work experience before you graduate, you will increase your support network of mentors who can provide supervision and support for your career goals as well as letters of support when you apply for jobs.

5. *Volunteer some of your time and talent to campus or community organizations, such as Psi Chi (the national honor society in psychology) or your school's psychology club.* In addition to showing that you are an active citizen in your department, you will gain important skills, such as meeting and event planning, how to work with a group, and improved communication skills, all of which enhance your marketability.

Postgraduate Degrees

A graduate degree in psychology will give you proficiency in an area of psychological specialization. According to the U.S. Bureau of Labor Statistics (2008), psychologists with advanced degrees held approximately 166,000 jobs in 2006. Employment for psychologists is expected to grow 15 percent from 2006 to 2016, which is faster than the average for all occupations. The work settings for psychologists vary somewhat by type of graduate degree. As shown in **FIGURE C.1**, psychologists with a doctorate work primarily in universities and colleges; most people with a master's degree work in other educational institutions (such as elementary and middle schools) and in for-profit companies. Among advanced degree recipients in 2005–2006, a total of 19,770 had master's degrees and 4921 earned doctoral degrees (National Center for Education Statistics, 2007a,b).

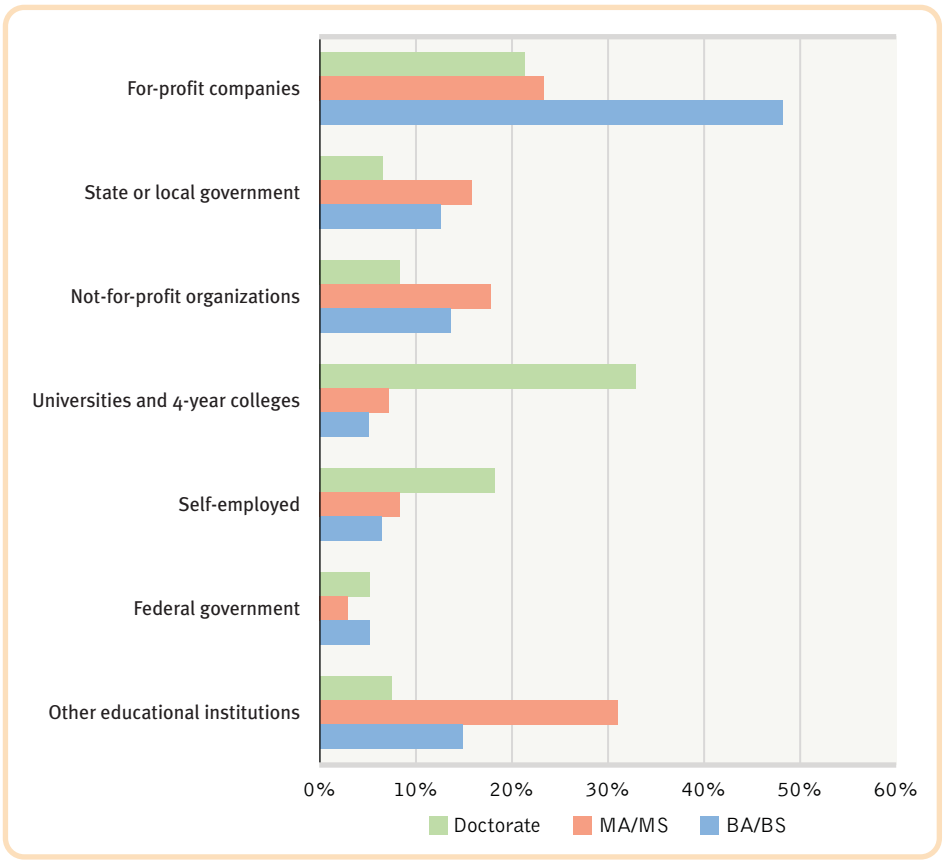

FIGURE C.1 Work settings for psychology-degree recipients
Source: Fogg et al., 2004.

The Master's Degree

A master's degree in psychology requires at least two years of full-time graduate study in a specific subfield of psychology. In addition to specialized course work in psychology, requirements usually include practical experience in an applied setting and/or a master's thesis reporting on an original research project. You might acquire a master's degree to do specialized work in psychology. As a graduate with a master's degree, you might handle research and data collection and analysis in a university,

Tom Stewart/Corbis

Prescription privileges Many psychologists would like the opportunity to prescribe medicines (normally reserved for physicians only) in order to expand the scope of clinical practice and to meet the need for psychiatric services in many parts of the United States. Psychologists in the U.S. military and in the states of New Mexico and Louisiana currently have prescription privileges.

government, or private industry setting. You might work under the supervision of a psychologist with a doctorate, providing some clinical service such as therapy or testing. Or you might find a job in the health, government, industry, or education field. You might also acquire a master's degree as a stepping stone for more advanced study in a doctoral program in psychology, which will considerably expand the number of employment opportunities available to you (Super & Super, 2001).

Doctoral Degrees

You will probably need five to seven years of graduate study in a specific subfield of psychology to get your doctoral degree. The degree you choose to pursue will depend on your career goals. You will probably choose to earn a doctor of philosophy (Ph.D.) in psychology if your career goals are geared toward conducting research, or a doctor of psychology (Psy.D.) if you are more interested in pursuing professional practice. Training for the Ph.D. culminates in a dissertation (an extensive research paper you will be required to defend orally) based on original research. Courses in quantitative research methods, which include the use of computer-based analysis, are an important part of graduate study and are necessary to complete the dissertation. Psy.D. training may be based on clinical (therapeutic) work and examinations rather than a dissertation. It is important to note, however, that psychologists with Psy.D. degrees are not the only ones who work in professional practice. Many psychologists who earn a Ph.D. in clinical or counseling psychology conduct research and work in professional settings. If you pursue clinical and counseling psychology programs, you should expect at least a one-year internship in addition to the regular course work, clinical practice, and research.

FIGURE C.2 lists by subfield the Ph.D.s earned in the United States in a recent year. Clinical psychology is the most popular specialty area among those with doctorates in psychology. The largest employment growth areas for doctoral graduates have been in the for-profit and self-employment sectors, including health services providers, industrial-organizational psychology, and educational psychology. About one-third of doctoral-level psychologists are employed in academic settings (Fogg et al., 2004).

In 2001, a total of 73 percent of new doctoral respondents and 55 percent of new master's respondents indicated that their primary occupational position was their first choice. Most new graduates with a master's degree or a Ph.D. are fairly satisfied with their current positions overall in terms of salary, benefits, opportunities for personal development, supervisors, colleagues, and working conditions (Kohout & Wicherski, 2004; Singleton et al., 2003).

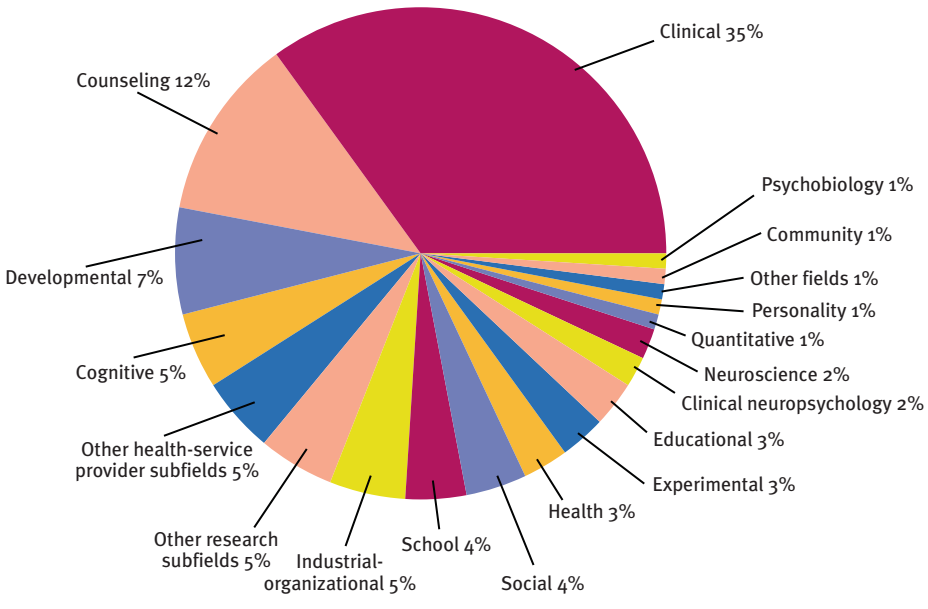

FIGURE C.2 U.S. Ph.D.s by subfield, 2001

Source: National Science Foundation 2001 Survey of Doctorate Recipients. Compiled by the American Psychological Association.

Subfields of Psychology

If you are like most psychology students, you may be unaware of the wide variety of specialties and work settings available in psychology (Terre & Stoddart, 2000). To date, the American Psychological Association (APA) has formed 56 divisions (**TABLE C.2**). An alphabetical list of some of these careers, in the main specialty areas of psychology, follows. Most require a graduate degree in psychology.

Clinical psychologists promote psychological health in individuals, groups, and organizations. Some clinical psychologists specialize in specific psychological disorders. Others treat a range of disorders, from adjustment difficulties to severe psychopathology. Clinical psychologists might engage in research, teaching, assessment, and consultation. Some hold workshops and lectures on psychological issues for other professionals or for the public. Clinical psychologists work in a variety of settings, including private practice, mental health service organizations, schools, universities, industries, legal systems, medical systems, counseling centers, government agencies, and military services.

To become a clinical psychologist, you will need to earn a doctorate from a clinical psychology program. The APA sets the standards for clinical psychology graduate programs, offering accreditation (official recognition) to those who meet their standards. In all U.S. states, clinical psychologists working in independent practice must obtain a license to offer services such as therapy and testing.

TABLE C.2 APA Divisions by Number and Name

1. Society for General Psychology
2. Society for the Teaching of Psychology
3. Experimental Psychology
4. There is no Division 4.
5. Evaluation, Measurement, and Statistics
6. Behavioral Neuroscience and Comparative Psychology
7. Developmental Psychology
8. Society for Personality and Social Psychology
9. Society for the Psychological Study of Social Issues (SPSSI)
10. Society for the Psychology of Aesthetics, Creativity, and the Arts
11. There is no Division 11.
12. Society of Clinical Psychology
13. Society of Consulting Psychology
14. Society for Industrial and Organizational Psychology
15. Educational Psychology
16. School Psychology
17. Society of Counseling Psychology
18. Psychologists in Public Service
19. Society for Military Psychology
20. Adult Development and Aging
21. Applied Experimental and Engineering Psychology
22. Rehabilitation Psychology
23. Society for Consumer Psychology
24. Society for Theoretical and Philosophical Psychology
25. Behavior Analysis
26. Society for the History of Psychology
27. Society for Community Research and Action: Division of Community Psychology
28. Psychopharmacology and Substance Abuse
29. Psychotherapy
30. Society of Psychological Hypnosis
31. State, Provincial, and Territorial Psychological Association Affairs
32. Society for Humanistic Psychology
33. Intellectual and Developmental Disabilities
34. Population and Environmental Psychology
35. Society for the Psychology of Women
36. Psychology of Religion
37. Society for Child and Family Policy and Practice
38. Health Psychology
39. Psychoanalysis
40. Clinical Neuropsychology
41. American Psychology-Law Society
42. Psychologists in Independent Practice
43. Society for Family Psychology
44. Society for the Psychological Study of Lesbian, Gay, and Bisexual Issues
45. Society for the Psychological Study of Ethnic Minority Issues
46. Media Psychology
47. Exercise and Sport Psychology
48. Society for the Study of Peace, Conflict, and Violence: Peace Psychology Division
49. Group Psychology and Group Psychotherapy
50. Addictions
51. Society for the Psychological Study of Men and Masculinity
52. International Psychology
53. Society of Clinical Child and Adolescent Psychology
54. Society of Pediatric Psychology
55. American Society for the Advancement of Pharmacotherapy
56. Trauma Psychology

Source: American Psychological Association.

Cognitive consulting Cognitive psychologists may advise businesses on how to operate more effectively by understanding the human factors involved.

Cognitive psychologists study thought processes and focus on such topics as perception, language, attention, problem solving, memory, judgment and decision making, forgetting, and intelligence. Recent areas of research interest include designing computer-based models of thought processes and identifying biological correlates of cognition. As a cognitive psychologist, you might work as a professor, industrial consultant, or human factors specialist in an educational or business setting.

Community psychologists move beyond focusing on specific individuals or families and deal with broad problems of mental health in community settings. These psychologists believe that human behavior is powerfully influenced by the interaction between people and their physical, social, political, and economic environments. They seek to improve individual functioning by enhancing environmental settings to promote psychological health. Community psychologists focus on prevention, promotion of positive mental health, and crisis intervention, with special attention to the problems of underserved groups and ethnic minorities. Given the shared emphasis on prevention, some community psychologists collaborate with professionals in other areas, such as public health. As a community psychologist, your work settings could include federal, state, and local departments of mental health, corrections, and welfare systems. You might conduct research or help evaluate research in health service settings, serve as an independent consultant for a private or government agency, or teach and consult as a college or university faculty member.

Counseling psychologists help people adjust to life transitions or make lifestyle changes. This field is very similar to clinical psychology, except that counseling psychologists typically help people with adjustment problems rather than severe psychopathology. Like clinical psychologists, counseling psychologists conduct therapy and provide assessments to individuals and groups. As a counseling psychologist, you would emphasize your clients' strengths, helping clients cope during a transitional time using their own skills, interests, and abilities. You might find yourself working in an academic setting as a faculty member or administrator or in a university counseling center, community mental health center, business, or private practice. As with clinical psychology, if you plan to work in independent practice you will need to obtain a state license to provide counseling services to the public.

Coping with disaster After Peru's deadly August 2007 earthquake, this community psychologist working with Doctors Without Borders helped survivors cope with the loss of their homes and, for many, the deaths of family members and friends.

Developmental psychologists conduct research in age-related behavioral changes and apply their scientific knowledge to educational, child-care, policy, and related settings. As a developmental psychologist, you would investigate change across a broad range of topics, including the biological, social, psychological, and

cognitive aspects of development. Developmental psychology informs a number of applied fields, including educational psychology, school psychology, child psychopathology, and gerontology. The field also informs public policy in areas such as education and child-care reform, maternal and child health, and attachment and adoption. You would probably specialize in behavior during infancy, childhood, adolescence, or middle or late adulthood. Your work setting could be an educational institution, day-care center, youth group program, or senior center.

Educational psychologists study the relationship between learning and our physical and social environments. They study the psychological processes involved in learning and develop strategies for enhancing the learning process. As an educational psychologist, you might work in a university—in a psychology department or a school of education. You might conduct basic research on topics related to learning or develop innovative methods of teaching to enhance the learning process. You might design effective tests including measures of aptitude and achievement. You might be employed by a school or government agency or charged with designing and implementing effective employee-training programs in a business setting.

Experimental psychologists are a diverse group of scientists who investigate a variety of basic behavioral processes in research involving humans and other animals. Prominent areas of study in experimental research include comparative methods of science, motivation, learning, thought, attention, memory, perception, and language. Most experimental psychologists identify with a particular subfield, such as cognitive psychology, depending on their area of study. It is also important to note that the experimental method for conducting research studies is not limited to the field of experimental psychology, as many other subfields rely on experimental methodology to conduct studies. As an experimental psychologist, you would most likely work in an academic setting, teaching courses and supervising students' research in addition to conducting your own research using experimental methodology. Or you might be employed by a research institution, zoo, business, industry affiliate, or government agency.

Forensic psychologists apply psychological principles to legal issues. They conduct research on the interface of law and psychology, help to create public policies related to mental health, help law-enforcement agencies in criminal investigations, or assist in forensic consultation involving jury selection and deliberation research. They also provide therapy and assessment to assist the legal community. Some forensic psychologists hold law degrees and provide clients with legal services as well. Although most forensic psychologists are clinical psychologists, they might have expertise in other areas of psychology, such as social or cognitive psychology. As a forensic psychologist, you might work in a university psychology department, law school, research organization, community mental health agency, law-enforcement agency, court, or correctional setting.

AP Photo/Jennifer Graylock

Criminal profiling On the popular U.S. TV show *Law & Order: Special Victims Unit,* Dr. George Huang (played by B. D. Wong) is an FBI agent and psychiatrist who uses his background in forensic psychology to conduct criminal investigations.

Health psychologists are researchers and practitioners concerned with psychology's contribution to promoting health and preventing disease. As applied psychologists or clinicians, they may help individuals lead healthier lives by designing, conducting, and evaluating programs to stop smoking, lose weight, improve sleep, manage pain, treat psychosocial problems associated with chronic and terminal illness, or prevent the spread of sexually transmitted infections. As researchers and clinicians, they identify conditions and practices associated with health and illness to help create effective interventions. In public service, health psychologists study and work to improve government policies and health care systems. As a health psychologist, you could be employed in a hospital, medical school, rehabilitation center, public health agency, college or university, or, if you are also a clinical psychologist, in private practice.

