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FOCUS ON
EMOTION
AND
ADULT DEVELOPMENT

K. Warner Schaie, PhD

M. Powell Lawton, PhD

Volume Editors



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Focus on
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K. Warner Schaie, PhD

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FORTHCOMING

ANNUAL REVIEW OF GERONTOLOGY AND GERIATRICS

Volume 18: Intervention Research with Older Adults

Editor-in-Chief: M. Powell Lawton

**Volume Editors: Richard Schulz, George Maddox,
and M. Powell Lawton**

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Preface

If the field of psychology can be said to have experienced its age of behavior and its age of cognition it may now be in its age of emotion. With the greatly increased attention having been given this third member of the conventional triumvirate in the past decades it seems as if the conventional boundaries among the three are becoming more permeable than was true in classical psychology. In fact, emotion itself is no longer partitioned, but is widely recognized as having cognitive, behavioral, subjective-feeling, psychophysiological, and neuropsychological manifestations. Further, emotion is widely viewed not simply as a reaction to a stimulus, but as a proactive means toward personal and evolutionary goals. A world view of holism has thus characterized much of our late-century thought on the place of emotion.

As the history of gerontology confirms in many other areas of study, aging and the later period of human development have tended to be excluded during early phases of general psychological theory development and research. It has been gerontologists who have begun the process of expanding the study of emotion into old age (Malatesta, 1981; Schulz, 1985). Their efforts have brought a number of gerontologists into this field, with the result that a fair amount of descriptive and age-comparative study of emotion in later life has occurred.

The need to incorporate the newer knowledge from general psychology into a more comprehensive view of emotion in adult development and aging led the editors to seek funding for a conference on this topic. The conference was planned deliberately to involve major contributors to the general psychology of emotion along with some of the gerontologists who had worked in this area. The National Institute on Aging (NIA) had recently issued a program announcement requesting research on emotion and aging. Ronald Abeles, Associate Director for the Behavioral and Social Sciences at the NIA, was very helpful in the conception and conduct of the Conference, which was held in October, 1996, at the Scanticon Conference Hotel in State College, PA, under the sponsorship of the

Pennsylvania State University Gerontology Center and the Philadelphia Geriatric Center. Funding for the conference was provided by a conference grant (AG 55503) from the National Institute on Aging and additional support by the Vice-President for Research of Penn State.

As it happened, just before the conference, the *Handbook of Emotion Adult Development and Aging* (Magai & McFadden, 1996) containing contributions by a number of conference participants was published. There has been so much recent activity, however, that there is little overlap between the content of the Handbook and this *Annual Review*.

The conference's purpose was to fortify the gerontological effort with broader perspectives and to produce a volume that would help motivate both gerontologists and general psychologists to further research emotion as a central concept over the entire life span. In the following paragraphs we give a preview of the rich content of this volume.

We begin with an overview of the psychological literature on emotion (Izard and Ackerman, Chapter 1). This chapter sets the stage for the volume as a whole by providing their view of emotion across the entire life-span. The holistic characteristic of the recent literature on emotion is epitomized in their tracing of the developmental aspects of emotion from their separate articulation in infancy through periods of increasingly stable systems that are fully integrated into other personal systems. Izard's differential emotions theory forms the background for the rich coverage of emotion from the neural to the behavioral and the subjective levels. The self-concept represents the culmination of this process. Constancy and stability are the keys to the development of self identity.

In Chapter 2, Cacioppo and his associates provide a life-span overview of the developmental psychophysiology of emotions. They provide behavioral and physiological evidence suggesting that there is at least partial independence of the evaluative mechanisms or systems for positive and negative emotions. They also discuss the different ways in which somatic and visceral afference play a role in emotional experience. Somatovisceral reactivity declines with age; this decline reduces the intensity of emotional experiences even if their frequency remains constant. Attention is given also to the fact that events that evoke emotions are not constant across the life course and that little is known as to whether response to emotional stimuli matched for extremity would evoke equivalent responses.

Some of the questions raised in Chapter 2 are explored from a more subjective framework in Chapter 3, by Zautra, Potter, and Reich. These authors suggest that positive and negative affective states are not polar

opposites of each other, but that their relationship depends on the context and state of the organism at the time the affect is experienced. They provide an integrative theoretical model and review the literature in the light of this model. They conclude that therapeutic interventions are likely to be more effective if positive and negative affects are seen as separate rather than opposing states.

In Chapter 4, Magai and Passman continue the theme of a developmental psychology of emotion. They are concerned especially with the way feelings are used in interpersonal communication across the many years of adulthood. Emotion as a means of transmitting and receiving social messages is shown to differ in some ways across young, middle, and later adulthood. The large literature on attachment and attachment styles is linked to the communicative functions of emotion. The chapter ends with the provocative question of why older adults express more positive interpersonal affect than younger adults. Do elders more successfully "route negative affect from consciousness" and if so, what are the gains and losses in doing so?

Leventhal and associates (Chapter 5) raise three sets of questions: They first ask whether there is a direct or indirect linkage between stressful life events and the occurrence of disease. They next consider whether different emotions may directly precipitate different diseases or whether there may be long-term emotionally induced physiological changes that lead to chronic malfunctions of the various regulatory systems. Finally, they examine how age-related changes affect these processes, and conclude that the direct effects from illness to emotional behaviors successively become stronger than the effects from emotion illness, even though the relationship remains bidirectional throughout life.

Schulz and Heckhausen (Chapter 6) provide a penetrating analysis of how emotion fits into their larger theoretical framework. In the gerontological literature, as in psychology in general, not only has emotion often been viewed as separate from other psychological processes but its position in major theoretical accounts of the developmental processes has often been ignored. These authors have previously contributed a life-span view of development that emphasizes the centrality of control. In this chapter they elaborate on how emotion articulates with cognition, motivation, and behavior. Emotion is found to play a major part in evolution through its function of maximizing the person's primary control over the environment. Secondary control, that is, adaptation achieved through the management of personal process, has increased relevance in the later years as primary

control becomes more difficult to maintain. Yet the two aspects of control represent a single motivational process that operates throughout the life span.