Industrial-organizational (I/O) psychologists study the relationship between people and their working environments. They may develop new ways to increase productivity, improve personnel selection, or promote job satisfaction in a business setting. Their interests include organizational structure and change, consumer behavior, and personnel selection and training. As an I/O psychologist, you might conduct workplace training or provide organizational analysis and development. You may find yourself working in business, industry, the government, or a college or university. Or you may be self-employed as a consultant or work for a management consulting firm.

Neuropsychologists investigate the relationship between neurological processes (structure and function of the brain) and behavior. As a neuropsychologist you might assess, diagnose, or treat disorders related to the central nervous system, such as Alzheimer's disease or stroke. You might also evaluate individuals for evidence of head injuries, learning and developmental disabilities (such as autism), and other psychiatric disorders (including attention-deficit hyperactivity disorder [ADHD]). If you are a ***clinical neuropsychologist,*** you might work in the neurology, neurosurgery, or psychiatric unit of a hospital. Neuropsychologists also work in academic settings, where they conduct research and teach.

Psychometric and ***quantitative psychologists*** study the methods and techniques used to acquire psychological knowledge. A psychometrician may update existing neurocognitive or personality tests or devise new tests for use in clinical and school settings or in business and industry. These psychologists also administer, score, and interpret such tests. Quantitative psychologists collaborate with researchers to design, analyze, and interpret the results of research programs. As a psychometric or quantitative psychologist, you will need to be well trained in research methods, statistics, and computer technology. You will most likely be employed by a university or college, testing company, private research firm, or government agency.

Rehabilitation psychologists are researchers and practitioners who work with people who have lost optimal functioning after an accident, illness, or other event. As a rehabilitation psychologist, you would probably work in a medical rehabilitation institution or hospital. You might also work in a medical school, university, state or federal vocational rehabilitation agency, or in private practice serving people with physical disabilities.

School psychologists are involved in the assessment of and intervention for children in educational settings. They diagnose and treat cognitive, social, and emotional problems that may negatively influence children's learning or overall functioning at school. As a school psychologist, you would collaborate with teachers, parents, and administrators, making recommendations to improve student learning. You would work in an academic setting, a federal or state government agency, a child guidance center, or a behavioral research laboratory.

Social psychologists are interested in our interactions with others. Social psychologists study how our beliefs, feelings, and behaviors are affected by and influence other people. They study topics such as attitudes, aggression, prejudice, interpersonal attraction, group behavior, and leadership. As a social psychologist, you would probably be a college or university faculty member. You might also work in organizational consultation, marketing research, or other applied psychology fields including social neuroscience. Some social psychologists work for hospitals, federal agencies, or businesses performing applied research.

As a ***sports psychologist,*** you would study the psychological factors that influence, and are influenced by, participation in sports and other physical activities. Professional activities of sports psychologists include coach education and athlete preparation, as well as research and teaching. Sports psychologists who also have a clinical or counseling degree can apply those skills to working with individuals with psychological problems such as anxiety or substance-abuse problems that might interfere with optimal performance. If you were not working in an academic or research setting, you would most likely work as part of a team or organization or in a private capacity.

Preparing Early for Graduate Study in Psychology

Competition for the openings for advanced degrees in psychology is keen. If you choose to go to graduate school, there are a number of things you can do now to maximize your chances of gaining admission to the school of your choice.

If possible, begin preparing during your first year on campus to maximize opportunities and obtain the experience needed to gain admission to a competitive program. Kristy Arnold and Kelly Horrigan (2002) have offered a number of suggestions to facilitate this process.

1. *Network.* Get to know faculty members and the psychology department by attending activities and meetings. This will be especially helpful when you apply to graduate school or for a professional position, because many applications require two to three letters of reference. Become involved in psychology clubs and in Psi Chi, the national honor society in psychology. These meetings connect students with similar interests and expose them to a broader study of the field.
2. *Become actively involved in research as early as possible.* Start by doing simple tasks such as data entry and data collection, and over time you will be prepared to conduct your own research project under the supervision of a research mentor. Consider applying for summer research positions through your university or from other organizations such as the American Psychological Association Summer Science Institute (SSI) or the National Science Foundation Research Experiences for Undergraduates (REU) Program to test your interest in academic careers and to build your skills for future study in psychology.
3. *Volunteer or get a job in a psychology-related field.* Getting involved will show your willingness to apply psychological concepts to real-world settings. Further, it will showcase your ability to juggle a number of tasks successfully, such as work and school—an important skill for graduate school success.
4. *Maintain good grades.* Demonstrate the ability to do well in graduate school with successful completion of challenging courses, especially those related to your interests.

In your junior year, you should begin studying for the Graduate Record Exam (GRE), the standardized test that applicants to graduate school must complete. Many graduate programs in psychology require both the General GRE and the Psychology subject tests. If you start preparing early, you will be ready for success in your graduate school application and study.

Membership benefits Members of the Psi Chi Honor Society, such as those meeting here, enjoy educational and professional benefits. They may attend special Psi Chi sessions at psychological conventions, apply for research grants in psychology or other academic awards, and read about research advances in the society's journal *Eye on Psi Chi.* (See www.psichi.org for more information.)

Stephen Simpson/Getty Images

* * *

So, the next time someone asks you what you will do with your psychology degree, tell them you have a lot of options. You might use your acquired skills and understanding to get a job and succeed in any number of fields, or you might pursue graduate school and then career opportunities in associated professions. In any case, what you have learned about behavior and mental processes will surely enrich your life (Hammer, 2003).

For More Information

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Answers to *Test for Success: Critical Thinking Exercises*

By Amy Himsel
El Camino College

MODULE 1 The History and Scope of Psychology

1. **"Nurture works on what nature endows." Describe what this means.**
   ANSWER: The environment (nurture) has an influence on us, but that influence is constrained by our biology (nature). Nature and nurture interact. If I am predisposed to be very tall (nature), for example, I am unlikely to become an Olympic gymnast, no matter how hard I work (nurture).

MODULE 2 Research Strategies: How Psychologists Ask and Answer Questions

1. **How can you use your knowledge of the scientific attitude to help you evaluate claims in the media, even if you're not a scientific expert on the issue?**
   ANSWER: One of the most important tips is to realize that hoping something is true has nothing to do with whether or not it is true. Sensible ideas, ideas that seem reasonable and likely, may nevertheless be false. The scientific attitude teaches us to look for evidence instead of relying on our often fallible intuition. In evaluating a claim in the media, look for any signs of empirical evidence, presumably from several studies. Are claims based on scientific findings? Have several studies replicated the findings and confirmed them? Are any experts cited? If so, research their background. Are they affiliated with a credible university, college, or institution? Have they written about scientific findings?

2. **Here are some recently reported correlations, with interpretations drawn by journalists. Further research, often including experiments, has clarified cause and effect in each case. Knowing just these correlations, can you come up with other possible explanations for each of these?**
   ANSWER:
   a. *Alcohol use is associated with violence. (One interpretation: Drinking triggers or unleashes aggressive behavior.)* Perhaps anger triggers drinking, or perhaps the same genes or rearing predispose both drinking and aggression. (Here researchers have learned that drinking does indeed trigger aggressive behavior.)
   b. *Educated people live longer, on average, than less-educated people. (One interpretation: Education lengthens life and enhances health.)* Perhaps richer people can afford more education and better health care. (Research supports this conclusion.)
   c. *Teens engaged in team sports are less likely to use drugs, smoke, have sex, carry weapons, and eat junk food than are teens who do not engage in team sports. (One interpretation: Team sports encourage healthy living.)* Perhaps some third factor explains this correlation—teens who use drugs, smoke, have sex, carry weapons, and eat junk food may be "loners" who do not enjoy playing on any team.
   d. *Adolescents who frequently see smoking in movies are more likely to smoke. (One interpretation: Movie stars' behavior influences impressionable teens.)* Perhaps adolescents who smoke and attend movies frequently have less parental supervision and more access to spending money than other adolescents.

3. **As you watch an Orlando Magic basketball game with your friend, he says that Dwight Howard really has a hot hand right now and the other players should give him the ball as soon as possible. Based on your knowledge of our tendency toward illusory thinking, how should you respond?**
ANSWER: Your friend is perceiving order where none exists. He sees Dwight Howard make several shots in a row, and he misinterprets the streak as a special phenomenon ("the hot hand"). The same thing happens when we toss a coin and happen to get a string of heads in a row. The coin hasn't changed; it's just that the random pattern doesn't always look random. Streaks are to be expected.

4. **Foot pads purported to draw toxins out of the body during sleep have become popular lately. Testimonials suggest that foot pads remove toxins from the body and also help alleviate a variety of health problems, including fatigue and backaches. How can we determine whether foot pads are actually effective?**
ANSWER: To determine whether the foot pads are truly effective, we have to experiment. It doesn't matter how convinced we are that the pads work; what matters is how well the pads actually do work. A double-blind experiment is the best method to determine this. We would give the experimental group the real foot pads and give the control group a placebo (something physically similar, but without any active agent). Participants would be randomly assigned to these groups, and they would be unaware of which group they are in. We would then monitor the health of all participants to see if the foot pads (the independent variable) actually do have an impact on health (the dependent variable). Are the foot pads likely to be effective? Health experts say *no.* Our body already has effective ways of releasing toxins, and we do not excrete enough toxins through our skin to have an impact on our health. So, the result we expect may be that the foot pads will have no effect. Yet only a well-run experiment can give us confidence in this finding.

MODULE 3 Neural and Hormonal Systems

1. **In *The Astonishing Hypothesis* (1994, p. 49), Sir Francis Crick noted, "What one neuron tells another neuron is simply how much it is excited." Using terms from this chapter, compare the neural communication when we are (a) tapped gently on the arm, and (b) slapped across the face.**
ANSWER: Whether we are tapped or slapped, communications between neurons would be at the same level of intensity because neurons fire in an all-or-nothing fashion. In each case, axon terminal/dendrite pairs would "chat" across a synapse about how excited or inhibited they are. If "I'm excited" chats outnumber "I'm inhibited" ones, a threshold would be reached, sending an impulse (the action potential) down the axon. Reaching the axon terminal, the impulse would launch a message, in the form of a neurotransmitter, across the synapse to the dendrite of the receiving neuron. Compared with a tap, a slap would involve more of these chats.

MODULE 4 The Brain

1. **Which area of the human brain is most similar to that of primitive animals? Which part of the human brain distinguishes us the most from primitive animals?**
ANSWER: The human brainstem is most similar to that of primitive animals, and the cerebral cortex is most different.

2. **We are not conscious of many brain processes that help create our experiences. To appreciate how much is going on outside of our awareness, we can imagine functioning without certain brain areas. For example, what would it be like to talk on the phone with your mother if you didn't have the temporal lobe association areas? What would you hear? What would you understand?**
ANSWER: You would hear sounds, but without the temporal lobe association areas you would be unable to make sense of what you were hearing. With no memories of the sound of your mother's voice, you would not realize, "It's my mother!" With no memories of the meaning of the words she was speaking, you could not understand what she was saying.

3. **Neurons bunch together in networks, just as people tend to congregate in cities—in each case, shorter distances enable efficient communication. Yet your brain somehow integrates information transmitted from distant regions. How do different neural networks communicate with one another to let you, for example, respond when a friend greets you at a party?**
   ANSWER: In the real estate of your brain, the various neural networks are connected by billions of interneurons, whose job is to form connections between other neurons. Each specialized area in the cerebral cortex resides next to an association area that helps integrate information across the cortex. The visual cortex, for example, is a neural network of sensory neurons that is connected via interneurons to other neural networks. This explains how you can integrate visual and auditory information to respond when a friend you recognize greets you at a party.

4. **In what brain region would damage be most likely to disrupt your ability to skip rope? Your ability to sense tastes and sounds? In what brain region would damage perhaps leave you in a coma? Without the very breath and heartbeat of life?**
   ANSWER: These regions are, respectively, the *cerebellum,* the *thalamus,* the *reticular formation,* and the *medulla.* These questions assess your understanding of the essential functions of the lower-level brain areas.

MODULE 5 Dual Processing, Sleep, and Dreams

1. **Research on the two-track mind shows that we know more than we know we know. Might we function better if we were completely conscious of all of our thought processes?**
   ANSWER: It is actually adaptive that our mind operates at two levels simultaneously. With an unconscious mind running largely on auto-pilot, our conscious thought processes can focus on executive-level, important decisions. While reading this textbook, for example, you don't have to remind yourself to inhale and exhale. Capable "assistants" in your unconscious mind—in this case, your medulla—are handling these tasks. Thanks to selective attention, you can focus consciously on only a fraction of the several billion bits of sensory information your mind processes in any given moment. Without this dual-processing ability, your information-processing system would be completely overwhelmed.

2. **In the discussion of sleep stages, a man in a cartoon states, "Boy, are my eyes tired! I had REM sleep all night long!" In reality, how tiring is REM sleep, and how much time do we spend in it?**
   ANSWER: In reality, REM sleep involves a mix of activity (bursts of eye movement and brain activity similar to alpha waves) and inactivity (body paralysis as the brainstem prevents cortex activity from reaching the rest of the body). This activity-paralysis mix gives REM sleep its other name: paradoxical sleep. Adults tend to spend about 20 to 25 percent of an average night in REM sleep. The man in the cartoon would be more likely to be exhausted by too little REM sleep than by too much.

3. **Sleep researcher William Dement said that a large sleep debt "makes you stupid" (1999, p. 231). What are some of the ways sleep deprivation can affect cognitive performance?**
   ANSWER: Chronic sleep deprivation can make you stupid by impairing your ability to concentrate, slowing reaction time, increasing irritability, and decreasing creativity and productivity. Lack of sleep can have disastrous effects on memory consolidation, which occurs during REM sleep. Chronic sleep deprivation also inhibits the nightly repair process of the brain and other body tissues, which sets the stage for impaired cognition.

4. **"For what one has dwelt on by day, these things are seen in visions of the night" (Menander of Athens [342–292 B.C.E.], *Fragments*). Consider this quote from the wish-fulfillment, information-processing, and activation-synthesis perspectives on dreaming.**
   ANSWER: *Freud's wish-fulfillment* explanation proposes that our thoughts *(what one has dwelt on by day)* do appear in our dreams (our *visions of the night*), but in deeply disguised form (the dream's latent content), not in the dream's actual story line (the

manifest content). The *information-processing* explanation proposes that brain activity during REM sleep enables us to sift through *what one has dwelt on by day* and to commit that information to memory. The *activation-synthesis* explanation proposes that our frontal cortex weaves a story from random bursts of brain activity (influenced by our past experiences, including *what one has dwelt on by day*) emanating from the brainstem during REM sleep, creating our dreams.

MODULE 6 Hypnosis

1. **Muriel believes that exploring her suppressed, painful childhood memories will help alleviate her chronic arthritis. In what ways might hypnosis help her?**
   ANSWER: Hypnosis is likely to help Muriel manage the physical pain of arthritis, especially if she is a highly hypnotizable person; however, hypnosis is not a reliable memory aid. Muriel's hypnotic recall may be strongly influenced by the hypnotist's questioning and result in false memories.

MODULE 7 Drugs

1. **Fourth-century-B.C.E. philosopher Plato observed, "How strange would appear to be this thing that men call pleasure! And how curiously it is related to what is thought to be its opposite, pain! . . . Wherever the one is found, the other follows up behind." Explain how this pleasure-pain description applies to the neurotransmitter activity underlying repeated use of heroin.**
   ANSWER: In general, psychoactive drugs create pleasure by altering brain chemistry. With repeated use, the brain undergoes neuroadaptation, changing the way it functions. Tolerance results as the amount of the drug needed to achieve the desired effect increases. Once the body becomes dependent, discontinuing use of the substance produces painful withdrawal symptoms because the brain's neurochemistry has changed. The opiate heroin creates a sense of *pleasure* by depressing neural functioning and making the user less responsive to physical pain. The *pain* that follows results from the neuroadaptation that decreases or stops the brain's production of natural opiates, the endorphins. Heroin abuse may permanently damage the endorphin production system.

MODULE 8 Behavior Genetics and Evolutionary Psychology

1. **If heredity is a primary influence on personality, how can we explain why some siblings, who have different combinations of their parents' genes, have very similar personalities?**
   ANSWER: When siblings have strikingly similar personalities, it is tempting to credit the influence of the family environment. But it's important to keep in mind that biological siblings share half their genes. By chance alone, couples could produce a few children with very similar genetic predispositions toward certain personality characteristics. Of course, genes also interact with the environment, so that two cheerful and outgoing siblings are likely to evoke positive reactions from others, further reinforcing their bubbly personalities. Conversely, children who differ greatly may evoke (and later recall) very different experiences in that "same" family environment. We must also keep in mind that this research focuses on personality. Other characteristics, including attitudes and values, are strongly influenced by the family environment.