Labouvie-Vief (Chapter 7) describes her research program on cognitive and emotional development throughout the adult life span. She argues that the increasing complexity of the mature person and increased awareness of the impermanence and mortality of the self raises the understanding of emotional dimensions of life to qualitatively different levels with increasing age. Nevertheless, she finds that the old, by comparison with the middle aged, achieve lower levels of self- and emotional representations. She relates this finding to possible reduction of coping strategies in old age related to declines in fluid ability and in lessened biological resources.

This theme is continued by Blanchard-Fields (Chapter 8) in her treatment of the role of emotion in social cognition across the adult life span. She reviews the social cognition perspective on both affect and cognition. She then summarizes her own research program that examines the role of emotion and cognition in problem solving and causal attributes across the latter half of the life span. She concludes that there are changes in emotional intensity and emotional understanding as we get older and calls for more detailed study of the phenomenological experience of the problem-solving adult. She cautions that the observed reduction in affect with age should not be viewed as a deficit but rather may represent effective self-regulation.

In Chapter 9, Tucker and Desmond's neurobehavioral perspective provides a refreshing complement to the many intrapsychic treatments of emotion by other authors. It is thus an extraordinary achievement to find this neural function perspective leading toward a new view of that epitome of the interior, the Self. Life-span development is viewed in terms of opposing processes of plasticity and stability. High neural plasticity in early life enhances flexibility and new learning, but impedes stability—for example, the development of a personal history based on event memory and ultimately a sense of self. Increased quantity and interconnectedness of learned material begins to contribute to increasing stability, at the cost of flexibility and easy assimilation of new experience. With a formal knowledge base in neuropsychology, Tucker and Desmond proceed to the thought-provoking conclusions that “the price of knowledge is identity,” and “rigidity may be a necessary strategy of aging.”

Dilworth-Anderson (Chapter 10) addresses what is undoubtedly the most neglected topic in the book, that of cultural and sociocultural perspec-

tive on emotion in old age. Research directly addressing this topic is virtually nonexistent. Dilworth-Anderson constructs a strong framework within which such inquiry may be placed: Research on African Americans which identifies the culture they share, their sociocultural resources, and their emotional well-being. History and the involuntary nature of African-Americans' original residence in the United States are linked to the psychological processes of dual and sometimes conflicted selves and reduced psychological well-being. Racially based resources such as judicious positive uses of anger, broad social support networks, and religion may help buffer the many forces that might lower experiences of well-being.

Diener and Suh (Chapter 11) provide new data on cross-national variations in indicators of subjective well-being. It is important to note the many names by which the literature has characterized similar constructs: Psychological well-being, happiness, life satisfaction, morale, and many others. Diener and Suh note rightly that both cognitive and affective judgments enter into people's appraisal of subjective well-being. Although this represents a different stream of research from that which is focused on emotion as such, it is essential for investigators in the latter area to be aware of this important source of information on how people see their interior state of well-being. These authors' review reveals a high degree of consensus from many surveys in different countries on such matters as the partial independence of positive and negative judgments and the lack of age differences when indicators of negative states are considered, as well as the less frequent reports of positive states expressed by older people. These findings are discussed in terms of several possible explanatory mechanisms, with the clear conclusion that future research will be needed in order to provide real resolutions of present ambiguities.

Finally, Carstensen and associates (Chapter 12) discuss the social context of emotional experience. This chapter broadly examines the question of how it is possible for older adults to fare well emotionally in the face of objective losses. The chapter further expounds Carstensen's theory of socioemotional selectivity which argues that the selective regulation of interpersonal relationships provides an explanation of why the emotional sphere may be relatively spared from the ravages of the aging process. The mechanisms of this development are seen to lie in strategic actions to manage the shrinking social context and thus selectively retain the most rewarding social contexts in the interest of avoiding negative emotions.

The editors hope that this volume will make accessible the best of current thinking regarding a topic that, after lying dormant for a long

period, is currently receiving renewed attention in psychology in general and which is seen as having particular relevance to the study of human aging. We also hope, of course, that the volume will be instrumental in inspiring additional research efforts as well as being helpful to the gerontological and geriatric practitioner in better understanding their older patients and clients.

The editors wish to acknowledge the capable assistance of Alvin Hall and Judy Hall in handling the conference logistics, and of Anna W. Shuey and Joan Houtz for their editorial support and preparation of the indices.

K. Warner Schaie
M. Powell Lawton

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CHAPTER 1

Emotions and Self-Concepts Across the Life Span

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In the tradition of Darwin and Tomkins, we propose that emotions are the truly significant organizing and motivational forces in human development and functioning. Birth and death, and all the personally relevant events in between, are defined in essential ways by emotion experiences. Would any life event really matter if there were no emotions?

Many of us would agree that emotions give meaning to life, and that the quality of our emotion experiences is a significant determinant of the quality of life. In the past 15 years, scholars have produced an impressive body of theory and research that testifies to the primacy of emotions in human affairs.

In recent years, emotions theory has increased in complexity and sophistication. We have moved beyond debates about the scientific status of emotions. We have become less concerned with the taxonomy of emotions: criteria for identifying basic emotions, determining their number, and labeling them properly. We have become more concerned with their neurophysiological structures and psychological functions.

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We no longer debate the question of whether emotion is fundamentally dimensional or divisible into discrete categories. The answer may be that emotions are both. Processes that place sensory data on a good-bad or pleasant-unpleasant dimension may serve us well when all we need is a maximally rapid movement toward or away from the stimulus, or a quick and simple decision whether to avoid or approach. Processes that place sensory data in a specific emotion category can generate many different kinds of approach and avoidant actions. Emotions motivate cognition and behavior relevant to all contingencies, not simply those concerned with simple approach or avoidance strategies.

Recent emotions theory, in the form of the dynamic systems framework, is facilitating serious consideration of advances in other sciences. Dynamic systems theory is also increasing our consciousness of the importance of constructs such as nonlinear causal processes, patterning, and self-organization (e.g., Izard, 1995; M. D. Lewis, 1995; Scherer, 1996).

In this chapter, we discuss the implications of differential emotions theory (DET) (Izard, 1977) for understanding major developments involving the emotions system across the life span. These developments consist of four general processes. The first describes the articulation of the emotions system in early and middle childhood with the emerging regulation of cognition-independent emotions present in infancy (i.e., fear, anger), and the acquisition of more cognition-dependent emotions (shame, guilt) in middle childhood. A second process consists of the increasing interconnections between the emotions and cognitive systems through adolescence and young adulthood. The third process describes the genesis and elaboration of self-concepts from substrates in the emotions system. The fourth process describes the consolidation of affect patterns and trait emotionality that provide stability, continuity, and coherence of personality throughout adulthood. We sketch these processes in sections on the *structure and function* of emotions, *emotion activation*, and *emotion-cognition* relations.

I. THE STRUCTURE AND FUNCTION OF EMOTIONS

An emotion is composed of neurochemical processes, expressive behavior, and a subjective experience. Discrete emotions also interrelate and form an emotions system with emergent properties (cf. Ackerman, Abe, & Izard, in press), and much of development consists of the coordination of the emotions and cognitive systems. This coordination involves the construction and consolidation of affective-cognitive structures.

Before discussing the structure and functions of emotions, a few definitions are in order. Arguments about the criteria for classifying an emotion as *fundamental* or *basic* have made those terms controversial and fraught with surplus meaning (Ortony & Turner, 1990; replies by Ekman, 1994, and Izard, 1994). Perhaps it is time to table concerns about a formal definition for these terms (Ekman, 1984). Nevertheless, it remains useful to sort emotions into categories. The categories that have heuristic value for DET distinguish between *positive* and *negative* emotions, and between *cognition-dependent* and *cognition-independent* emotions.

Emotions Categories

The rubrics indicating valence (positive, negative) help in understanding motivational factors influencing behavior. No emotion is always positive (good for us) or negative (bad for us). Instead, emotions have inherently adaptive functions when they are ecologically valid or appropriate to their contexts, and have maladaptive functions in inappropriate contexts. Fear is appropriate, for instance, when we make an accurate appraisal of a real danger and seek a safe haven. Fear is inappropriate when we evaluate a safe situation as threatening and engage in needless protective behavior. Emotions become maladaptive when they become associated with inappropriate cognition and action. Thus, designating an emotion as negative should not deter the study of the *adaptive* functions of that emotion. Because we think there are important cognitive and noncognitive activators of emotions, it also is useful to distinguish emotions that can be activated independently of cognition from those that depend on the development of certain cognitive capacities and certain cognitive processes (Ackerman et al., in press). Most of us would agree that contempt, shame, and the emotional component of pride require cognitive abilities and cognitive information processing. To experience an emotion like shame or contempt, we have to have: (a) a sense of self, (b) the ability to differentiate self and other, and (c) the ability to engage in comparison processes. We experience these emotions only after we develop these capacities (M. Lewis, 1993; M. Lewis, Sullivan, Stanger, & Weiss, 1988). Although rudimentary shame behavior may be experienced early in life, we and others have shown that shame in response to failure cannot be reliably observed until the age of 5 years (Fantauzzo & Izard, 1996, unpublished data). Guilt as a response to wrongdoing emerges at about age 7 (Brown & Dunn, 1996). We hypothesize that, should dementia, psychopathology,

or injury deprive us of the requisite cognitive capacities for emotions like shame and guilt, we lose these emotions.

We are on shakier ground in trying to identify emotions that are independent of cognition, emotions that are a function of noncognitive processes endogenous to the individual. Lazarus (1991) and kindred theorists believe all emotions are cognition-dependent. Let us begin the argument to the contrary with the observation that genes are significant determinants of the thresholds of the various emotions. The work on shyness by Buss and Plomin (1984), Kagan and his colleagues (Kagan, Reznick, & Snidman, 1988), and Suomi (1991) provides good evidence for genetic influences on emotion experiences and emotion dispositions. Genetic and other biological factors may be the primary determinants of dispositional or trait emotions like shyness or a characteristically happy mood.

Diener and his colleagues' (Diener and Suh, Chapter 11, this volume; Larsen & Diener, 1992) evidence of individual differences in happiness and well-being appears to support the notion of independent emotion systems. They showed that these trait emotions or moods are very robust and stable. More important for the present argument, trait emotions are relatively immune to the influences of environmental factors and even to medical conditions and physical handicaps. Thus trait emotions may be largely a function of noncognitive emotion activators, endogenous emotion-activating processes that are sometimes capable of overriding environmental information and even information from other biological systems of the individual.

Furthermore, some state or situational emotions are a function of noncognitive activators. It is generally accepted that exercise-induced increases of endorphins in the brain lead to pleasant feelings. There is also evidence that acute unexpected pain activates anger expression in young infants before they have the cognitive capacity to appraise the source of the injury (Izard, Hembree, & Huebner, 1987). Indeed, once the infant associates the pain with stimuli in the context, cognitive appraisal of these stimuli elicits fear, not anger. Finman and Berkowitz (1989) have demonstrated that diffuse negative affect can activate anger and aggression in adults. There is also evidence suggesting that changes in hormone levels associated with childbirth result in changes in mood (Izard, Libero, Putnam, & Haynes, 1993).

Neural Substrates

During the past 15 years, researchers in biopsychology and neuroscience have substantially increased our knowledge of the neural substrates of

emotions (see Tucker and Desmond, Chapter 9, this volume). Most of the research that focuses on a discrete emotion has centered on the brain mechanisms, pathways, and neurotransmitters involved in *fear*. Most of that research uses animals (typically rats) and experimental models. The most common topics of this research are fear conditioning and fear-potentiated startle. The work represents invaluable contributions to our understanding of brain-emotion-behavior relations. Davis (1996) has reviewed this work and made an effort to extend the research to include human models.

Several findings from animal research on emotions appear relevant to the study of human emotions. A series of experiments by LeDoux and his colleagues demonstrated that fear could be conditioned to acoustic or visual stimuli without involvement of the acoustic or visual cortex, respectively (LeDoux, Sakaguchi, & Reis, 1984). After sectioning or blocking pathways to relevant cortex, LeDoux and his colleagues were able to identify a subcortical route to fear activation and conditioning. The route is from sense organ to thalamus to the amygdala, now considered the sensory gateway to emotions (Aggleton & Mishkin, 1986). Efferent projections carry the transformed sense data or emotion information from the amygdala to the hypothalamus, which releases autonomic nervous system activity, and to brain stem central gray, which releases motor responses such as freezing (LeDoux, Iwata, Cicchetti, & Reis, 1988).