2. **It's been said that our female ancestors most often sent their genes into the future by pairing wisely, and our male ancestors by pairing widely. How does the evolutionary psychology perspective explain why these adaptive patterns are still seen in the behaviors and priorities of contemporary men and women who have more choices about when and whether they will have children?**
   ANSWER: Our interests and motivations have been shaped by the genetic legacy (carried in our DNA) of our species. As evolutionary psychologist David Buss said, "Humans are living fossils—collections of mechanisms produced by prior selection pressures." From an evolutionary perspective, human sexual motivation is directed toward the goal of survival of the species, which requires passing our genes on to future generations. In

our evolutionary past, men could ensure the survival of their genes by mating with several women, especially those who were young, healthy, and fertile. Our female ancestors, capable of sustaining only one pregnancy at a time, were more likely to leave surviving descendents if they focused more on quality of partners rather than quantity—thus, say evolutionary psychologists, women were attracted to partners able to protect and support offspring.

3. **Primatologist Frans B. M. de Waal (1999) observed that "genes, by themselves, are like seeds dropped onto pavement: powerless to produce anything." Explain what this means, in terms of our human characteristics.**
ANSWER: Genes certainly are important because they trigger the development of the protein molecules that help form all our physical characteristics (including the brain). But to do this work, genes need housing (the environment provided by the cells in which our genetic code—our DNA—lives). Genes also need other genes because groups of genes work in concert to produce our complex psychological characteristics, such as intelligence. Finally, genes are self-regulating and some (like a gene that predisposes a person to depression) need environmental influences (such as major life stress) to trigger their expression. Genes and environment interact.

MODULE 9 Environmental Influences on Behavior

1. **"Use it or lose it" is a phrase often used when discussing strategies to stave off brain aging and decline in adulthood. In reality, this rule is just as critical during infancy. Explain why.**
ANSWER: Infancy is the time when the brain is most plastic (changeable). The human brain continues to produce new neurons and connections throughout the life span, but no time is more critical than infancy. During the first years of life, surplus neural connections form in the brain of an infant experiencing a healthy family environment and adequate levels of stimulation through seeing, hearing, touching, being touched, and having things to do. Without these normal experiences—for example, in severely deprived environments—the pathways in a child's brain won't develop, and the normal pruning process will eliminate underused neural connections. Another milder wave of surplus building and pruning occurs across childhood and adolescence, but if damage has been extensive during the first years of life, later recovery may be impaired.

2. **Consider the Chinese saying, "One needs to cultivate the spirit of sacrificing the *little me* to achieve the benefits of the *big me*." What is the *little me*? The *big me*? How might a staunch individualist react to this saying?**
ANSWER: This saying reflects a central feature of collectivism: that one's identity is formed in connection with group goals. The *little me* is the individual, separate from others; the *big me* is the sense of self in connection to the group—the individual's family, friends, society, and so on. If the needs of the group and the individual collide, the *big me* must take priority in order to maintain harmony and bring honor to the group. A staunch individualist would likely struggle to understand this saying. The *little me* looms large in individualist cultures, where the *big me* may be sacrificed or compromised in service to the goals and desires of the *little me*. Staunch individualists might even struggle to comprehend the meaning of *big me* because their concept of self is defined as separate from that of the group.

MODULE 10 Developmental Issues, Prenatal Development, and the Newborn

1. **"Nature is all that a man brings with him into the world; nurture is every influence that affects him after his birth," said Francis Galton *(English Men of Science,* 1874). What part of this quote would need to be updated to reflect current research?**
ANSWER: The second half of Galton's quote would need to be updated because we now know that nurture includes not only all that we experience *after* birth, but also all that we experience in the womb *prior* to birth. The importance of the prenatal environment, our first experience of nurture, is clearly illustrated by the effects of *teratogens,* substances like viruses and drugs that can reach the developing organism and cause harm.

MODULE 11 Infancy and Childhood

1. **We all learned to walk as infants, and we retain that learning as adults. Yet we would be unable to consciously recall just how we achieved this feat. Why can't we reconstruct those memories?**
   ANSWER: Although our brain is processing information and we are learning from our experiences, our brain is not equipped to form conscious memories before the age of 3, a concept known as infantile amnesia. The baby in Rovee-Collier's study demonstrated this idea when he showed that he had learned from his experience of moving a mobile by kicking his foot. Although our nervous system is processing information and creating memories during the phase of infantile amnesia, we cannot access those memories consciously.

MODULE 12 Adolescence

1. **A counselor has advised a teenager's frustrated parents that his behavior may improve when his brain matures. What evidence supports the counselor's suggestion?**
   ANSWER: The immaturity of the adolescent brain is so well established that the U.S. Supreme Court ruled it unconstitutional to sentence adolescents to the death penalty. The frontal lobes of a teenager's cerebral cortex continue to develop during adolescence and may not reach full maturity until his mid-twenties. As frontal lobe neurons become increasingly myelinated, the teen will slowly gain more control over his emotions and impulses. Heavy drinking during adolescence can, however, interfere with frontal lobe development.

MODULE 13 Adulthood

1. **"I hope I die before I get old," sang rock star Peter Townshend—when he was 20. What could you tell other 20-year-olds to make them feel more optimistic about aging?**
   ANSWER: You could remind 20-year-olds that aging is more than a series of losses. For most people, the rapid-processing skills of fluid intelligence will decrease steadily, but the vocabulary and knowledge of crystallized intelligence will increase well into older adulthood. Negative emotions will likely be less intense than in young adulthood, and the risk of depression often decreases with age.

2. **Research has shown that living together before marriage predicts an increased likelihood of future divorce. Can you imagine two possible explanations for his correlation?**
   ANSWER: Will Axinn and Arland Thornton (1992) reported data that support two explanations. (1) The first explanation is an example of a *selection effect*—our tendency to seek out others who are similar to us. Cohabitation attracts people who are more open to terminating unsatisfying relationships. People who cohabit bring a more individualistic ethic to marriage, are more likely to see close relationships as temporary and fragile, are more accepting of divorce, and are about three times more likely after marriage to have an affair (Forste & Tanfer, 1996). (2) Axinn and Thornton's second explanation illustrates the *causal effect* of the experience of cohabitation. Over time, those who cohabit tend to become more approving of dissolving an unfulfilling union. This divorce-accepting attitude increases the odds of later divorce.

MODULE 14 Basic Concepts and Vision

1. **Before reading this question, you probably didn't notice the sensation of your shoes touching your feet. Yet it's likely you notice them now. Why?**
   ANSWER: Before this question brought the touch of your shoes into your conscious awareness, you were experiencing sensory adaptation. The shoes provide constant stimulation, which triggers fewer and fewer neurons to fire, until the sensation recedes into the background, unnoticed. Sensory adaptation allows us to focus on changing stimuli, which are typically most important for survival. Without this adaptive reaction, we would be bombarded with incoming information and would have difficulty functioning.

2. **What mental processes allow you to perceive a lemon as yellow?**
   ANSWER: The lemon itself has no color; your brain constructs this perception of color in two stages. First, the lemon reflects light energy into your eyes, where it is transformed into neural messages. Three sets of cones, each sensitive to a different light frequency (red, blue, and green) process color. In this case, the light energy stimulates both red-sensitive and green-sensitive cones. In the second stage, a network of opponent-process cells sensitive to paired opposites of color (red/green, black/white, and yellow/blue) evaluates the incoming neural messages as they pass through your optic nerve to the thalamus and visual cortex. When the yellow-sensitive opponent-process cells are stimulated, you identify the lemon as yellow.

MODULE 15 The Other Senses

1. **Why do you feel a little dizzy immediately after a roller coaster ride?**
   ANSWER: The same sensory features that allow you to perceive the world accurately can also, on occasion, generate false perceptions. Your vestibular sense regulates balance and body positioning through kinesthetic receptors triggered by fluid in your inner ear. Wobbly legs and a spinning world are signs that these receptors are still responding to the ride's turbulence. As your vestibular sense adjusts to solid ground, your balance will be restored.

2. **Why might it be helpful for people with chronic pain to meditate or exercise?**
   ANSWER: Because we feel pain in our brain, we may diminish the experience of pain by changing the messages sent to the brain. Gate-control theory proposes that our pain sensory receptors send signals to the spinal cord, which relays messages to the brain. Small fibers in the spinal cord open the gate to pain; large fibers close the gate, blocking those signals. Meditation triggers large-fiber activity by shifting our attention elsewhere (toward breathing or a repeated word); exercise triggers that activity by generating competing stimulation and endorphin release.

MODULE 16 Perceptual Organization and Interpretation

1. **Why do you perceive a lemon as the same shade of yellow whether you view it in sunlight or in dim lighting?**
   ANSWER: The sunlit lemon reflects more light than the dimly-lit lemon. Nevertheless, thanks to color constancy, you experience both lemons as yellow because you integrate sensations of light reflecting off all other objects surrounding the lemon into your perception of its color.

MODULE 17 Classical Conditioning

1. **"Sex sells!" is a common saying in advertising. Using classical conditioning terms, explain how sexual images in advertisements can condition your response to a product.**
   ANSWER: The sexual image is a US that triggers the UR of interest or arousal. The product is an NS. An advertisement pairs the product with a sexual image. Over time, the product becomes a CS that triggers the CR of interest or arousal.

MODULE 18 Operant Conditioning

1. **Ethan constantly misbehaves at preschool even though his teacher scolds him several times each day. Why does his misbehavior continue, and what can his teacher do to stop it?**
   ANSWER: Ethan probably enjoys the attention; if so, he is experiencing the scolding as a positive reinforcement instead of a punishment. To stop the misbehavior, he needs a mild punishment (such as a time out) to teach him what *not* to do, followed by reinforcement (such as praise) to teach him what *to* do. Reinforcement is most effective for long-term learning, but initially, it may be challenging for the teacher to find any behavior to praise. The teacher might encourage Ethan toward increasingly appropriate behavior by shaping with successive approximations. Another option is to rephrase rules as rewards instead of as punishments, perhaps saying, "You can have a snack if you play nicely with the other children" (reward) instead of "You will not get a snack if you misbehave!" (punishment).

2. **How could your psychology instructor use negative reinforcement to encourage your attentive behavior during class?**
   ANSWER: Your instructor could reinforce your attentive behavior by taking away something you dislike. If you detest writing, the promise of shortening the required length of a paper might be an effective reward. If you are easily bored, an engaging lecture might be rewarding. If you dislike lectures, a reward could be an in-class video or activity. In each case, the instructor would remove something aversive in order to negatively reinforce your focused attention.

MODULE 19 Learning by Observation

1. **Why might a gymnastics coach encourage her students to improve their routines by watching recordings of Olympic gold medal gymnastics performances?**
   ANSWER: The coach may realize that mirror neurons influence observational learning. Mirror neurons in the students' frontal lobes will mimic the Olympic gymnasts' movements, and this "brain rehearsal" will help prepare the students for learning when they practice their own routines later.

2. **Jason's parents and older friends all smoke, but they advise him not to. Juan's parents and friends don't smoke, but they say nothing to deter him from doing so. Will Jason or Juan be more likely to start smoking?**
   ANSWER: Although both saying and doing can influence people, experiments suggest that children more often do as others do and say as they say. Generalizing this finding to smoking, we can expect that Jason will be more likely to start smoking.

MODULE 20 Information Processing

1. **What would be the most effective strategy to learn and retain a list of names of key historical figures for a week? For a year?**
   ANSWER: For a week: Make the names personally meaningful. For a year: Overlearn the list and space out rehearsals over the course of several weeks.

2. **Maria has always loved to wear winter clothing. The sensation of being bundled up makes her feel safe and secure. How might her preference be related to her January birth in Chicago?**
   ANSWER: Maria's first few months of life were spent wrapped in warm clothing in the bitter cold of a Chicago winter. As an infant, she may have learned to associate winter clothing with her parents' sensitive caregiving (feeling safe and secure). Maria could not form explicit memories of these experiences because of her immature hippocampus and verbal skills. Instead, an implicit memory retrieved from her cerebellum may be triggering this vague sense of comfort.

3. **When you feel sad, why might it help to look at pictures that reawaken some of your best memories?**
   ANSWER: Memories are stored within a web of many associations, one of which is mood. When you recall fond moments from your past, you stimulate the "happy-memories" associations. By deliberately activating these threads of the web, you may experience mood-congruent memory and recall other happy moments, which will likely improve your mood and positively influence your interpretation of current events.

MODULE 21 Forgetting, Memory Construction, and Memory Improvement

1. **What you know today seems to be what you have always known. Explain what this means.**
   ANSWER: Our memories are often modified by our subsequent experiences, thoughts, and expectations. We tend to fill in gaps with reasonable guesses that eventually feel like real memories. Misinformation may color the construction of retrieved memories. If you have a vivid imagination, you may be especially susceptible to incorporating imagined events into your memories. In addition, motivated forgetting may lead you to revise memories to align them with your current self-concept. We are largely unaware of this memory revision process, which is why "what we remember today" seems to be "what we have always remembered."

2. **Eliza's family loves to tell the story of how she "stole the show" as a 2-year-old, dancing at her aunt's wedding reception. Infantile amnesia should have prevented her from forming a memory, yet Eliza can recall the event clearly. How is this possible?**
   ANSWER: Eliza's immature hippocampus and lack of verbal skills prevented her from encoding an explicit memory of her aunt's wedding reception at the age of two. Instead, it's likely that Eliza learned information (from hearing the story repeatedly) that she eventually constructed into a very convincing (yet false) explicit memory.

3. **What—given the commonality of source amnesia—might life be like if we remembered all our waking experiences and all our dreams?**
   ANSWER: Real experiences would be confused with those we dreamed. When meeting someone, we might therefore be unsure whether we were reacting to something they previously had done or to something we dreamed they had done. William Dement (1999, p. 298) noted that this "would put a great burden on your sanity. . . . I truly believe that the wall of memory is a blessed protection."

MODULE 22 Thinking

1. **Oscar describes his political beliefs as "strongly liberal," but he has decided to explore opposing viewpoints. How might this influence his thinking?**
   ANSWER: Oscar is guarding against confirmation bias by seeking out opposing viewpoints, but he is likely to find fault with these views and grow overconfident in his liberal beliefs. Even if Oscar encounters new information that disproves his liberal beliefs, belief perseverance may lead him to cling to these views anyway. It will take more compelling evidence to change his political beliefs than it took to create them.

MODULE 23 Language and Thought

1. **It's been said that the development of language can be compared to the growth of a flower. Explain how, using the theories of Skinner and Chomsky.**
   ANSWER: The growth of a flower is influenced by sunlight, water, and soil. Skinner argued that language similarly develops from environmental stimulation, as children learn associations between words and objects or actions; imitate observed language behaviors; and receive reinforcement for their speech. The growth of a flower is also influenced by the innate components of the seed. Chomsky argued that inborn skills (such as the language acquisition device) similarly permit language development to "just happen," provided children receive adequate stimulation during a critical period early in life. Contemporary psychologists tend to believe that each viewpoint explains part of the language development process.

2. **A Czech proverb says, "Learn a new language and get a new soul." To what extent is this true?**
   ANSWER: Words do not *determine* how you think (as the linguistic determinism theory suggests), but they do *influence* your thinking. A newly learned language may alter your thoughts, personality, and sense of self. In addition, the vocabulary of the new language widens your perspective and allows you to think more like the members of that culture.

3. **How could mental rehearsal help your performance in this class?**
   ANSWER: Studying is a skill that improves with practice. You can improve your study skills by using visual imagery as mental rehearsal for future behaviors. Visualizing yourself engaged in the *process* of achieving your goals—effective study behaviors, such as rehearsing information and eliminating distractions—is more effective than dreaming about your desired *outcome*.

MODULE 24 Intelligence

1. **When asked to report his IQ, Nobel Prize-winning physicist Stephen Hawking (2004) responded, "I have no idea. People who boast about their IQ are losers." How important are intelligence test scores to success in life?**
   ANSWER: Standard intelligence test scores best predict school performance and analytic intelligence ("school smarts"), but they only modestly predict other factors that influence success in life, such as common sense, creativity, or self-motivation. Other types of intelligence, such as those proposed by Gardner, Sternberg, and others, address a variety of mental abilities that may also influence success in life, such as practical, musical, or emotional intelligence.

2. **As society succeeds in creating equality of opportunity, it will also increase the heritability of ability. The heritability of intelligence scores will be greater in a society marked by equal opportunity than in a society of peasants and aristocrats. Why?**
   ANSWER: Perfect environmental equality would create 100 percent heritability—because genes alone would account for any remaining human differences.

MODULE 25 Basic Concepts and Hunger

1. **Dorothea Dix (1801–1887) once remarked, "Nobody wants to kiss when they are hungry." Which theory of motivation best supports her statement?**
   ANSWER: Maslow's hierarchy of needs best supports this statement because it addresses the primacy of some motives over others. Physiological needs (such as hunger) trump all others. Once those basic needs are met, safety concerns are addressed next, followed by belongingness and love needs (such as the desire to kiss).