*Subcortical Pathway for Conditioned Fear in Rats:
Implications for Human Emotions*

If the findings on brain-emotion relations and fear conditioning in animals are generalizable to human beings, as is proposed by neuroscience investigators (e.g., Davis, 1996), then we may have a mechanism for acquiring conditioned fears quite efficiently and without awareness of their origins. The subcortical process for emotion activation (via sense organ → thalamus → amygdala) is very rapid, automatic, and nonconscious. Some researchers have suggested a process like this as the source of certain phobias (Jacobs & Nadel, 1985), but others have questioned this explanation (McNally, 1996). Nevertheless, the case for the generalizability of the findings relating to the amygdala and subcortical emotion information processing has been improved by research with brain injured patients (Bechara et al., 1995). Patients with bilateral damage to the amygdala failed to acquire conditioned autonomic responses to aversive auditory stimuli. They did acquire declarative information, such as the names of

the colors of visual stimuli associated with the conditioned stimulus. The authors concluded that the amygdala is critical in integrating information from different sensory modalities with the somatic state that defines an emotional response. The results imply that conditioned startle and fear responses in humans are mediated by the amygdala.

Not only is the subcortical route to fear conditioning rapid, automatic, and nonconscious, it leads to fear that is difficult to control. LeDoux and his colleagues (LeDoux, Romanski, & Xagoraris, 1989) showed that extended nonreinforced presentations of the conditioned stimulus failed to extinguish the fear that was acquired without the participation of the cortex (for a summary, see LeDoux, 1993). The cortex proved unnecessary for fear acquisition, but very important in the extinction and control of fear.

In the context of the experimental animal model, the work relating to the subcortical process of fear activation and fear conditioning appears impeccable. Attempting to extend it to the free-ranging animal in its ecological niche and to human beings may reveal its limitations. One question that remains is whether conditioned fears play a significant role in human behavior. If the answer is yes, many human fear experiences might be explained in terms of learning by association, but doubts have been raised about the credibility of such an explanation. Evidence has indicated that many human fear experiences do not systematically lead to conditioned fears (Yule, Udwin, & Murdoch, 1990).

Developmental Changes in the Neural Substrates of Emotions

A number of neuroscientists agree that the amygdala is the sensory gateway to emotions. Although most of the experimental evidence relates to fear, there is evidence that the amygdala is involved in anger and other emotions.

If we generalize from evidence on the emergence of emotion expressions (Haviland & Lelwica, 1987; Izard et al., 1995), we can conclude that the neural substrates of the independent emotion systems are functional in the early months of life.

Although there is still no definitive study on cell loss in the brain due to aging, some recent evidence suggests that there is little loss of cortical neurons (Wickelgren, 1996). Apparently, neurons shrink with advancing age, but they do not disappear. The picture is quite different for Alzheimer's and other dementias (for a summary, see Mann, 1992). In these conditions there is substantial neuron loss as well as the formation of plaque and neurofibrillary tangles. Investigators have estimated losses in

dementias of 35–70% in various nuclei of the amygdala. Judging from what we know about the role of the amygdala in processing emotion information, this neuroanatomical evidence provides a basis for understanding some of the emotional problems in persons suffering with dementia. Loss of amygdaloid neurons does not necessarily mean the total loss of emotional life, but it could explain some flattening, lability, and dysfunctional affect in these patients.

Some evidence suggests that the hippocampus is not fully functional in the first 2 years or so (Jacobs & Nadel, 1985). The hippocampus is involved in linking declarative knowledge to emotion-eliciting stimuli and thus in emotion-cognition relations. We are unaware of evidence on the effects of aging on the hippocampus, but we suspect that changes in this structure and adjacent cortices may help account for some forms of memory loss and perhaps some loss of affective-cognitive structures or schemas involved in defining the self and social roles.

Emotion Expressions

We have robust evidence that reliably codeable emotion-expressive signals and emotion communication begin in early infancy and continue through the life span (Izard et al., 1995; Malatesta & Izard, 1984). There is also solid evidence for the salience of emotion signals in social communication and social relationships (Hobson, 1993; Malatesta, Culver, Tesman, & Shepard, 1989; Weinberg & Tronick, 1994). Little wonder that studies have shown that the absence of maternal emotion expression is quite disturbing to infants as young as 3 months (Cohn & Tronick, 1989). We are confident that the extended absence or loss of facial expression due to mental or physical disability has a detrimental effect on social relationships at all stages of life.

Emotion expressions are not only fundamental to social communication and relationships, they are also mechanisms of emotion regulation (cf. Gross & Levenson, 1997). We have found that age-related changes in early development, from full-face instinct-like emotion expressions to more refined and restricted expressions, index increases in socioemotional competence (Izard, Kogos, Levinson, & Ackerman, 1996, unpublished data). We have also shown that a child's ability to identify and label emotion expressions predicts social competence. Furthermore, emotion expression knowledge, or the understanding of expressive signals, predicts aspects of social competence after partialling out the effect of cognitive

development as measured by verbal ability (Ackerman, Kogos, & Izard, 1996; Izard, 1971).

Emotion Experience

Although the science of emotion rests largely on hard evidence from studies of the neural substrates and behavioral expressions of emotions, everybody wants to explain the subjective experience of emotion. We know a great deal about the brain mechanisms for emotion expression, but we do *not* know how the brain generates emotion experience (Damasio, 1994; LeDoux, 1987).

Natural Activators of Emotion Experiences

There is substantial evidence for the idea that there are natural elicitors of fear. Put another way, the idea is that we are biologically prepared to respond with fear to certain stimuli (Bowlby, 1973; Seligman, 1970). A classic study of children's fears by Jersild (1947) revealed both developmental changes in fear elicitors and a core of fear stimuli that were stable from birth to 6 years: animals, darkness, being alone, heights, and threat of physical harm. We have found the same stimuli activate fear in 7-year-old children from low-income families. Furthermore, this list of natural activators is quite similar to those revealed by research with adults, especially in clinical investigations of phobias (McNally, 1987). We propose that there is a core set of elicitors for each of the basic emotions and that this set is rather stable across the life span. For example, interest is always elicited by nonthreatening novelty, joy by reunion of loved ones, sadness by loss of loved ones, anger by restraint, fear by threat of physical harm, shame by awareness of self-inadequacy, and guilt by immoral behavior. There is some cross-cultural evidence for a stable set of emotion-specific elicitors (Walbott & Scherer, 1986), but we need much more research on this topic.