2. **Sanjay recently adopted the typical college diet high in fat and sugar. He knows he may gain weight, but he figures it's no big deal because he can lose the extra pounds in the future. How would you evaluate Sanjay's plan?**
   ANSWER: Sanjay's plan is problematic. Yes, he could someday lose his "college weight" by expending more calories than he consumes; however, weight gain now could make weight loss and maintenance in the future more challenging. With weight gain, his fat cells may increase in number; even if he tries to lose weight later, those cells will shrink in size but will never be eliminated entirely. Sanjay would be better off to maintain his current, healthy weight by adopting a balanced diet and exercising regularly.

MODULE 26 Sexual Motivation

1. **Everything psychological is simultaneously biological. How is this true of sexual orientation?**
   ANSWER: Sexual orientation involves both psychology (mental processes and behaviors) and biology (genetics, prenatal hormones, and the brain). Researchers have not yet found that environmental factors outside of the womb determine sexual orientation, but the influence of biology has been demonstrated in several studies. For example, sexual orientation correlates with differences in the structure and functioning of the hypothalamus. Other research indicates that biological factors (such as genetic influences and prenatal hormonal activity) may predispose these brain-related differences. Biological factors may also predispose a temperament that motivates the child toward gender-atypical behavior, which may gradually develop into a homosexual orientation.

2. **To what extent might social networking Web sites like Facebook satisfy or thwart our need to belong?**
   ANSWER: During social networking, healthy relationships (which increase self-esteem and happiness) may grow stronger because of increased contact with important others, and we may make new friends online, satisfying our need to belong. But electronic contact may not confer the same benefit as face-to-face or telephone contact. We risk being deceived or misled by others who misrepresent themselves. We may even experience social rejection (ostracism and cyberbullying, for example), which could trigger depression, withdrawal, and even aggressive retaliation. Thus, social networking sites may satisfy *and* thwart our need to belong.

MODULE 27 Theories and Physiology of Emotion

1. **Christine is holding her 8-month-old baby when a fierce dog appears out of nowhere and, with teeth bared, leaps for the baby's face. Christine immediately ducks for cover to protect the baby, screams at the dog, then notices that her heart is banging in her chest and she's broken out in a cold sweat. How would the James-Lange, Cannon-Bard, and two-factor theories explain Christine's emotional reaction?**

ANSWER: The James-Lange theory would say that Christine's emotional reaction consists of her awareness of her physiological responses to the dog attack. The Cannon-Bard theory would say that her fear experience happened simultaneously with her physiological arousal. Schacter's two-factor theory would presume that her emotional reaction stemmed from her interpreting and labeling the arousal.

2. **How might mountain climbing on a first date influence your emotional reaction to the person?**
ANSWER: Mountain climbing increases physiological arousal, which may spill over and intensify your emotions. So, if your date might otherwise seem slightly annoying, you may feel intense dislike. If your date is mildly interesting, you may feel strong attraction. A quiet dinner will give you a more accurate read without intensifying your emotions.

MODULE 28 Expressing and Experiencing Emotion

1. **You are happy to have earned a B on an exam until you learn that most of your friends received an A. How can you explain your drop in mood?**
ANSWER: You experienced *relative deprivation,* the sense that you fared more poorly than others with whom you compared yourself. When you compare upward, focusing on those who did better (in this case, those who received an A), your happiness decreases. If you compare downward (with those who received a C), your happiness will likely rebound.

MODULE 29 Stress and Health

1. **A self-help book declares that you can prevent cancer through "the power of positive thinking." How would you evaluate this claim?**
ANSWER: Positive thinking may boost immune functioning and slow the growth of tumors, but it won't prevent the formation of cancer cells, which are the product of various biological and environmental influences. Nevertheless, negative thinking can exacerbate our health problems by triggering a fight-or-flight reaction, stress hormone activity, and the reduction of T lymphocyte and natural killer cells. As a result, tumors may grow faster. So, although positive thinking doesn't prevent cancer, it may enhance the immune system's fight against the disease.

2. **A Chinese proverb warns, "The fire you kindle for your enemy often burns you more than him." How is this true of Type A individuals?**
ANSWER: During their frequent bouts of hostility, Type A individuals put themselves greatly at risk for health problems, including heart disease. Their sympathetic nervous system diverts blood away from the liver, leaving fat and cholesterol circulating in the bloodstream for deposit near the heart and other organs. Hostility also correlates with unhealthy habits, such as smoking, drinking, and obesity. Ultimately, the Type A individual harms himself greatly by kindling a fire for his enemy.

MODULE 30 Classic Perspectives on Personality

1. **How might Freud and Rogers differ in their explanations of how the environment influences the development of a criminal?**
ANSWER: Freud might argue that the environment failed to trigger the superego, which moderates the id's dangerous urges (inherent selfishness and aggression). Lacking proper guidance as a child, the criminal may have developed a weak superego, allowing the id free rein. Rogers might assert that the environment failed to nurture self-actualizing potential. Thus, the criminal was likely raised in an environment lacking genuineness, acceptance (unconditional positive regard), and empathy, which inhibited psychological growth and led to a negative self-concept.

MODULE 31 Contemporary Perspectives on Personality

1. **In *Essays,* Michel de Montaigne (1588) suggested, "There is as much difference between us and ourselves, as between us and others." Does research on the trait perspective support his claim?**
ANSWER: Trait researchers have found significant *differences between us and others* on the Big Five personality characteristics. These traits are stable (especially in adulthood),

moderately heritable, and documented worldwide. Nevertheless, situational variations in our behavior indicate *differences between us and ourselves* as well. Personality assessments, designed to measure behavior averaged across many situations, are weak predictors of behavior in a given moment because the demands of the situation may overpower our stable traits.

2. **You think you are talented enough to compete on *American Idol,* but you don't want to make a fool of yourself on TV. What is the best way to accurately assess your talent beforehand?**
   ANSWER: The least competent individuals have the most difficulty recognizing their incompetence, so the more talented you are, the better your chances of accurately judging yourself. But to be safe, ask peers to evaluate your singing; they are likely to be more objective than you.

3. **A fortune cookie advises, "Love yourself and happiness will follow." Is this good advice?**
   ANSWER: Loving yourself can lead to happiness *or* sorrow. High levels of secure self-esteem promote a focus beyond the self and correlate with a high quality of life. In contrast, low self-esteem involves negativity directed not only toward the self, but toward others as well. Yet narcissism and the self-serving bias may prompt self-esteem that is artificially high (not based on one's behaviors) or defensive (erected to protect the self), which may lead to sorrow, especially when negative external feedback triggers anger or aggression.

MODULE 32 Basic Concepts and Mood Disorders

1. **A full-figured body is the traditional cultural ideal for women in the South Pacific island of Fiji. After the introduction of American TV programs to the island in 1995, however, eating disorder diagnoses increased rapidly. How can the biopsychosocial approach explain this phenomenon?**
   ANSWER: In the past, the cultural ideal of full figures helped protect Fijian women from developing eating disorders. American TV programs, with their emphasis on thinness, introduced a competing social-cultural ideal, which also probably triggered changes in psychological factors (such as perceptions and thoughts about weight). These social-cultural and psychological influences, in combination with biological factors (such as genetic predispositions), increased Fijian women's risk of eating disorders.

2. **When women get sad, they often get sadder than men do. When men get mad, they often get madder than women do. How does this correspond to gender differences in psychological disorders?**
   ANSWER: Women tend to have strong emotional memories and to ruminate over negative events, leaving them more vulnerable to anxiety and depression. Men, who tend to direct their negative emotions outward, show higher rates of substance abuse disorder or antisocial personality disorder than are found among women.

3. **What does it mean to say that depression is the "common cold" of psychological disorders?**
   ANSWER: Saying that depression is the "common cold" of psychological disorders is a quick way to state that this serious disorder is the most common condition found in those seeking mental health treatment—with almost 6 percent of men and nearly 10 percent of women reporting a depressive episode each year. Worldwide, depression is the leading cause of disability.

MODULE 33 Schizophrenia

1. **Victor exclaimed, "The weather has been so schizophrenic lately: It's hot one day and freezing the next!" Is this an accurate analogy? Why or why not?**
   ANSWER: This analogy is inaccurate; it reflects a common misunderstanding—that schizophrenia involves rapid changes in mood or identity. Schizophrenia is a disorder involving the altered perceptions, emotions, and behaviors of a mind split from reality. Perhaps Victor is confusing schizophrenia with dissociative identity disorder (DID), in which a person may display distinctly different identities from one moment to the next.

MODULE 34 Other Disorders

1. **Anna is embarrassed that it takes her several minutes to parallel park her car. She usually gets out of the car once or twice to inspect her distance both from the curb and from the cars nearby. Should she worry about having a psychological disorder?**
   ANSWER: Anna's behaviors are similar to some symptoms of obsessive-compulsive disorder, but she probably does not have a psychological disorder. Her behavior is unusual, causes her distress, and may make her a few minutes late on occasion, but it does not appear to significantly disrupt her ability to function. Like most of us, Anna demonstrates some unusual behaviors that are not disabling or dysfunctional.

MODULE 35 The Psychological Therapies

1. **American playwright August Wilson (1945–2005) advised, "Your willingness to wrestle with your demons will cause your angels to sing." Which psychological therapy best matches this quote, and why?**
   ANSWER: Psychoanalysis is the best fit for this quote because it proposes that unpleasant, repressed conflicts and urges will fester and cause psychological disorders. To help the patient increase awareness of unwanted, hidden aspects of the self *(wrestling with demons)*, the psychoanalyst encourages free association, explores resistance, and offers interpretations. As a result, the patient hopefully gains insight and improved psychological functioning *(causing angels to sing)*.

2. **After a near-fatal car accident, Rico developed an intense fear of driving on the freeway. In fact, his anxious response to the freeway has become so intense that he must take lengthy alternative routes to work each day. Which psychological therapy might best help Rico overcome his phobia, and why?**
   ANSWER: Behavior therapies are often the best choice for treating phobias and other anxiety disorders. A behavior therapist would view Rico's fear of the freeway as a learned response that can be changed. Using counterconditioning (such as systematic desensitization, an exposure therapy), the therapist would teach Rico to replace his anxious response to freeway driving with a relaxation response. Over time, Rico should be able to resume freeway driving without intense anxiety.

3. **Talia is convinced the "anxiety-relief" herbal tea she ordered online has improved her mental health over the past few weeks. What other explanations might account for Talia's improvement?**
   ANSWER: This untested alternative therapy may seem effective for many reasons. Talia's relief from anxiety may be due to her strong expectation that the tea would work (the *placebo effect*). She may have ordered the tea during a particularly tough time, and her anxiety may now have lessened naturally *(spontaneous recovery)*. And feeling the need to self-justify the money and time she has spent on this alternative remedy, Talia may be convincing herself it was worth the effort. Ultimately, a controlled research study (such as a randomized clinical trial) would be needed to objectively measure the effectiveness of this or any other alternative therapy.

MODULE 36 The Biomedical Therapies

1. **How can we apply the knowledge that *everything psychological is simultaneously biological* to the treatment of depression?**
   ANSWER: Depression's feelings of worthlessness and distorted thoughts correlate with brain activity. Biomedical treatments (such as antidepressants or neurostimulation) affect the limbic system, working from the bottom up to influence neurotransmitter activity and the growth of new neurons. As a result, distorted thoughts and negative emotions often subside. But changes in thoughts and feelings triggered by psychological therapies (such as cognitive-behavioral therapy) work from the top down as well, influencing the brain activity of the frontal lobes.

MODULE 37 Social Thinking

1. **Driving to school one wintry day, Marco narrowly misses a car that slides through a red light. "Slow down! What a terrible driver," he thinks to himself. Moments later, Marco himself slips through an intersection and yelps, "Wow! These roads are awful. The city snow plows need to get out here." What social psychology principle has Marco just demonstrated? Explain.**
   ANSWER: By attributing the other person's behavior to the person ("he's a terrible driver") and his own to the situation ("these roads are awful"), Marco has exhibited the fundamental attribution error.

2. **Jamal's therapist has suggested that Jamal should "act as if" he is confident, even though he feels insecure and shy. Which social psychological theory would best support this suggestion, and what might the therapist be hoping to achieve?**
   ANSWER: Cognitive dissonance theory best supports this suggestion. If Jamal acts confident, his behavior will contradict his negative self-thoughts, creating cognitive dissonance. To relieve the tension, Jamal may realign his attitudes with his actions by viewing himself as more outgoing and confident.

MODULE 38 Social Influence

1. **Dr. Huang, a popular music professor whose classes are always jam-packed, delivers riveting lectures on music history but gets nervous and often makes mistakes when describing exam statistics in front of the class. Why does his performance vary by task?**
   ANSWER: The presence of a large audience generates arousal and strengthens Dr. Huang's most likely response: enhanced performance on a task he has mastered (expertise in music history) and impaired performance on a task he finds difficult (statistics).

MODULE 39 Social Relations

1. **Stacy, a Chicago Cubs fan who is normally a very calm and soft-hearted person, becomes wild with joy whenever the White Sox, a rival baseball team, loses a game. Why does Stacy take such pleasure in their losses?**
   ANSWER: In this situation, social identity forces are influencing Stacy's thoughts and emotions, even more so than her enduring personality traits. As a Chicago Cubs fan, Stacy is a member of an ingroup that sets itself apart from an outgroup (White Sox fans). In such cases, ingroup bias tends to develop, leading to prejudice and the view that the outgroup is worthy of misfortune. This tendency is particularly strong when the two groups share many similarities, as is the case with these two Chicago baseball teams. So, when something bad happens to the White Sox (they lose a game), Stacy and other Cubs fans take pleasure in denigrating the Sox and viewing their failure as justified.

2. **Brittany, the president of the Psychology Club, needs assistance preparing for an upcoming fund-raising event. She made a plea for help in an e-mail she sent in a mass mailing to all 60 club members. So far, however, nobody has responded—either to help or not help. What might be the problem, and how could Brittany change her approach in the hope of getting people to respond and help?**
   ANSWER: People are less likely to help when they are part of a group. By sending one e-mail addressed to all members of the club, Brittany has created conditions that will foster diffusion of responsibility. With responsibility spread across all 60 members, each of them will feel less responsible for assisting Brittany—much as individuals feel less responsible for helping when they are in the presence of many other bystanders. Brittany may receive the assistance she needs if she sends a personal e-mail to each club member, which will make each person notice the problem, interpret it as a cry for help, and—hopefully—take responsibility for finding a solution.

GLOSSARY

A

absolute threshold the minimum stimulation needed to detect a particular stimulus 50 percent of the time. (p. 190)

accommodation adapting our current understandings (schemas) to incorporate new information. (p. 152)

accommodation the process by which the eye's lens changes shape to focus near or far objects on the retina. (p. 194)

acquisition in classical conditioning, the initial stage, when one links a neutral stimulus and an unconditioned stimulus so that the neutral stimulus begins triggering the conditioned response. (p. 241)

action potential a neural impulse; a brief electrical charge that travels down an axon. (p. 37)

active listening empathic listening in which the listener echoes, restates, and clarifies. A feature of Rogers' client-centered therapy. (p. 515)

adaptation-level phenomenon our tendency to form judgments (of sounds, of lights, of income) relative to a neutral level defined by our prior experience. (p. 413)

addiction compulsive drug craving and use, despite adverse consequences. (p. 93)

adolescence the transition period from childhood to adulthood, extending from puberty to independence. (p. 166)

adrenal [ah-DREEN-el] **glands** a pair of endocrine glands that sit just above the kidneys and secrete hormones (epinephrine and norepinephrine) that help arouse the body in times of stress. (p. 44)

aerobic exercise sustained exercise that increases heart and lung fitness; may also reduce stress, depression, and anxiety. (p. 430)

aggression any physical or verbal behavior intended to hurt or destroy. (pp. 131, 569)

algorithm a methodical, logical rule or procedure that guarantees solving a particular problem. Contrasts with the usually speedier—but also more error-prone—use of *heuristics*. (p. 306)

alpha waves the relatively slow brain waves of a relaxed, awake state. (p. 73)

altruism unselfish regard for the welfare of others. (p. 581)

amnesia the loss of memory. (p. 283)

amphetamines drugs that stimulate neural activity, causing speeded-up body functions and associated energy and mood changes. (p. 96)

amygdala [uh-MIG-duh-la] two lima-bean–sized neural clusters in the limbic system; linked to emotion. (p. 50)

anorexia nervosa an eating disorder in which a person (usually an adolescent female) diets and becomes significantly (15 percent or more) underweight, yet, still feeling fat, continues to starve. (p. 362)

antianxiety drugs drugs used to control anxiety and agitation. (p. 535)

antidepressant drugs drugs used to treat depression; also increasingly prescribed for anxiety. Different types work by altering the availability of various neurotransmitters. (p. 536)

antipsychotic drugs drugs used to treat schizophrenia and other forms of severe thought disorder. (p. 535)

antisocial personality disorder a personality disorder in which the person (usually a man) exhibits a lack of conscience for wrongdoing, even toward friends and family members. May be aggressive and ruthless or a clever con artist. (p. 507)

anxiety disorders psychological disorders characterized by distressing, persistent anxiety or maladaptive behaviors that reduce anxiety. (p. 499)

aphasia impairment of language, usually caused by left-hemisphere damage either to Broca's area (impairing speaking) or to Wernicke's area (impairing understanding). (p. 56)

applied research scientific study that aims to solve practical problems. (p. 9)

assimilation interpreting our new experiences in terms of our existing schemas. (p. 152)

association areas areas of the cerebral cortex that are not involved in primary motor or sensory functions; rather, they are involved in higher mental functions, such as learning, remembering, thinking, speaking, and integrating information. (p. 55)

associative learning learning that certain events occur together. The events may be two stimuli (as in classical conditioning) or a response and its consequences (as in operant conditioning). (pp. 239, 249)

attachment an emotional tie with another person; shown in young children by their seeking closeness to the caregiver and showing distress on separation. (p. 158)

attention-deficit hyperactivity disorder (ADHD) a psychological disorder marked by the appearance by age 7 of one or more of three key symptoms: extreme inattention, hyperactivity, and impulsivity. (p. 474)

attitude feelings, often influenced by our beliefs, that predispose us to respond in a particular way to objects, people, and events. (p. 547)

attribution theory the theory that we explain someone's behavior by crediting either the situation or the person's disposition. (p. 545)

audition the sense or act of hearing. (p. 203)

autism a disorder that appears in childhood and is marked by deficient communication, social interaction, and understanding of others' states of mind. (p. 156)

automatic processing unconscious encoding of incidental information, such as space, time, and frequency, and of well-learned information, such as word meanings. (p. 273)

autonomic [aw-tuh-NAHM-ik] **nervous system** the part of the peripheral nervous system that controls the glands and the muscles of the internal organs (such as the heart). Its sympathetic division arouses; its parasympathetic division calms. (p. 41)

availability heuristic estimating the likelihood of events based on their availability in memory; if instances come readily to mind (perhaps because of their vividness), we presume such events are common. (p. 309)

aversive conditioning a type of counterconditioning that associates an unpleasant state (such as nausea) with an unwanted behavior (such as drinking alcohol). (p. 518)

axon the neuron's extension that passes messages through its branching terminal fibers that form junctions with other neurons, muscles, or glands. (p. 37)

B

babbling stage beginning at about 4 months, the stage of speech development in which the infant spontaneously utters various sounds at first unrelated to the household language. (p. 317)

barbiturates drugs that depress the activity of the central nervous system, reducing anxiety but impairing memory and judgment. (p. 95)

basal metabolic rate the body's resting rate of energy expenditure. (p. 360)

basic research pure science that aims to increase the scientific knowledge base. (p. 9)

basic trust according to Erik Erikson, a sense that the world is predictable and trustworthy; said to be formed during infancy by appropriate experiences with responsive caregivers. (p. 161)

behavior genetics the study of the relative power and limits of genetic and environmental influences on behavior. (p. 109)

behavior therapy therapy that applies learning principles to the elimination of unwanted behaviors. (p. 516)

behaviorism the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2). (pp. 5, 239)

belief perseverance clinging to one's initial conceptions after the basis on which they were formed has been discredited. (p. 311)

binge-eating disorder significant binge-eating episodes, followed by distress, disgust, or guilt, but without the compensatory purging, fasting, or excessive exercise that marks bulimia nervosa. (p. 362)

binocular cues depth cues, such as retinal disparity, that depend on the use of two eyes. (p. 219)

biological psychology the scientific study of the links between biological (genetic, neural, hormonal) and psychological processes. (Some biological psychologists call themselves *behavioral neuroscientists, neuropsychologists, behavior geneticists, physiological psychologists,* or *biopsychologists*.) (p. 37)

biomedical therapy prescribed medications or medical procedures that act directly on the patient's nervous system. (p. 534)

biopsychosocial approach an integrated approach that incorporates biological, psychological, and social-cultural levels of analysis. (p. 7)

bipolar disorder a mood disorder in which the person alternates between the hopelessness and lethargy of depression and the overexcited state of mania. (Formerly called *manic-depressive disorder.*) (p. 481)

blind spot the point at which the optic nerve leaves the eye, creating a "blind" spot because no receptor cells are located there. (p. 195)

bottom-up processing analysis that begins with the sensory receptors and works up to the brain's integration of sensory information. (p. 189)

brainstem the oldest part and central core of the brain, beginning where the spinal cord swells as it enters the skull; the brainstem is responsible for automatic survival functions. (p. 47)

Broca's area controls language expression; an area of the frontal lobe, usually in the left hemisphere, that directs the muscle movements involved in speech. (p. 56)

bulimia nervosa an eating disorder characterized by episodes of overeating, usually of high-calorie foods, followed by vomiting, laxative use, fasting, or excessive exercise. (p. 362)

bystander effect the tendency for any given bystander to be less likely to give aid if other bystanders are present. (p. 583)

C

Cannon-Bard theory the theory that an emotion-arousing stimulus simultaneously triggers (1) physiological responses and (2) the subjective experience of emotion. (p. 393)

case study an observation technique in which one person is studied in depth in the hope of revealing universal principles. (p. 19)

catharsis emotional release. The catharsis hypothesis maintains that "releasing" aggressive energy (through action or fantasy) relieves aggressive urges. (p. 409)

central nervous system (CNS) the brain and spinal cord. (p. 40)

central route persuasion attitude-change path in which interested people focus on the arguments and respond with favorable thoughts. (p. 547)

cerebellum [sehr-uh-BELL-um] the "little brain" at the rear of the brainstem; functions include some nonverbal learning, processing sensory input, and coordinating movement output and balance. (p. 49)

cerebral [seh-REE-bruhl] **cortex** the intricate fabric of interconnected neural cells covering the cerebral hemispheres; the body's ultimate control and information-processing center. (p. 52)

change blindness failing to notice changes in the environment. (p. 71)

chromosomes threadlike structures made of DNA molecules that contain the genes. (p. 109)

chunking organizing items into familiar, manageable units; often occurs automatically. (p. 277)

circadian [ser-KAY-dee-an] **rhythm** the biological clock; regular bodily rhythms (for example, of temperature and wakefulness) that occur on a 24-hour cycle. (p. 72)

classical conditioning a type of learning in which one learns to link two or more stimuli and anticipate events. (p. 239)

client-centered therapy a humanistic therapy, developed by Carl Rogers, in which the therapist uses techniques such as active listening within a genuine, accepting, empathic environment to facilitate clients' growth. (Also called *person-centered therapy.*) (p. 515)

clinical psychology a branch of psychology that studies, assesses, and treats people with psychological disorders. (p. 10)

cochlea [KOHK-lee-uh] a coiled, bony, fluid-filled tube in the inner ear through which sound waves trigger nerve impulses. (p. 204)

cognition all the mental activities associated with thinking, knowing, remembering, and communicating. (pp. 151, 305)

cognitive dissonance theory the theory that we act to reduce the discomfort (dissonance) we feel when two of our thoughts (cognitions) are inconsistent. For example, when our awareness of our attitudes and of our actions clash, we can reduce the resulting dissonance by changing our attitudes. (p. 550)

cognitive map a mental representation of the layout of one's environment. For example, after exploring a maze, rats act as if they have learned a cognitive map of it. (p. 256)

cognitive neuroscience the interdisciplinary study of the brain activity linked with cognition (including perception, thinking, memory, and language). (p. 5)

cognitive therapy therapy that teaches people new, more adaptive ways of thinking and acting; based on the assumption that thoughts intervene between events and our emotional reactions. (p. 520)

cognitive-behavioral therapy a popular integrated therapy that combines cognitive therapy (changing self-defeating thinking) with behavior therapy (changing behavior). (p. 521)

collective unconscious Carl Jung's concept of a shared, inherited reservoir of memory traces from our species' history. (p. 443)

collectivism giving priority to group goals (often those of the extended family or work group) and defining one's identity accordingly. (p. 128)

color constancy perceiving familiar objects as having consistent color, even if changing illumination alters the wavelengths reflected by the object. (p. 224)

companionate love the deep affectionate attachment we feel for those with whom our lives are intertwined. (p. 580)

complementary and alternative medicine (CAM) as yet unproven health care treatments intended to supplement (complement) or serve as alternatives to conventional medicine, and which typically are not widely taught in medical schools, used in hospitals, or reimbursed by insurance companies. When research shows a therapy to be safe and effective, it usually then becomes part of accepted medical practice. (p. 426)

concept a mental grouping of similar objects, events, ideas, or people. (p. 305)

concrete operational stage in Piaget's theory, the stage of cognitive development (from about 6 or 7 to 11 years of age) during which children gain the mental operations that enable them to think logically about concrete events. (p. 155)

conditioned reinforcer a stimulus that gains its reinforcing power through its association with a primary reinforcer; also known as a *secondary reinforcer.* (p. 252)

conditioned response (CR) in classical conditioning, the learned response to a previously neutral (but now conditioned) stimulus (CS). (p. 240)

conditioned stimulus (CS) in classical conditioning, a previously neutral stimulus that, after association with an unconditioned stimulus (US), comes to trigger a conditioned response. (p. 240)

cones retinal receptor cells that are concentrated near the center of the retina and that function in daylight or in well-lit conditions. The cones detect fine detail and give rise to color sensations. (p. 195)

confirmation bias a tendency to search for information that supports our preconceptions and to ignore or distort contradictory evidence. (p. 306)

conflict a perceived incompatibility of actions, goals, or ideas. (p. 584)

conformity adjusting one's behavior or thinking to coincide with a group standard. (p. 553)

consciousness our awareness of ourselves and our environment. (p. 67)

conservation the principle (which Piaget believed to be a part of concrete operational reasoning) that properties such as mass, volume, and number remain the same despite changes in the forms of objects. (p. 154)

content validity the extent to which a test samples the behavior that is of interest. (p. 338)

continuous reinforcement reinforcing the desired response every time it occurs. (p. 253)

control group in an experiment, the group that is *not* exposed to the treatment; contrasts with the experimental group and serves as a comparison for evaluating the effect of the treatment. (p. 25)

conversion disorder a rare somatoform disorder in which a person experiences very specific genuine physical symptoms for which no physiological basis can be found. (p. 505)

coping alleviating stress using emotional, cognitive, or behavioral methods. (p. 427)

coronary heart disease the clogging of the vessels that nourish the heart muscle; the leading cause of death in North America. (p. 421)

corpus callosum [KOR-pus kah-LOW-sum] the large band of neural fibers connecting the two brain hemispheres and carrying messages between them. (p. 59)

correlation the extent to which two factors vary together, and thus of how well either factor predicts the other. The *correlation coefficient* is the mathematical expression of the relationship, ranging from –1 to +1. (p. 22)

correlation coefficient a statistical measure of the extent to which two factors vary together, and thus of how well either factor predicts the other. Scores with a *positive correlation coefficient* move up and down together (as with high school and college GPAs). A *negative correlation coefficient* indicates that one score falls as the other rises (as in the relationship between self-esteem and depression). (p. A-4)

counseling psychology a branch of psychology that assists people with problems in living (often related to school, work, or marriage) and in achieving greater well-being. (p. 9)

counterconditioning a behavior therapy procedure that uses classical conditioning to evoke new responses to stimuli that are triggering unwanted behaviors; includes *exposure therapies* and *aversive conditioning.* (p. 517)

creativity the ability to produce novel and valuable ideas. (p. 333)

critical period an optimal period shortly after birth when an organism's exposure to certain stimuli or experiences produces proper development. (p. 159)

critical thinking thinking that does not blindly accept arguments and conclusions. Rather, it examines assumptions, discerns hidden values, evaluates evidence, and assesses conclusions. (p. 17)

crystallized intelligence our accumulated knowledge and verbal skills; tends to increase with age. (p. 179)

culture the enduring behaviors, ideas, attitudes, values, and traditions shared by a group of people and transmitted from one generation to the next. (pp. 28, 126)

D

defense mechanisms in psychoanalytic theory, the ego's protective methods of reducing anxiety by unconsciously distorting reality. (p. 442)

deindividuation the loss of self-awareness and self-restraint occurring in group situations that foster arousal and anonymity. (p. 559)

déjà vu that eerie sense that "I've experienced this before." Cues from the current situation may subconsciously trigger retrieval of an earlier experience. (p. 288)

delta waves the large, slow brain waves associated with deep sleep. (p. 74)

delusions false beliefs, often of persecution or grandeur, that may accompany psychotic disorders. (p. 492)

dendrite the neuron's bushy, branching extensions that receive messages and conduct impulses toward the cell body. (p. 37)

dependent variable the outcome factor; the variable that may change in response to manipulations of the independent variable. (p. 26)

depressants drugs (such as alcohol, barbiturates, and opiates) that reduce neural activity and slow body functions. (p. 94)

depth perception the ability to see objects in three dimensions although the images that strike the retina are two-dimensional; allows us to judge distance. (p. 219)

developmental psychology a branch of psychology that studies physical, cognitive, and social change throughout the life span. (p. 143)

difference threshold the minimum difference between two stimuli required for detection 50 percent of the time. We experience the difference threshold as a *just noticeable difference* (or *jnd*). (p. 191)

discrimination in classical conditioning, the learned ability to distinguish between a conditioned stimulus and stimuli that do not signal an unconditioned stimulus. (p. 243)

discrimination unjustifiable negative behavior toward a group and its members. (p. 564)

dissociation a split in consciousness, which allows some thoughts and behaviors to occur simultaneously with others. (p. 89)

dissociative disorders disorders in which conscious awareness becomes separated (dissociated) from previous memories, thoughts, and feelings. (p. 505)

dissociative identity disorder (DID) a rare dissociative disorder in which a person exhibits two or more distinct and alternating personalities. Formerly called *multiple personality disorder.* (p. 506)

DNA (deoxyribonucleic acid) a complex molecule containing the genetic information that makes up the chromosomes. (p. 109)

double-blind procedure an experimental procedure in which both the research participants and the research staff are ignorant (blind) about whether the research participants have received the treatment or a placebo. Commonly used in drug-evaluation studies. (p. 25)

Down syndrome a condition of mild to severe intellectual disability and associated physical disorders caused by an extra copy of chromosome 21. (p. 338)

dream a sequence of images, emotions, and thoughts passing through a sleeping person's mind. Dreams are notable for their hallucinatory imagery, discontinuities, and incongruities, and for the dreamer's delusional acceptance of the content and later difficulties remembering it. (p. 81)

drive-reduction theory the idea that a physiological need creates an aroused tension state (a drive) that motivates an organism to satisfy the need. (p. 356)

DSM-IV-TR the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders,* Fourth Edition, updated as a 2000 "text revision"; a widely used system for classifying psychological disorders. (p. 476)

dual processing the principle that information is often simultaneously processed on separate conscious and unconscious tracks. (p. 68)

E

echoic memory a momentary sensory memory of auditory stimuli; if attention is elsewhere, sounds and words can still be recalled within 3 or 4 seconds. (p. 279)

eclectic approach an approach to psychotherapy that, depending on the client's problems, uses techniques from various forms of therapy. (p. 513)