Defining Emotion Experience

DET defines the experience of an emotion as a feeling or motivational state that often is accompanied by a readiness for cognitive or motor activity. The distinctive aspects of this definition are the emphasis on emotion as motivation, the concept of emotion motivation as synonymous with emotion feeling, and the idea that each emotion has a distinctly

different feeling state and that discrete emotions retain their unique motivational properties even when they occur in clusters or patterns. We have found repeatedly that emotions do occur in clusters or patterns. The affective phenomenologies of anxiety, depression, and hostility are distinctly different patterns of emotions (Blumberg & Izard, 1986; Izard, 1972; Izard & Youngstrom, 1996).

Assessing Subjective Experiences of Emotions

We have become more convinced over the years that the sometimes maligned method of self-report is an invaluable tool in the study of human emotions. The Differential Emotions Scale (DES; Izard, 1972), for instance, has proved useful in the study of emotion feelings in children, adolescents, and adults. Early studies identified the patterns of emotions in anxiety, depression, and hostility. Recently we have used versions of this self-report measure in longitudinal studies of caregivers and children from low-income families and in studies of relations between emotion feelings and traits of personality. In a sample of white middle-class mothers of young children, we found substantial stability in the frequency of discrete emotion feeling states over a 3-year period. We found robust relations between emotions and personality traits.

We also found that composite scores for Head Start caregivers' reports of negative emotions (negative emotionality) and children's temperament are powerful mediators of the effects of environmental stress on children's behavior problems (Youngstrom, Izard, & Ackerman, 1996, unpublished data). Furthermore, the caregiver pattern of emotions in hostility and the pattern for anxiety-depression have differential effects in the predicted direction in mediating the effects of stress on children's externalizing and internalizing problems, respectively (Youngstrom, Izard, & Ackerman, 1996).

Our most recent finding in the study of emotion feelings is with the DES V, a version adapted for children as young as 5 years. In a cross-sectional study of 5- and 7-year-old Head Start children, we have found that some 5-year-olds and even more 7-year-olds can give meaningful reports of their experiences of interest, joy, sadness, anger, fear, shame, and guilt (Izard, Kogos, Levinson, & Ackerman, 1996, unpublished data). Children used a meter stick to indicate the amount of time that they experience the emotion in daily life, and then gave three examples of objects or events that activated the emotion. Judges agreed that the children

described activators appropriate to the emotion category. These descriptions proved quite revealing about their emotional lives and about the effects of living in poverty and a harsh environment. For example, about 70% of the children identified physical aggression or physical punishment as an activator of anger, fear, or sadness. The children who experienced emotions as a result of aggression were, in turn, more aggressive toward others.

The results also showed remarkable differences between the 5- and 7-year-old children. In general, the older children gave far more examples of elicitors for all the emotions. The developmental differences were far greater for some emotions, however, than for others. For example, almost none of the 5-year-olds could give us appropriate examples of emotion elicitors for the cognition-dependent emotions of shame and guilt. Over 60% of the 7-year-olds gave clear and unequivocal examples. In summary, the DES V provides a window on the world of children's emotion experiences, and the DES IV was quite effective in the study of their parents.

The Emotions System

Having considered the neural, expressive, and experiential components of an emotion, we now consider the concept of an emotions system. Each discrete emotion is composed of interactions of neural, expressive-behavioral, and experiential components. One component influences the activity of the other components and the emotion process. For example, as observed by Darwin (1872/1965) and demonstrated in a number of recent experiments (Laird, 1974; Lanzetta & Orr, 1986), the expression of an emotion can amplify physiological activity and reported emotion experience.

The various discrete emotions and their interactions form the emotions system. Within the emotions system, one emotion can activate or amplify another emotion. The relations and interactions of sadness, anger, and shame in depression and the interactions of fear and guilt in anxiety exemplify emotion systems processes (Izard & Youngstrom, 1996). We believe the systems concept is important for a developmental perspective on emotions.

Intersystem Connections in Life Span Development

Forming connections is fundamental to the development of the brain and life processes (Comery, Shah, & Greenough, 1995). Failure of the branches

of neurons to make connections results in their atrophy. Learning and experience are important determinants of neural connections. Of greatest importance for psychology is the development of connections among the substrates of the emotions, cognitive, and motor systems. What develops in emotional development is mainly the formation of connections among systems (cf. Ackerman et al., in press).

For emotion understanding, emotion regulation, and healthy development, emotions must make appropriate connections to cognition and action. Although the overall personality system has holistic properties, it also is composed of quasi-independent modules and subsystems that require connection. Furthermore, the intersystem connections necessary for effective adaptation at different stages of life do not happen automatically or simply as a function of maturation or aging. Information coded in the genes plays a significant role in the emotion-cognition connections that form emotion traits and personality dimensions, but even gene expression is dependent on experience. Development depends on interactions and transactions among biosocial and environmental systems. The nature and scope of these transactions change with increasing age, significantly so in late life (Carstensen, Gross, and Jung, Chapter 12, this volume).

In early development, for example, children have to learn the appropriate labels for emotion expressions and for emotion feelings. They also have to learn culturally accepted modes of action in response to each of many different emotion experiences. How well a child makes the appropriate connections between emotion feelings and cognition is a function of aspects of emotion experience as well as cognitive ability.

In a recent study (Ackerman et al., 1996), we found that both verbal ability and aspects of the family emotional environment contribute to the development of emotion knowledge. We found, further, that these connections between the emotions and cognitive systems were important, as emotion knowledge was a significant predictor of important behavioral outcomes (Ackerman et al., 1996). We defined emotion knowledge as the understanding of emotion expressions, emotion feelings, and the causes and consequences of emotion experiences. We measured emotion knowledge in terms of the ability to identify discrete signals in facial expressions. We assessed emotion situation knowledge by having the child identify the emotion feeling of a protagonist in brief vignettes about emotion-eliciting events. After partialling the effects of cognitive ability, emotion-expression knowledge measured at age 5 correlated significantly with aspects of social competence. Furthermore, after partialling the effects of

cognitive ability, a composite emotion knowledge score at age 5 predicted social competence at age 7 (Izard, Ackerman, & Schultz, 1996). Individual differences in emotion knowledge probably continue through the life span and continue to index levels of social competence (cf. Magai and Passman, Chapter 4, this volume).

The findings of these studies demonstrating the differential roles of verbal knowledge and emotion knowledge in predicting social competence are consistent with the idea that appropriate intersystem connections are necessary for effective adaptation. Cognitive ability alone was a poor predictor of the development of social competence. A better predictor was the child's repertoire of affective-cognitive structures, indexed in terms of ability to detect and label emotion signals in facial expressions and to understand the cause of emotion experiences. We assume that the development of these affective-cognitive schemas and individual differences in the repertoire of such emotional schemas is a function of the emotions system, the cognitive system, and connections between emotions and cognition.

II. EMOTION ACTIVATION

There are multiple processes or systems that activate emotions, and cognition is but one of them. There are several reasons for reviewing the processes of emotion activation.

First, it is important to know that emotion activation is not a unitary concept. It is not adequately described by a single lock-step sequence of events such as stimulus → appraisal → valenced response/affect → emotion.

Second, each of the emotion-activating systems defies description in simple cause-effect language or in terms of linear processes. Whatever cognitive or neurophysiological system plays a role in activating emotion is likely to be influenced in turn by the activated emotion. The emotion activation process, like the emotions system and the more complex systems of self or personality, has nonlinear features. Emotion activation processes involve feedback and feedforward loops. For example, changes in hormone levels may activate emotions, and the emotions, in turn, affect neurohormonal processes. When cognition or coping behavior activates an emotion, the emotion, in turn, affects cognition and coping (Izard, 1993b).

Equally important, an activating cognitive appraisal is often, if not always, affected by ongoing emotion in consciousness. When we start to

design a study, all of us seek some linear segment of the emotion-cognition-emotion-behavior-emotion loop, but awareness of the nonlinear aspects of these complex processes should prove heuristic.

Third, each of the emotion-activating systems is also an emotion-regulating system. Trait emotionality, such as a characteristically happy mood, influences appraisals of life events and subsequent emotions. Cognition in the form of a certain combination of thoughts or causal attributions can elicit anger, but a reinterpretation of the causes can attenuate the anger or elicit the emotion of sadness. Anger, self-activated through intentional behavioral processes or therapeutically induced, can attenuate fear and anxiety. Some evidence suggests that voluntarily initiated expressive behavior can activate emotion feeling and regulate ongoing feelings. Izard (1993b) argued in considerable detail for four emotion activating and regulating systems. We give a brief summary here.

The Four Activating and Regulating Systems

1. Neural Processes

Both endogenous chemicals, like endorphins, and exogenous chemicals, like antidepressive drugs, are capable of activating and regulating emotions. Genetically determined neurochemical processes play a significant role in setting a person's characteristic mood. Disease and dysfunction of the immune system also influence emotion (Leventhal, Chapter 5, this volume). As we shall see later, emotions are highly related and probably integral to traits of personality (Malatesta, 1990; Watson & Clark, 1992), and the big five personality traits have a heritability index in the range of .28 to .46 (Loehlin, 1992). On the basis of the animal research on fear conditioning, we can infer that neural processes can lead to emotion without involvement of the sort of cognition that depends on neocortex.

2. Expressive Behavior

There is robust evidence for the innateness and universality of certain facial expressions (Ekman, 1989; Izard, 1971; Izard et al., 1995). These expressions consist of a configuration of movements in all three regions of the face or of the contraction of a single muscle or small set of coordinated muscles in one area. A number of theorists have argued that there is a natural connection between these expressions and corresponding

feeling or motivational states (Hobson, 1995; Izard, 1971; Izard & Malatesta, 1987). They hold that meaningful social communication and relationships are dependent on a reliable link between emotion expression and emotion feeling.

Either an innate or learned link between expression and feeling would provide an avenue for the regulation of emotion feelings (Izard, Ackerman, & Schulz, 1996b, unpublished data; Gross & Levenson, 1997). Considerable evidence from experimental social psychology indicates that even experimenter-manipulated expressive behavior has a small but reliable effect on emotion feelings (Laird, 1974; Matsumoto, 1987; Strack, Martin, & Stepper, 1988). Combining cognition with expressive movement through purposeful and intentional expression produces an even greater effect on emotion feelings (see Izard, 1992, for a review). If we assume a reliable connection between emotion expressions and emotion feelings, then it is reasonable to assume that, under certain conditions, expressions play a role in generating and regulating emotions. In some cases, expressions can act as noncognitive activators and regulators of emotion feelings.

3. *Affective Process*

Evidence suggests that affective states, such as pain or physical distress, can activate emotion without cognitive mediation (Finman & Berkowitz, 1989; Izard et al., 1987). Some theory and anecdotal data suggests that one emotion can activate another. Certain discrete emotions frequently co-occur (Blumberg & Izard, 1986; Izard, 1972; Izard & Youngstrom, 1996). For example, many students of depression acknowledge that its affective component includes sadness and anger, yet few have attempted to pursue the implications of multiple discrete emotions in depression. Careful attention to the emotional complexity of depression should benefit research and clinical practice. The same holds for anxiety and hostility, which are also characterized by patterns of interacting discrete emotions.

We do not know precisely why anger often couples with sadness in depression. Tomkins (1963) hypothesized that prolonged sadness was an innate activator of anger. In any case, the two emotions serve contrasting functions that can be adaptive and provide alternative motivations for coping with different aspects of self and environment. Sadness slows us down and motivates a thorough assessment of causal factors. Anger is an antidote to the slowing function of sadness. Anger mobilizes energy for action, and, if properly channeled, can stimulate activities that relieve

the effects of the intense and prolonged sadness that typically dominates depressive mood.

The main point here is that in depression, anxiety, and hostility distinctly different patterns of emotions co-occur. The evidence is consistent with the hypothesis that one emotion can activate another. Links between emotions probably become even more stable with advancing years.

4. *Cognitive Processes*

We do not need to elaborate on the notion that cognition activates and regulates emotion. Appraisal, attribution, judgment, comparison, memory, and anticipation are significant sources of influence on emotion. However, what we want to do here is invite a keener awareness of two things: (a) the evidence for noncognitive activators and regulators, and (b) the notion that trait emotionality and emotion produced by noncognitive processes are frequently, if not always, in consciousness and influencing the cognitive activating and regulatory processes.