Ecstasy (MDMA) a synthetic stimulant and mild hallucinogen. Produces euphoria and social intimacy, but with short-term health risks and longer-term harm to serotonin-producing neurons and to mood and cognition. (p. 99)

effortful processing encoding that requires attention and conscious effort. (p. 273)

ego the largely conscious, "executive" part of personality that, according to Freud, mediates among the demands of the id, superego, and reality. The ego operates on the *reality principle,* satisfying the id's desires in ways that will realistically bring pleasure rather than pain. (p. 440)

egocentrism in Piaget's theory, the preoperational child's difficulty taking another's point of view. (p. 154)

electroconvulsive therapy (ECT) a biomedical therapy for severely depressed patients in which a brief electric current is sent through the brain of an anesthetized patient. (p. 538)

electroencephalogram (EEG) an amplified recording of the waves of electrical activity that sweep across the brain's surface. These waves are measured by electrodes placed on the scalp. (p. 48)

embryo the developing human organism from about 2 weeks after fertilization through the second month. (p. 146)

emerging adulthood for some people in modern cultures, a period from the late teens to mid-twenties, bridging the gap between adolescent dependence and full independence and responsible adulthood. (p. 173)

emotion a response of the whole organism, involving (1) physiological arousal, (2) expressive behaviors, and (3) consciously experienced thoughts and feelings. (p. 393)

emotion-focused coping attempting to alleviate stress by avoiding or ignoring a stressor and attending to emotional needs related to one's stress reaction. (p. 427)

emotional intelligence the ability to perceive, understand, manage, and use emotions. (p. 334)

empirically derived test a test (such as the MMPI) developed by testing a pool of items and then selecting those that discriminate between groups. (p. 456)

encoding the processing of information into the memory system—for example, by extracting meaning. (p. 272)

endocrine [EN-duh-krin] **system** the body's "slow" chemical communication system; a set of glands that secrete hormones into the bloodstream. (p. 43)

endorphins [en-DOR-fins] "morphine within"—natural, opiatelike neurotransmitters linked to pain control and to pleasure. (p. 40)

environment every nongenetic influence, from prenatal nutrition to the people and things around us. (p. 109)

equity a condition in which people receive from a relationship in proportion to what they give to it. (p. 581)

estrogens sex hormones, such as estradiol, secreted in greater amounts by females than by males and contributing to female sex characteristics. In nonhuman female mammals, estrogen levels peak during ovulation, promoting sexual receptivity. (p. 374)

evidence-based practice clinical decision making that integrates the best available research with clinical expertise and patient characteristics and preferences. (p. 525)

evolutionary psychology the study of the roots of behavior and mental processes, using the principles of natural selection. (p. 116)

experiment a research method in which an investigator manipulates one or more factors (independent variables) to observe the effect on some behavior or mental process (the dependent variable). By *random assignment* of participants, the experimenter aims to control other relevant factors. (p. 25)

experimental group in an experiment, the group that is exposed to the treatment, that is, to one version of the independent variable. (p. 25)

explicit memory memory of facts and experiences that one can consciously know and "declare." (Also called *declarative memory.*) (p. 284)

exposure therapies behavioral techniques, such as systematic desensitization, that treat anxieties by exposing people (in imagination or actuality) to the things they fear and avoid. (p. 517)

external locus of control the perception that chance or outside forces beyond your personal control determine your fate. (p. 461)

extinction the diminishing of a conditioned response; occurs in classical conditioning when an unconditioned stimulus (US) does not follow a conditioned stimulus (CS). (p. 242)

extrasensory perception (ESP) the controversial claim that perception can occur apart from sensory input; includes telepathy, clairvoyance, and precognition. (p. 230)

F

factor analysis a statistical procedure that identifies clusters of related items (called *factors*) on a test; used to identify different dimensions of performance that underlie a person's total score. (p. 330)

family therapy therapy that treats the family as a system. Views an individual's unwanted behaviors as influenced by, or directed at, other family members. (p. 522)

feature detectors nerve cells in the brain that respond to specific features of a stimulus, such as shape, angle, or movement. (p. 196)

feel-good, do-good phenomenon people's tendency to be helpful when already in a good mood. (p. 410)

fetal alcohol syndrome (FAS) physical and cognitive abnormalities in children caused by a pregnant woman's heavy drinking. In severe cases, symptoms include noticeable facial misproportions. (p. 146)

fetus the developing human organism from 9 weeks after conception to birth. (p. 146)

figure-ground the organization of the visual field into objects (the *figures*) that stand out from their surroundings (the *ground*). (p. 217)

fixation according to Freud, a lingering focus of pleasure-seeking energies at an earlier psychosexual stage, in which conflicts were unresolved. (p. 441)

fixation the inability to see a problem from a new perspective, by employing a different mental set. (p. 307)

fixed-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified time has elapsed. (p. 254)

fixed-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified number of responses. (p. 253)

flashbulb memory a clear memory of an emotionally significant moment or event. (p. 282)

fluid intelligence our ability to reason speedily and abstractly; tends to decrease during late adulthood. (p. 179)

fMRI (functional MRI) a technique for revealing bloodflow and, therefore, brain activity by comparing successive MRI scans. fMRI scans show brain function. (p. 48)

foot-in-the-door phenomenon the tendency for people who have first agreed to a small request to comply later with a larger request. (p. 548)

formal operational stage in Piaget's theory, the stage of cognitive development (normally beginning about age 12) during which people begin to think logically about abstract concepts. (p. 155)

fovea the central focal point in the retina, around which the eye's cones cluster. (p. 196)

framing the way an issue is posed; how an issue is framed can significantly affect decisions and judgments. (p. 313)

fraternal twins twins who develop from separate fertilized eggs. They are genetically no closer than brothers and sisters, but they share a fetal environment. (p. 111)

free association in psychoanalysis, a method of exploring the unconscious in which the person relaxes and says whatever comes to mind, no matter how trivial or embarrassing. (p. 439)

frequency the number of complete wavelengths that pass a point in a given time (for example, per second). (p. 203)

frontal lobes portion of the cerebral cortex lying just behind the forehead; involved in speaking and muscle movements and in making plans and judgments. (p. 53)

frustration-aggression principle the principle that frustration—the blocking of an attempt to achieve some goal—creates anger, which can generate aggression. (p. 571)

fundamental attribution error the tendency for observers, when analyzing another's behavior, to underestimate the impact of the situation and to overestimate the impact of personal disposition. (p. 545)

G

gate-control theory the theory that the spinal cord contains a neurological "gate" that blocks pain signals or allows them to pass on to the brain. The "gate" is opened by the activity of pain signals traveling up small nerve fibers and is closed by activity in larger fibers or by information coming from the brain. (p. 209)

gender in psychology, the biologically and socially influenced characteristics by which people define *male* and *female*. (p. 118)

gender identity our sense of being male or female. (p. 135)

gender role a set of expected behaviors for males or for females. (p. 134)

gender typing the acquisition of a traditional masculine or feminine role. (p. 135)

general adaptation syndrome (GAS) Selye's concept of the body's adaptive response

to stress in three phases—alarm, resistance, exhaustion. (p. 419)

general intelligence *(g)* a general intelligence factor that, according to Spearman and others, underlies specific mental abilities and is therefore measured by every task on an intelligence test. (p. 330)

generalization the tendency, once a response has been conditioned, for stimuli similar to the conditioned stimulus to elicit similar responses. (p. 242)

generalized anxiety disorder an anxiety disorder in which a person is continually tense, apprehensive, and in a state of autonomic nervous system arousal. (p. 499)

genes the biochemical units of heredity that make up the chromosomes; a segment of DNA capable of synthesizing a protein. (p. 109)

gestalt an organized whole. Gestalt psychologists emphasized our tendency to integrate pieces of information into meaningful wholes. (p. 217)

glucose the form of sugar that circulates in the blood and provides the major source of energy for body tissues. When its level is low, we feel hunger. (p. 359)

GRIT Graduated and Reciprocated Initiatives in Tension-Reduction—a strategy designed to decrease international tensions. (p. 587)

group polarization the enhancement of a group's prevailing inclinations through discussion within the group. (p. 560)

grouping the perceptual tendency to organize stimuli into coherent groups. (p. 218**)**

groupthink the mode of thinking that occurs when the desire for harmony in a decision-making group overrides a realistic appraisal of alternatives. (p. 561)

H

hallucinations false sensory experiences, such as seeing something in the absence of an external visual stimulus. (p. 74)

hallucinogens psychedelic ("mind-manifesting") drugs, such as LSD, that distort perceptions and evoke sensory images in the absence of sensory input. (p. 100)

heritability the proportion of variation among individuals that we can attribute to genes. The heritability of a trait may vary, depending on the range of populations and environments studied. (p. 343)

heuristic a simple thinking strategy that often allows us to make judgments and solve problems efficiently; usually speedier but also more error-prone than *algorithms.* (p. 306)

hierarchy of needs Maslow's pyramid of human needs, beginning at the base with physiological needs that must first be satisfied before higher-level safety needs and then psychological needs become active. (p. 357)

higher-order conditioning a procedure in which the conditioned stimulus in one conditioning experience is paired with a new neutral stimulus, creating a second (often weaker) conditioned stimulus. For example, an animal that has learned that a tone predicts food might then learn that a light predicts the tone and begin responding to the light alone. (Also called *second-order conditioning.*) (p. 241)

hindsight bias the tendency to believe, after learning an outcome, that we would have foreseen it. (Also known as the *I-knew-it-all-along phenomenon.*) (p. 14)

hippocampus a neural center that is located in the limbic system; helps process explicit memories for storage. (p. 284)

homeostasis a tendency to maintain a balanced or constant internal state; the regulation of any aspect of body chemistry, such as blood glucose, around a particular level. (p. 356)

hormones chemical messengers that are manufactured by the endocrine glands, travel through the bloodstream, and affect other tissues. (p. 43)

hue the dimension of color that is determined by the wavelength of light; what we know as the color names *blue, green,* and so forth. (p. 193)

humanistic psychology historically significant perspective that emphasized the growth potential of healthy people and the individual's potential for personal growth. (p. 5)

hypnosis a social interaction in which one person (the hypnotist) suggests to another (the subject) that certain perceptions, feelings, thoughts, or behaviors will spontaneously occur. (p. 87)

hypochondriasis a somatoform disorder in which a person interprets normal physical sensations as symptoms of a disease. (p. 505)

hypothalamus [hi-po-THAL-uh-muss] a neural structure lying below *(hypo)* the thalamus; it directs several maintenance activities (eating, drinking, body temperature), helps govern the endocrine system via the pituitary gland, and is linked to emotion and reward. (p. 51)

hypothesis a testable prediction, often implied by a theory. (p. 18)

I

iconic memory a momentary sensory memory of visual stimuli; a photographic or picture-image memory lasting no more than a few tenths of a second. (p. 279)

id contains a reservoir of unconscious psychic energy that, according to Freud, strives to satisfy basic sexual and aggressive drives. The id operates on the *pleasure principle,* demanding immediate gratification. (p. 440)

identical twins twins who develop from a single fertilized egg that splits in two, creating two genetically identical organisms. (p. 110)

identification the process by which, according to Freud, children incorporate their parents' values into their developing superegos. (p. 441)

identity our sense of self; according to Erikson, the adolescent's task is to solidify a sense of self by testing and integrating various roles. (p. 171)

illusory correlation the perception of a relationship where none exists. (p. 23)

imagery mental pictures; a powerful aid to effortful processing, especially when combined with encoding. (p. 277)

implicit memory retention independent of conscious recollection. (Also called *nondeclarative memory*.) (p. 284)

imprinting the process by which certain animals form attachments during a critical period very early in life. (p. 159)

inattentional blindness failing to see visible objects when our attention is directed elsewhere. (p. 70)

incentive a positive or negative environmental stimulus that motivates behavior. (p. 356)

independent variable the experimental factor that is manipulated; the variable whose effect is being studied. (p. 26)

individualism giving priority to one's own goals over group goals and defining one's identity in terms of personal attributes rather than group identifications. (p. 128)

informational social influence influence resulting from one's willingness to accept others' opinions about reality. (p. 554)

ingroup "Us"—people with whom we share a common identity. (p. 567)

ingroup bias the tendency to favor our own group. (p. 567)

inner ear the innermost part of the ear, containing the cochlea, semicircular canals, and vestibular sacs. (p. 204)

insight a sudden and often novel realization of the solution to a problem; it contrasts with strategy-based solutions. (p. 306)

insight therapies a variety of therapies that aim to improve psychological functioning by increasing the client's awareness of underlying motives and defenses. (p. 515)

insomnia recurring problems in falling or staying asleep. (p. 79)

instinct a complex behavior that is rigidly patterned throughout a species and is unlearned. (p. 355)

intellectual disability *(formerly referred to as mental retardation)* a condition of limited mental ability, indicated by an intelligence score of 70 or below and difficulty in adapting to the demands of life; varies from mild to profound. (p. 338)

intelligence mental quality consisting of the ability to learn from experience, solve problems, and use knowledge to adapt to new situations. (p. 329)

intelligence quotient (IQ) defined originally as the ratio of mental age *(ma)* to chronological age *(ca)* multiplied by 100 (thus, IQ = $ma/ca \times 100$). On contemporary intelligence tests, the average performance for a given age is assigned a score of 100. (p. 336)

intelligence test a method for assessing an individual's mental aptitudes and comparing them with those of others, using numerical scores. (p. 335)

intensity the amount of energy in a light or sound wave, which we perceive as brightness or loudness, as determined by the wave's amplitude. (p. 194)

interaction the interplay that occurs when the effect of one factor (such as environment) depends on another factor (such as heredity). (p. 115)

internal locus of control the perception that you control your own fate. (p. 461)

interneurons neurons within the brain and spinal cord that communicate internally and intervene between the sensory inputs and motor outputs. (p. 41)

interpretation in psychoanalysis, the analyst's noting supposed dream meanings, resistances, and other significant behaviors and events in order to promote insight. (p. 513)

intimacy in Erikson's theory, the ability to form close, loving relationships; a primary developmental task in late adolescence and early adulthood. (p. 171)

intuition an effortless, immediate, automatic feeling or thought, as contrasted with explicit, conscious reasoning. (p. 312)

J

James-Lange theory the theory that our experience of emotion is our awareness of our physiological responses to emotion-arousing stimuli. (p. 393)

just-world phenomenon the tendency for people to believe the world is just and that people therefore get what they deserve and deserve what they get. (p. 566)

K

kinesthesis [kin-ehs-THEE-sehs] the system for sensing the position and movement of individual body parts. (p. 206)

L

language our spoken, written, or signed words and the ways we combine them to communicate meaning. (p. 316)

latent content according to Freud, the underlying meaning of a dream (as distinct from its manifest content). (p. 82)

latent learning learning that occurs but is not apparent until there is an incentive to demonstrate it. (p. 256)

law of effect Thorndike's principle that behaviors followed by favorable consequences become more likely. (p. 249)

learned helplessness the hopelessness and passive resignation an animal or human learns when unable to avoid repeated aversive events. (p. 461)

learning a relatively permanent change in an organism's behavior due to experience. (pp. 239, 249, 263)

lesion [LEE-zhuhn] tissue destruction. A brain lesion is a naturally or experimentally caused destruction of brain tissue. (p. 48)

levels of analysis the differing complementary views, from biological to psychological to social-cultural, for analyzing any given phenomenon. (p. 7)

limbic system neural system (including the *hippocampus, amygdala,* and *hypothalamus*) located below the cerebral hemispheres; associated with emotions and drives. (p. 50)

linguistic determinism Whorf's hypothesis that language determines the way we think. (p. 320)

lobotomy a now-rare psychosurgical procedure once used to calm uncontrollably emotional or violent patients. The procedure cut the nerves connecting the frontal lobes to the emotion-controlling centers of the inner brain. (p. 540)

long-term memory the relatively permanent and limitless storehouse of the memory system. Includes knowledge, skills, and experiences. (p. 272)

long-term potentiation (LTP) an increase in a synapse's firing potential after brief, rapid stimulation. Believed to be a neural basis for learning and memory. (p. 281)

LSD a powerful hallucinogenic drug; also known as acid *(lysergic acid diethylamide)*. (p. 100)

lymphocytes the two types of white blood cells that are part of the body's immune system: *B lymphocytes* form in the *b*one marrow and release antibodies that fight bacterial infections; *T lymphocytes* form in the *t*hymus and other lymphatic tissue and attack cancer cells, viruses, and foreign substances. (p. 423)

M

major depressive disorder a mood disorder in which a person experiences, in the absence of drugs or a medical condition, two or more weeks of significantly depressed moods, feelings of worthlessness, and diminished interest or pleasure in most activities. (p. 481)

mania a mood disorder marked by a hyperactive, wildly optimistic state. (p. 481)

manifest content according to Freud, the remembered story line of a dream (as distinct from its latent, or hidden, content). (p. 82)

maturation biological growth processes that enable orderly changes in behavior, relatively uninfluenced by experience. (p. 149)

mean the arithmetic average of a distribution, obtained by adding the scores and then dividing by the number of scores. (p. A-1)

median the middle score in a distribution; half the scores are above it and half are below it. (p. A-1)

medical model the concept that diseases, in this case psychological disorders, have physical causes that can be *diagnosed, treated,* and, in most cases, *cured,* often through treatment in a hospital. (p. 475)

medulla [muh-DUL-uh] the base of the brainstem; controls heartbeat and breathing. (p. 47)

memory the persistence of learning over time through the storage and retrieval of information. (p. 271)

menarche [meh-NAR-key] the first menstrual period. (p. 167)

menopause the time of natural cessation of menstruation; also refers to the biological changes a woman experiences as her ability to reproduce declines. (p. 175)

mental age a measure of intelligence test performance devised by Binet; the chronological age that most typically corresponds to a given level of performance. Thus, a child who does as well as the average 8-year-old is said to have a mental age of 8. (p. 335)

mental set a tendency to approach a problem in one particular way, often a way that has been successful in the past. (p. 307)

mere exposure effect the phenomenon that repeated exposure to novel stimuli increases liking of them. (p. 576)

methamphetamine a powerfully addictive drug that stimulates the central nervous system, with speeded-up body functions and associated energy and mood changes; over time, appears to reduce baseline dopamine levels. (p. 96)

middle ear the chamber between the eardrum and cochlea containing three tiny bones (hammer, anvil, and stirrup) that concentrate the vibrations of the eardrum on the cochlea's oval window. (p. 204)