Developmental Changes in Emotion Activation

The emotion-eliciting power of various events and situations changes with age. Cognitive development has a dual function here. Increased cognitive ability decreases the power of some stimuli and increases that of others. For example, the emergence of the ability to discriminate familiar faces from faces of strangers inhibits the promiscuous smiling of young infants and eliminates the reflex-like link between the perception of the face and the smile response. On the other hand, the cognitive ability of the 1-year-old to detect an incongruity (e.g., an adult walking like a toddler) greatly increases the range of stimuli for smiling and laughing (Sroufe & Wunsch, 1972).

The emotion of interest-excitement also provides a good example of life span changes in eliciting stimuli. People of all ages respond to non-threatening novelty with interest (Tomkins, 1962). However, for the young infant, virtually all stimuli are novel and, often, whatever moves or changes captures the infant's interest. Increasing cognitive maturity enables the individual to disengage from aspects of the environment and to sort task-relevant stimuli from distractors. At the same time, the sheer volume of novel stimuli in one's niche decreases with age and the accumulation of experiences and memories. Beyond this, age-related sensory and motor

deficits can result in a decrease in the size and complexity of one's ecological niche. The consequent decrease in interesting objects, events, and activities can lead to a general decline in interest and engagement in the environment and hence to depression. However, deliberate reduction of one's social network and involvement through preferential selectivity has adaptive advantages in late life (Carstensen, Gross, and Jung, Chapter 12, this volume).

The other aspect of cognitive functioning in later adulthood that may affect emotion-activating conditions concerns a decline in processing resources (Crossley & Hiscock, 1992). Resource limitations may attenuate sensitivity to competing emotion stimuli in the environment and encourage stimulus selectivity and perhaps more stereotypical appraisals of emotion events.

Similarly, the three other activating and regulating systems involving neural processes, expressive behavior, and affective process change throughout adulthood, though the nature of the changes are poorly understood. Older adults, for example, often show reduced physiological responsiveness to emotion stimuli (Levenson, Carstensen, Friesen, & Ekman, 1991), and reduced emotional surgency and excitement (Lawton, Kleban, Rajagopal, & Dean, 1992). On the other hand, in contrast to claims for diminished emotionality for older adults, Carstensen and Turk-Charles (1994) argue for increases with age in the relative salience of emotion, and Lawton et al. (1992) argue for greater control over emotion with age.

Weiner and Graham (1989) provide a good example of change in activation and regulation processes. They examined the cognitive antecedents of feelings of sympathy and intention to engage in helping behavior for participants ranging in age from 5 to 95. In the scenario, "You and some friends are waiting in line to see a special movie when a person behind you, Chris, falls forward, causing both of you to fall down, and you hurt yourself." In one version of the story, Chris was fooling around [controllable behavior], and in the other version, he had a cast on his leg and lost his balance [uncontrollable behavior].

Except for the early adolescent years, the degree of pity felt for Chris when his behavior was uncontrollable and when his behavior was controllable increased with age. This trend was even more marked in regard to the likelihood of engaging in helping behavior. Even when participants thought the perpetrator's behavior was controllable, they showed an age-related increase in altruism up to the age group 75 to 95.

III. EMOTION-COGNITION RELATIONS: STABILITY AND CHANGE IN EMOTION EXPERIENCES

The emotions system is functional at birth, and all the independent emotions (like sadness, joy, anger, and fear) quickly become operational, largely as a function of the maturation of the brain and neuromuscular mechanism (Ackerman et al., in press). Only extremely harsh environments are likely to change the course of these events. The dependent emotions (like contempt, shame, and guilt) emerge as cognitive development enables appraisal processes, self-concept formation, comparison processes, and causal attribution. Cognitive development also facilitates the development of affective-cognitive structures or schema, processes like empathy, sympathy, and guilt-motivated moral behavior, that clearly involve both emotion feeling and cognition. Because of the dependence of these phenomena on cognitive development, social learning plays a relatively larger role in determining the list of antecedents and consequences of their activation. For example, culture plays a large role in determining the characteristics of the social self and the acceptability of certain aspects of our appearance, and both of these matters are potential sources of shame.

Continuity in Emotion Experiences

Differential emotions theory espouses two principles that help explain the role of emotions in life-span development. The principles concern the constancy of the motivational significance of each basic emotion, and the stability of the frequency with which we experience the various emotions. Constancy and stability provide the continuity of feeling states that forms the basis of enduring self-concepts.

The Constancy Principle

Emotion *feelings* are among life's few invariant phenomena. They do not exhibit developmental changes. The quality of an emotion feeling state, whether joy or sadness, anger or fear, remains constant over time. The feeling of sadness is always the same, even though the specific *causes* of sadness and the *cognition* associated with sadness change substantially with development. Constancy in an emotion feeling is necessary in order

that the basic motivational significance of a particular emotion is always the same. Constancy in the feeling state and motivational influence of an emotion is essential in person-environment relations. For example, there must be reliable connections between the appraisal of imminent danger and the motivation to engage in protective behavior, motivation that inspires escape to safety and security. Such motivation is precisely what constitutes the feeling of fear. Thus, in the face of danger, the feeling of fear is exactly what we need to guarantee a reliable resource for coping with threatening situations. If the quality of the feeling of fear were variable, so would be the reliability of our motivation to respond appropriately to imminent danger.

The Stability Principle

Considerable data support the hypothesis of stability in emotion experiences across the life span. In one study of white middle-class children, emotionality measured in terms of dimensions of temperament was moderately stable from the end of the first year of life through age 4 years (Izard, 1993a). In another study, the DES measured trait emotions, or the frequency of emotion experiences, in the daily lives of white middle-class mothers from 2 months after giving birth until their children were 3 years of age (Izard et al., 1993). There were some interesting and predictable changes in group means on certain negative emotions during the first 6 months postpartum, confirming the notion of hormonal influences on emotion activation. Nevertheless, even during this period of change in group means, individual stability of the frequency of emotion feelings was fairly high, and stability continued to be high for the remaining 3 years of the project.

We did a similar study of an ethnically diverse group of approximately 200 caregivers whose low-income status qualified their children for Head Start. The mean age of the caregivers was 31, with a range of 19 to 62. Evidence from multiple methods and multiple informants revealed that these caregivers and their children live under considerable chronic stress. They suffer the ill fortunes of poverty and relatively frequent negative life events that might be expected to bring frequent shifts in the quality of emotion experiences. Nevertheless, the stability of emotion feelings in this group proved to be comparable to that in the white middle-class sample.