Minnesota Multiphasic Personality Inventory (MMPI) the most widely researched and clinically used of all personality tests. Originally developed to identify emotional disorders (still considered its most appropriate use), this test is now used for many other screening purposes. (p. 455)

mirror neurons frontal lobe neurons that fire when performing certain actions or when observing another doing so. The brain's mirroring of another's action may enable imitation and empathy. (p. 263)

mirror-image perceptions mutual views often held by conflicting people, as when each side sees itself as ethical and peaceful and views the other side as evil and aggressive. (p. 585)

misinformation effect incorporating misleading information into one's memory of an event. (p. 297)

mnemonics [nih-MON-iks] memory aids, especially those techniques that use vivid imagery and organizational devices. (p. 277)

mode the most frequently occurring score(s) in a distribution. (p. A-1)

modeling the process of observing and imitating a specific behavior. (p. 263)

monocular cues depth cues, such as interposition and linear perspective, available to either eye alone. (p. 220)

mood disorders psychological disorders characterized by emotional extremes. See *major depressive disorder, mania,* and *bipolar disorder.* (p. 480)

mood-congruent memory the tendency to recall experiences that are consistent with one's current good or bad mood. (p. 288)

motivation a need or desire that energizes and directs behavior. (p. 355)

motor cortex an area at the rear of the frontal lobes that controls voluntary movements. (p. 54)

motor neurons neurons that carry outgoing information from the brain and spinal cord to the muscles and glands. (p. 41)

MRI (magnetic resonance imaging) a technique that uses magnetic fields and radio waves to produce computer-generated images of soft tissue. MRI scans show brain anatomy. (p. 48)

mutation a random error in gene replication that leads to a change. (p. 117)

N

narcolepsy a sleep disorder characterized by uncontrollable sleep attacks. The sufferer may lapse directly into REM sleep, often at inopportune times. (p. 79)

natural selection the principle that, among the range of inherited trait variations, those that lead to increased reproduction and survival will most likely be passed on to succeeding generations. (p. 116)

naturalistic observation observing and recording behavior in naturally occurring situations without trying to manipulate and control the situation. (p. 21)

nature-nurture issue the longstanding controversy over the relative contributions that genes and experience make to the development of psychological traits and behaviors. Today's science sees traits and behaviors arising from the interaction of nature and nurture. (p. 6)

near-death experience an altered state of consciousness reported after a close brush with death (such as through cardiac arrest); often similar to drug-induced hallucinations. (p. 100)

negative reinforcement increasing behaviors by stopping or reducing negative stimuli. A negative reinforcer is any stimulus that, when *removed* after a response, strengthens the response. (Note: negative reinforcement is *not* punishment.) (p. 251)

nerves bundled axons that form neural "cables" connecting the central nervous system with muscles, glands, and sense organs. (p. 40)

nervous system the body's speedy, electrochemical communication network, consisting of all the nerve cells of the peripheral and central nervous systems. (p. 40)

neurogenesis the formation of new neurons. (p. 59)

neuron a nerve cell; the basic building block of the nervous system. (p. 37)

neurotransmitters chemical messengers that cross the synaptic gaps between neurons. When released by the sending neuron, neurotransmitters travel across the synapse and bind to receptor sites on the receiving neuron, thereby influencing whether that neuron will generate a neural impulse. (p. 38)

neutral stimulus (NS) in classical conditioning, a stimulus that elicits no response before conditioning. (p. 239)

night terrors a sleep disorder characterized by high arousal and an appearance of being terrified; unlike nightmares, night terrors occur during Stage 4 sleep, within two or three hours of falling asleep, and are seldom remembered. (p. 80)

norm an understood rule for accepted and expected behavior. Norms prescribe "proper" behavior. (p. 127)

normal curve *(normal distribution)* a symmetrical, bell-shaped curve that describes the distribution of many types of data for physical and psychological attributes; most scores fall near the mean, or average (68 percent fall within one *standard deviation* of it), and fewer and fewer near the extremes. (pp. 337, A-3)

normative social influence influence resulting from a person's desire to gain approval or avoid disapproval. (p. 554)

O

object permanence the awareness that things continue to exist even when not perceived. (p. 152)

observational learning learning by observing others. (p. 263)

obsessive-compulsive disorder (OCD) an anxiety disorder characterized by unwanted repetitive thoughts (obsessions) and/or actions (compulsions). (p. 500)

occipital [ahk-SIP-uh-tuhl] **lobes** portion of the cerebral cortex lying at the back of the head; includes areas that receive information from the visual fields. (p. 53)

Oedipus [ED-uh-puss] **complex** according to Freud, a boy's sexual desires toward his mother and feelings of jealousy and hatred for the rival father. (p. 441)

one-word stage the stage in speech development, from about age 1 to 2, during which a child speaks mostly in single words. (p. 317)

operant behavior behavior that operates on the environment, producing consequences. (p. 249)

operant chamber in operant conditioning research, a chamber (also known as a *Skinner box*) containing a bar or key that an animal can manipulate to obtain a food or water reinforcer; attached devices record the animal's rate of bar pressing or key pecking. (p. 250)

operant conditioning a type of learning in which behavior is strengthened if followed by a reinforcer or diminished if followed by a punisher. (p. 249)

operational definition a statement of the procedures (operations) used to define research variables. For example, *human intelligence* may be operationally defined as "what an intelligence test measures." (p. 19)

opiates opium and its derivatives, such as morphine and heroin; they depress neural activity, temporarily lessening pain and anxiety. (p. 95)

opponent-process theory the theory that opposing retinal processes (red-green, yellow-blue, white-black) enable color vision. For example, some cells are stimulated by green and inhibited by red; others are stimulated by red and inhibited by green. (p. 200)

optic nerve the nerve that carries neural impulses from the eye to the brain. (p. 195)

other-race effect the tendency to recall faces of one's own race more accurately than faces of other races. Also called the *cross-race effect* and the *own-race bias.* (p. 568)

outgroup "Them"—those perceived as different or apart from our ingroup. (p. 567)

overconfidence the tendency to be more confident than correct—to overestimate the accuracy of our beliefs and judgments. (p. 309)

P

panic disorder an anxiety disorder marked by unpredictable minutes-long episodes of intense dread in which a person experiences terror and accompanying chest pain, choking, or other frightening sensations. (p. 499)

parallel processing the processing of many aspects of a problem simultaneously; the brain's natural mode of information processing for many functions, including vision. Contrasts with the step-by-step (serial) processing of most computers and of conscious problem solving. (p. 198)

parapsychology the study of paranormal phenomena, including ESP and psychokinesis. (p. 230)

parasympathetic nervous system the division of the autonomic nervous system that calms the body, conserving its energy. (p. 41)

parietal [puh-RYE-uh-tuhl] **lobes** portion of the cerebral cortex lying at the top of the head and toward the rear; receives sensory input for touch and body position. (p. 53)

partial (intermittent) reinforcement reinforcing a response only part of the time; results in slower acquisition of a response but much greater resistance to extinction than does continuous reinforcement. (p. 253)

passionate love an aroused state of intense positive absorption in another, usually present at the beginning of a love relationship. (p. 579)

perception the process of organizing and interpreting sensory information, enabling us to recognize meaningful objects and events. (p. 189)

perceptual adaptation in vision, the ability to adjust to an artificially displaced or even inverted visual field. (p. 226)

perceptual constancy perceiving objects as unchanging (having consistent shapes, size, lightness, and color) even as illumination and retinal images change. (p. 222)

perceptual set a mental predisposition to perceive one thing and not another. (p. 227)

peripheral nervous system (PNS) the sensory and motor neurons that connect the central nervous system (CNS) to the rest of the body. (p. 40)

peripheral route persuasion attitude-change path in which people are influenced by incidental cues, such as a speaker's attractiveness. (p. 547)

personal control the extent to which people perceive control over their environment rather than feeling helpless. (p. 461)

personal space the buffer zone we like to maintain around our bodies. (p. 127)

personality an individual's characteristic pattern of thinking, feeling, and acting. (pp. 439, 453)

personality disorders psychological disorders characterized by inflexible and enduring behavior patterns that impair social functioning. (p. 507)

personality inventory a questionnaire (often with *true-false* or *agree-disagree* items) on which people respond to items designed to gauge a wide range of feelings and behaviors; used to assess selected personality traits. (p. 455)

PET (positron emission tomography) scan a visual display of brain activity that detects where a radioactive form of glucose goes while the brain performs a given task. (p. 48)

phobia an anxiety disorder marked by a persistent, irrational fear and avoidance of a specific object, activity, or situation. (p. 500)

physical dependence a physiological need for a drug, marked by unpleasant withdrawal symptoms when the drug is discontinued. (p. 92)

pitch a tone's experienced highness or lowness; depends on frequency. (p. 203)

pituitary gland the endocrine system's most influential gland. Under the influence of the hypothalamus, the pituitary regulates growth and controls other endocrine glands. (p. 44)

placebo [pluh-SEE-bo; Latin for "I shall please"] **effect** experimental results caused by expectations alone; any effect on behavior caused by the administration of an inert substance or condition, which the recipient assumes is an active agent. (p. 25)

plasticity the brain's ability to change, especially during childhood, by reorganizing after damage or by building new pathways based on experience. (p. 58)

polygraph a machine, commonly used in attempts to detect lies, that measures several of the physiological responses accompanying emotion (such as perspiration and cardiovascular and breathing changes). (p. 397)

population all the cases in a group being studied, from which samples may be drawn. (*Note:* Except for national studies, this does *not* refer to a country's whole population.) (p. 20)

positive psychology the scientific study of optimal human functioning; aims to discover and promote strengths and virtues that enable individuals and communities to thrive. (p. 463)

positive reinforcement increasing behaviors by presenting positive stimuli, such as food. A positive reinforcer is any stimulus that, when *presented* after a response, strengthens the response. (p. 251)

post-traumatic growth positive psychological changes as a result of struggling with extremely challenging circumstances and life crises. (p. 502)

post-traumatic stress disorder (PTSD) an anxiety disorder characterized by haunting memories, nightmares, social withdrawal, jumpy anxiety, and/or insomnia that lingers for four weeks or more after a traumatic experience. (p. 501)

posthypnotic suggestion a suggestion, made during a hypnosis session, to be carried out after the subject is no longer hypnotized; used by some clinicians to help control undesired symptoms and behaviors. (p. 88)

predictive validity the success with which a test predicts the behavior it is designed to predict; it is assessed by computing the correlation between test scores and the criterion behavior. (Also called *criterion-related validity.*) (p. 339)

prejudice an unjustifiable (and usually negative) attitude toward a group and its members. Prejudice generally involves stereotyped beliefs, negative feelings, and a predisposition to discriminatory action. (p. 564)

preoperational stage in Piaget's theory, the stage (from about 2 to 6 or 7 years of age) during which a child learns to use language but does not yet comprehend the mental operations of concrete logic. (p. 153)

primary reinforcer an innately reinforcing stimulus, such as one that satisfies a biological need. (p. 252)

primary sex characteristics the body structures (ovaries, testes, and external genitalia) that make sexual reproduction possible. (p. 166)

priming the activation, often unconsciously, of certain associations, thus predisposing one's perception, memory, or response. (pp. 191, 287)

proactive interference the disruptive effect of prior learning on the recall of new information. (p. 294)

problem-focused coping attempting to alleviate stress directly—by changing the stressor or the way we interact with that stressor. (p. 427)

projective test a personality test, such as the Rorschach inkblot test, that provides ambiguous stimuli designed to trigger projection of one's inner dynamics. (p. 444)

prosocial behavior positive, constructive, helpful behavior. The opposite of antisocial behavior. (p. 265)

prototype a mental image or best example of a category. Matching new items to a prototype provides a quick and easy method for sorting items into categories (as when comparing feathered creatures to a prototypical bird, such as a robin). (p. 305)

psychiatry a branch of medicine dealing with psychological disorders; practiced by physicians who sometimes provide medical (for example, drug) treatments as well as psychological therapy. (p. 10)

psychoactive drug a chemical substance that alters perceptions and moods. (p. 92)

psychoanalysis Freud's theory of personality that attributes thoughts and actions to unconscious motives and conflicts; the techniques used in treating psychological disorders by seeking to expose and interpret unconscious tensions. (pp. 439, 513)

psychodynamic therapy therapy deriving from the psychoanalytic tradition that views individuals as responding to unconscious forces and childhood experiences, and that seeks to enhance self-insight. (p. 514)

psychological dependence a psychological need to use a drug, such as to relieve negative emotions. (p. 92)

psychological disorder deviant, distressful, and dysfunctional patterns of thoughts, feelings, and actions. (p. 473)

psychology the science of behavior and mental processes. (p. 5)

psychopharmacology the study of the effects of drugs on mind and behavior. (p. 534)

psychophysics the study of relationships between the physical characteristics of stimuli, such as their intensity, and our psychological experience of them. (p. 190)

psychophysiological illness literally, "mind-body" illness; any stress-related physical illness, such as hypertension and some headaches. (p. 423)

psychosexual stages the childhood stages of development (oral, anal, phallic, latency, genital) during which, according to Freud, the id's pleasure-seeking energies focus on distinct erogenous zones. (p. 441)

psychosurgery surgery that removes or destroys brain tissue in an effort to change behavior. (p. 540)

psychotherapy treatment involving psychological techniques; consists of interactions between a trained therapist and someone seeking to overcome psychological difficulties or achieve personal growth. (p. 513)

psychotic disorder a psychological disorder in which a person loses contact with reality, experiencing irrational ideas and distorted perceptions. (p. 492)

puberty the period of sexual maturation, during which a person becomes capable of reproducing. (p. 166)

punishment an event that *decreases* the behavior it follows. (p. 254)

R

random assignment assigning participants to experimental and control groups by chance, thus minimizing preexisting differences between those assigned to the different groups. (p. 25)

random sample a sample that fairly represents a population because each member has an equal chance of inclusion. (p. 20)

range the difference between the highest and lowest scores in a distribution. (p. A-3)

recall a measure of memory in which the person must retrieve information learned earlier, as on a fill-in-the-blank test. (p. 286)

reciprocal determinism the interacting influences of behavior, internal cognition, and environment. (p. 459)

reciprocity norm an expectation that people will help, not hurt, those who have helped them. (p. 583)

recognition a measure of memory in which the person need only identify items previously learned, as on a multiple-choice test. (p. 286)

reflex a simple, automatic response to a sensory stimulus, such as the knee-jerk response. (p. 42)

refractory period a resting period after orgasm, during which a man cannot achieve another orgasm. (p. 374)

regression toward the mean the tendency for extreme or unusual scores or events to fall back (regress) toward the average. (p. A-6)

rehearsal the conscious repetition of information, either to maintain it in consciousness or to encode it for storage. (p. 274)

reinforcer in operant conditioning, any event that *strengthens* the behavior it follows. (p. 251)

relative deprivation the perception that we are worse off relative to those with whom we compare ourselves. (p. 414)

relearning a measure of memory that assesses the amount of time saved when learning material for a second time. (p. 286)

reliability the extent to which a test yields consistent results, as assessed by the consistency of scores on two halves of the test, or on retesting. (p. 337)

REM rebound the tendency for REM sleep to increase following REM sleep deprivation (created by repeated awakenings during REM sleep). (p. 83)

REM sleep rapid eye movement sleep; a recurring sleep stage during which vivid dreams commonly occur. Also known as *paradoxical sleep,* because the muscles are relaxed (except for minor twitches) but other body systems are active. (p. 73)

repetitive transcranial magnetic stimulation (rTMS) the application of repeated pulses of magnetic energy to the brain; used to stimulate or suppress brain activity. (p. 539)

replication repeating the essence of a research study, usually with different participants in different situations, to see whether the basic finding extends to other participants and circumstances. (p. 19)

representativeness heuristic judging the likelihood of things in terms of how well they seem to represent, or match, particular prototypes; may lead us to ignore other relevant information. (p. 308)

repression in psychoanalytic theory, the basic defense mechanism that banishes from consciousness anxiety-arousing thoughts, feelings, and memories. (pp. 296, 442)

resistance in psychoanalysis, the blocking from consciousness of anxiety-laden material. (p. 513)

respondent behavior behavior that occurs as an automatic response to some stimulus. (p. 249)

reticular formation a nerve network in the brainstem that plays an important role in controlling arousal. (p. 49)

retina the light-sensitive inner surface of the eye, containing the receptor rods and cones plus layers of neurons that begin the processing of visual information. (p. 194)

retinal disparity a binocular cue for perceiving depth: By comparing images from the retinas in the two eyes, the brain computes distance—the greater the disparity (difference) between the two images, the closer the object. (p. 219)

retrieval the process of getting information out of memory storage. (p. 272)

retroactive interference the disruptive effect of new learning on the recall of old information. (p. 294)

rods retinal receptors that detect black, white, and gray; necessary for peripheral and twilight vision, when cones don't respond. (p. 195)

role a set of expectations (norms) about a social position, defining how those in the position ought to behave. (pp. 134, 548)

Rorschach inkblot test the most widely used projective test, a set of 10 inkblots, designed by Hermann Rorschach; seeks to identify people's inner feelings by analyzing their interpretations of the blots. (p. 444)

S

savant syndrome a condition in which a person otherwise limited in mental ability has an exceptional specific skill, such as in computation or drawing. (p. 330)

scapegoat theory the theory that prejudice offers an outlet for anger by providing someone to blame. (p. 568)

scatterplots a graphed cluster of dots, each of which represents the values of two variables. The slope of the points suggests the direction of the relationship between the two variables. The amount of scatter suggests the strength of the correlation (little scatter indicates high correlation). (p. A-4)

schema a concept or framework that organizes and interprets information. (p. 152)

schizophrenia a group of severe disorders characterized by disorganized and delusional thinking, disturbed perceptions, and inappropriate emotions and actions. (p. 492)

secondary sex characteristics nonreproductive sexual characteristics, such as female breasts and hips, male voice quality, and body hair. (p. 166)

selective attention the focusing of conscious awareness on a particular stimulus. (p. 69)

self in contemporary psychology, assumed to be the center of personality, the organizer of our thoughts, feelings, and actions. (p. 466)

self-actualization according to Maslow, one of the ultimate psychological needs that arises after basic physical and psychological needs are met and self-esteem is achieved; the motivation to fulfill one's potential. (p. 448)

self-concept all our thoughts and feelings about ourselves, in answer to the question, "Who am I?" (p. 449)

self-disclosure revealing intimate aspects of oneself to others. (p. 581)

self-esteem one's feelings of high or low self-worth. (p. 466)

self-serving bias a readiness to perceive oneself favorably. (p. 467)

sensation the process by which our sensory receptors and nervous system receive and represent stimulus energies from our environment. (p. 189)

sensorimotor stage in Piaget's theory, the stage (from birth to about 2 years of age) during which infants know the world mostly in terms of their sensory impressions and motor activities. (p. 152)

sensory adaptation diminished sensitivity as a consequence of constant stimulation. (p. 192)

sensory cortex area at the front of the parietal lobes that registers and processes body touch and movement sensations. (p. 54)

sensory interaction the principle that one sense may influence another, as when the smell of food influences its taste. (p. 213)

sensory memory the immediate, very brief recording of sensory information in the memory system. (p. 272)

sensory neurons neurons that carry incoming information from the sensory receptors to the brain and spinal cord. (p. 41)

serial position effect our tendency to recall best the last and first items in a list. (p. 275)

set point the point at which an individual's "weight thermostat" is supposedly set. When the body falls below this weight, an increase in hunger and a lowered metabolic rate may act to restore the lost weight. (p. 359)

sexual disorder a problem that consistently impairs sexual arousal or functioning. (p. 374)

sexual orientation an enduring sexual attraction toward members of either one's own sex (homosexual orientation) or the other sex (heterosexual orientation). (p. 379)

sexual response cycle the four stages of sexual responding described by Masters and Johnson—excitement, plateau, orgasm, and resolution. (p. 373)

shaping an operant conditioning procedure in which reinforcers guide behavior toward closer and closer approximations of the desired behavior. (p. 250)

short-term memory activated memory that holds a few items briefly, such as the seven digits of a phone number while dialing, before the information is stored or forgotten. (p. 272)

sleep periodic, natural loss of consciousness—as distinct from unconsciousness resulting from a coma, general anesthesia, or hibernation. (Adapted from Dement, 1999.) (p. 73)

sleep apnea a sleep disorder characterized by temporary cessations of breathing during sleep and repeated momentary awakenings. (p. 80)

social clock the culturally preferred timing of social events such as marriage, parenthood, and retirement. (p. 181)

social exchange theory the theory that our social behavior is an exchange process, the aim of which is to maximize benefits and minimize costs. (p. 583)

social facilitation stronger responses on simple or well-learned tasks in the presence of others. (p. 558)

social identity the "we" aspect of our self-concept; the part of our answer to "Who am I?" that comes from our group memberships. (p. 171)

social learning theory the theory that we learn social behavior by observing and imitating and by being rewarded or punished. (p. 135)

social loafing the tendency for people in a group to exert less effort when pooling their efforts toward attaining a common goal than when individually accountable. (p. 559)

social psychology the scientific study of how we think about, influence, and relate to one another. (pp. 545, 552, 564)

social trap a situation in which the conflicting parties, by each rationally pursuing their self-interest, become caught in mutually destructive behavior. (p. 584)

social-cognitive perspective views behavior as influenced by the interaction between people's traits (including their thinking) and their social context. (p. 459)

social-responsibility norm an expectation that people will help those dependent upon them. (p. 583)

somatic nervous system the division of the peripheral nervous system that controls the body's skeletal muscles. Also called the *skeletal nervous system.* (p. 41)

somatoform disorder psychological disorder in which the symptoms take a somatic (bodily) form without apparent physical cause. (See *conversion disorder* and *hypochondriasis.*) (p. 505)

source amnesia attributing to the wrong source an event we have experienced, heard about, read about, or imagined. (Also called *source misattribution.*) Source amnesia, along with the misinformation effect, is at the heart of many false memories. (p. 298)

spacing effect the tendency for distributed study or practice to yield better long-term retention than is achieved through massed study or practice. (p. 274)

split brain a condition resulting from surgery that isolates the brain's two hemispheres by cutting the fibers (mainly those of the corpus callosum) connecting them. (p. 60)

spontaneous recovery the reappearance, after a pause, of an extinguished conditioned response. (p. 242)

spotlight effect overestimating others' noticing and evaluating our appearance, performance, and blunders (as if we presume a spotlight shines on us). (p. 466)

SQ3R a study method incorporating five steps: *S*urvey, *Q*uestion, *R*ead, *R*ehearse, *R*eview. (p. 10)

standard deviation a computed measure of how much scores vary around the mean score. (p. A-3)

standardization defining meaningful scores by comparison with the performance of a pretested group. (p. 337)

Stanford-Binet the widely used American revision (by Terman at Stanford University) of Binet's original intelligence test. (p. 335)

statistical significance a statistical statement of how likely it is that an obtained result occurred by chance. (p. A-7)

stereotype a generalized (sometimes accurate but often overgeneralized) belief about a group of people. (p. 564)

stereotype threat a self-confirming concern that one will be evaluated based on a negative stereotype. (p. 349)

stimulants drugs (such as caffeine, nicotine, amphetamines, and the even more powerful cocaine, Ecstasy, and methamphetamine) that excite neural activity and speed up body functions. (p. 96)

storage the retention of encoded information over time. (p. 272)

stranger anxiety the fear of strangers that infants commonly display, beginning by about 8 months of age. (p. 158)

stress the process by which we perceive and respond to certain events, called *stressors,* that we appraise as threatening or challenging. (p. 418)

subjective well-being self-perceived happiness or satisfaction with life. Used along with measures of objective well-being (for example, physical and economic indicators) to evaluate people's quality of life. (p. 411)

subliminal below one's absolute threshold for conscious awareness. (p. 190)

superego the part of personality that, according to Freud, represents internalized ideals and provides standards for judgment (the conscience) and for future aspirations. (p. 440)

superordinate goals shared goals that override differences among people and require their cooperation. (p. 586)

survey a technique for ascertaining the self-reported attitudes or behaviors of a particular group, usually by questioning a representative, random sample of the group. (p. 20)

sympathetic nervous system the division of the autonomic nervous system that arouses the body, mobilizing its energy in stressful situations. (p. 41)

synapse [SIN-aps] the junction between the axon tip of the sending neuron and the dendrite or cell body of the receiving neuron. The tiny gap at this junction is called the *synaptic gap* or *synaptic cleft.* (p. 38)

systematic desensitization a type of exposure therapy that associates a pleasant relaxed state with gradually increasing anxiety-triggering stimuli. Commonly used to treat phobias. (p. 517)

T

telegraphic speech early speech stage in which a child speaks like a telegram—"go car"—using mostly nouns and verbs. (p. 317)

temperament a person's characteristic emotional reactivity and intensity. (p. 114)

temporal lobes portion of the cerebral cortex lying roughly above the ears; includes the auditory areas, each receiving information primarily from the opposite ear. (p. 53)

teratogens agents, such as chemicals and viruses, that can reach the embryo or fetus during prenatal development and cause harm. (p. 146)

testosterone the most important of the male sex hormones. Both males and females have it, but the additional testosterone in males stimulates the growth of the male sex organs in the fetus and the development of the male sex characteristics during puberty. (pp. 134, 374)

thalamus [THAL-uh-muss] the brain's sensory switchboard, located on top of the brainstem; it directs messages to the sensory receiving areas in the cortex and transmits replies to the cerebellum and medulla. (p. 49)

THC the major active ingredient in marijuana; triggers a variety of effects, including mild hallucinations. (p. 101)

theory an explanation using an integrated set of principles that organizes observations and predicts behaviors or events. (p. 18)

theory of mind people's ideas about their own and others' mental states—about their feelings, perceptions, and thoughts, and the behaviors these might predict. (p. 154)

threshold the level of stimulation required to trigger a neural impulse. (p. 38)

token economy an operant conditioning procedure in which people earn a token of some sort for exhibiting a desired behavior and can later exchange the tokens for various privileges or treats. (p. 519)

tolerance the diminishing effect with regular use of the same dose of a drug, requiring the user to take larger and larger doses before experiencing the drug's effect. (p. 92)

top-down processing information processing guided by higher-level mental processes, as when we construct perceptions drawing on our experience and expectations. (p. 189)

trait a characteristic pattern of behavior or a disposition to feel and act, as assessed by self-report inventories and peer reports. (p. 453)

transference in psychoanalysis, the patient's transfer to the analyst of emotions linked with other relationships (such as love or hatred for a parent). (p. 514)

two-factor theory the Schachter-Singer theory that to experience emotion one must (1) be physically aroused and (2) cognitively label the arousal. (p. 394)

two-word stage beginning about age 2, the stage in speech development during which a child speaks mostly two-word statements. (p. 317)

Type A Friedman and Rosenman's term for competitive, hard-driving, impatient, verbally aggressive, and anger-prone people. (p. 421)

Type B Friedman and Rosenman's term for easygoing, relaxed people. (p. 421)

U

unconditional positive regard according to Carl Rogers, a caring, nonjudgmental attitude of total acceptance toward another person; Rogers believed that this attitude, used in therapy, would help clients develop self-awareness and self-acceptance. (pp. 448, 515)

unconditioned response (UR) in classical conditioning, the unlearned, naturally occurring response to the unconditioned stimulus (US), such as salivation when food is in the mouth. (p. 240)

unconditioned stimulus (US) in classical conditioning, a stimulus that unconditionally—naturally and automatically—triggers a response. (p. 240)

unconscious according to Freud, a reservoir of mostly unacceptable thoughts, wishes, feelings, and memories. According to contemporary psychologists, information processing of which we are unaware. (p. 439)

V

validity the extent to which a test measures or predicts what it is supposed to. (See also *content validity* and *predictive validity*.) (p. 338)

variable-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response at unpredictable time intervals. (p. 254)

variable-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response after an unpredictable number of responses. (p. 254)

vestibular sense the sense of body movement and position, including the sense of balance. (p. 206)

visual cliff a laboratory device for testing depth perception in infants and young animals. (p. 219)

W

wavelength the distance from the peak of one light or sound wave to the peak of the next. Electromagnetic wavelengths vary from the short blips of cosmic rays to the long pulses of radio transmission. (p. 193)

Weber's law the principle that, to be perceived as different, two stimuli must differ by a constant minimum percentage (rather than a constant amount). (p. 191)

Wechsler Adult Intelligence Scale (WAIS) the WAIS is the most widely used intelligence test; contains verbal and performance (nonverbal) subtests. (p. 336)

Wernicke's area controls language reception; a brain area, usually in the left temporal lobe, that is involved in language comprehension and expression. (p. 56)

withdrawal the discomfort and distress that follow discontinuing the use of an addictive drug. (p. 92)

working memory a newer understanding of short-term memory that focuses on conscious, active processing of incoming auditory and visual-spatial information, and of information retrieved from long-term memory. (p. 273)

X

X chromosome the sex chromosome found in both men and women. Females have two X chromosomes; males have one. An X chromosome from each parent produces a female child. (p. 134)

Y

Y chromosome the sex chromosome found only in males. When paired with an X chromosome from the mother, it produces a male child. (p. 134)

Young-Helmholtz trichromatic (three-color) theory the theory that the retina contains three different color receptors—one most sensitive to red, one to green, one to blue—which, when stimulated in combination, can produce the perception of any color. (p. 199)

Z

zygote the fertilized egg; it enters a 2-week period of rapid cell division and develops into an embryo. (p. 145)

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The Story of Psychology: A Timeline *(continued from inside front cover)*

1949 In *The Organization of Behavior: A Neuropsychological Theory*, Canadian psychologist Donald O. Hebb outlines a new and influential conceptualization of how the nervous system functions.

1950 Solomon Asch publishes studies of effects of conformity on judgments of line length.

In *Childhood and Society,* Erik Erikson outlines his stages of psychosocial development.

1951 Carl Rogers publishes *Client-Centered Therapy.*

1952 The American Psychiatric Association publishes the *Diagnostic and Statistical Manual of Mental Disorders,* an influential book that will be updated periodically.

1953 Eugene Aserinski and Nathaniel Kleitman describe rapid eye movements (REM) that occur during sleep.

Janet Taylor's Manifest Anxiety Scale appears in the *Journal of Abnormal Psychology.*

1954 In *Motivation and Personality,* Abraham Maslow proposes a hierarchy of motives ranging from physiological needs to self-actualization. (Maslow later updates the hierarchy to include self-transcendence needs.)

James Olds and Peter Milner, McGill University neuropsychologists, describe rewarding effects of electrical stimulation of the hypothalamus in rats.

Gordon Allport publishes *The Nature of Prejudice*.

1956 In his *Psychological Review* article titled "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," George Miller coins the term *chunk* for memory researchers.

1957 Robert Sears, Eleanor Maccoby, and Harry Levin publish *Patterns of Child Rearing*.

Charles Ferster and B. F. Skinner publish *Schedules of Reinforcement*.

1959 Noam Chomsky's critical review of B. F. Skinner's *Verbal Behavior* appears in the journal *Language*.

Eleanor Gibson and Richard Walk report their research on infants' depth perception in "The Visual Cliff."

Harry Harlow outlines "The Nature of Love," his work on attachment in monkeys.

Lloyd Peterson and Margaret Peterson in the *Journal of Experimental Psychology* article, "Short-Term Retention of Individual Verbal Items," highlight the importance of rehearsal in memory.

John Thibaut and Harold Kelley publish *The Social Psychology of Groups*.

1969 In his APA presidential address, "Psychology as a Means of Promoting Human Welfare," George Miller emphasizes the importance of "giving psychology away."

1971 Kenneth B. Clark becomes the first African-American president of the American Psychological Association.

Albert Bandura publishes *Social Learning Theory.*

Allan Paivio publishes *Imagery and Verbal Processes.*

B. F. Skinner publishes *Beyond Freedom and Dignity.*

1972 Elliot Aronson publishes *The Social Animal.*

Fergus Craik and Robert Lockhart's "Levels of Processing: A Framework for Memory Research" appears in the *Journal of Verbal Learning and Verbal Behavior.*

Robert Rescorla and Allan Wagner publish their associative model of Pavlovian conditioning.

Under the leadership of Derald Sue and Stanley Sue, the Asian-American Psychological Association is founded.

1973 Ethologists Karl von Frisch, Konrad Lorenz, and Nikolaas Tinbergen receive the Nobel prize for their research on animal behavior.

1974 APA's Division 2 first publishes its journal, *Teaching of Psychology,* with Robert S. Daniel as editor.

Eleanor Maccoby (pictured) and Carol Jacklin publish *The Psychology of Sex Differences.*

1975 Biologist Edward O. Wilson's *Sociobiology* appears; it will be a controversial precursor to evolutionary psychology.

1976 Sandra Wood Scarr and Richard A. Weinberg publish "IQ Test Performance of Black Children Adopted by White Families" in *American Psychologist.*

1978 Psychologist Herbert A. Simon, Carnegie-Mellon University, wins a Nobel prize for pioneering research on computer simulations of human thinking and problem solving.

1979 James J. Gibson publishes T*he Ecological Approach to Visual Perception*.

Elizabeth Loftus publishes *Eyewitness Testimony*.

1981 Ellen Langer is the first woman to be granted tenure in Harvard University's Department of Psychology.

David Hubel and Torsten Wiesel receive a Nobel prize for research on single-cell recordings that identified feature detector cells in the visual cortex .

Roger Sperry receives a Nobel prize for research on split-brain patients.