Dougherty and Riggins (1995) also used the DES in a cross-sectional study of what they termed the middle-aged (50–64), young-old (65–74),

and old-old (75–89). The mean ages for the three groups were 59, 69, and 81, respectively. The emotion scale means and standard deviations for the three age groups were remarkably similar.

In summary, substantial evidence indicates stability of the frequency of emotion experiences or trait emotions across the life span. The supporting data come from participants who range in age from 1 to 89 and who come from low and middle socioeconomic classes and from different ethnic groups.

Constancy and Stability of Feelings and the Development of Self-Identity

In DET, self-concepts are affective-cognitive structures or affectively toned schemas. Thus self-oriented feelings are central to personality and self-concepts. There is evidence for strong relations between indexes of emotion feelings and traits of personality.

In our sample of middle-class mothers, the emotions of interest and joy were positively related to sociability, shyness was negatively related to sociability, and the three emotions accounted for 19% of the variance in the personality dimension (Izard et al., 1993). We have similar findings on low-income caregivers, many of whom are single parents. For example, the emotion feelings of anger, disgust, and contempt accounted for 24% of the variance in the personality trait of hostility-aggression (Youngstrom et al., 1996).

The principles of constancy and stability and the resulting continuity of emotion feelings help explain the development of the self and self-identity. The role of emotion feelings in the continuity of self is explained in part by the constancy of the quality of emotion feelings. A happy or sad feeling today is the same in quality as the happy or sad feeling of yesterday and of tomorrow. Continuity of self-identity also is fostered by the stability of the frequency of each emotion feeling. Our characteristic mood of the past is likely to be our characteristic mood of the future. Thus, a certain dependability and regularity in our emotion experiences provides stability in basic aspects of self-identity, self-concept, and personality.

In DET, emotions play a key role in the development and maintenance of self-identity and the broader construct of self-concept. Emotion feelings define the central feature of sense of self. They provide stability and continuity to self-perceptions throughout the life span (Dougherty, Abe, &

Izard, 1996). The mechanisms for maintaining stability and continuity are the motivational processes inherent in emotions. Aspects of emotion feelings that become central to the self-concept include an awareness of their distinctive qualities, their antecedents, their consequences for other aspects of the self and for others, and, eventually, an awareness of their thresholds of activation. The development of the latter increases the individual's ability to regulate emotion feelings through anticipatory plans and actions.

The stability and continuity of the emotion feelings component of the self serves as a resource factor in the child's development of social competence and a resilient personality. This is so because the stability of emotion feelings increases the child's opportunity to learn relations between emotion activators, the motivational power of emotions, and emotion-generated thoughts and actions. Low thresholds for positive emotions and the consequent positive emotionality and positive self-concept act as a protective factor against the stressful forces of a harsh environment (cf. Harter, 1990). Low thresholds for certain negative emotions may prove adaptive in certain situations (shyness can keep a child away from dangerous social environments). Although traitlike in nature, the emotions component of self and personality yields to significant changes in the social environment (Suomi, 1991).

In summary, there are four ways that emotion experiences contribute to the development of the self and self-identity (cf. Dougherty et al., 1996). First, constancy in the quality of emotion feelings contributes to the stability of self-concept and personality. The *feeling* of joy or sadness is always the same. Second, the stability of emotion experiences enables a sense of predictability and self-efficacy. For example, the infant's emotion expressions and the caregiver's dependable responses to those expressions add to the infant's sense of self as causal agent (Izard, 1978; Sroufe, 1996).

Third, the constancy and stability of feeling states provide continuity with the past and with the anticipated future. We know that certain events in the past have evoked joy, and others sadness, and that similar events in the future will have the same effect. The sameness of our feelings in the sadness-eliciting situations of yesterday and tomorrow tells us that the self is the same yesterday and tomorrow. Memories associated with happy, sad, frightening, and shaming events create a powerful connection with the past and enable us to forecast reactions and activities of the future. Fourth, the consistency of the basic functions of each of the emotions enables a stable set of connections between events, cognition,

and actions. Knowing generally how we will think and act in a situation that elicits interest or anger or sadness contributes to the sense of self-identity and self-control.

CONCLUSION

We have sketched some implications of differential emotions theory for conceptualizing emotional development across the life span. DET represents a set of arguments about the structure and functions of emotions, the multiple sources of emotion activation, and emotion-cognition relations. Life span developments within these theoretical domains concern the emergence, systemic organization, and regulation of cognition-independent and cognition-dependent emotions, the growth of interconnections of the emotions and cognitive systems, the emergence and elaboration of self-concepts and personality from emotion substrates, and the consolidation and perpetuation of stable patterns of emotionality. Continuity and coherence in these patterns anchor self-identity, self-knowledge, and self-regulation throughout the life span.

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Psychophysiology of Emotion Across the Life Span*

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Emotions penetrate the deepest recesses of human existence across the life span. They guide, enrich, and ennoble life; they provide meaning to everyday existence. Emotions promote behaviors that protect life, form the basis for the continuity in life, and compel the termination of life. Given their evolutionary heritage and daily currency, there is little wonder that emotions have preoccupied humankind throughout recorded history, and there is little doubt that emotions are biologically rooted and culturally molded.

Emotions involve cognitions (e.g., feelings, memories, appraisals); visceral, humoral, and immunological reactions; gestures, vocalizations, and expressive displays; postural orientations and overt behaviors; or varying combinations of these (e.g., Frijda, 1986; Izard, 1977; Leventhal & Mosbach, 1983). Emotions have been further characterized as being evoked by biologically relevant stimuli and by associated internal or external events, mobilizing limited attentional and cognitive resources toward pres-

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ent or future coping, and modulating internalized and externalized actions to promote generally adaptive coping responses (Malmö, 1975; Plutchik, 1980). Emotions involve an explicit evaluative categorization of a stimulus into positive and/or negative valence classes and the activation of behavioral dispositions that entail bivalent tendencies toward (e.g., approach, acquisition or consumption, affection) or away (e.g., avoidance, escape or rejection, withdrawal, repulsion) from the stimulus (Berntson, Boysen, & Cacioppo, 1993; Lang, 1995; Schneirla, 1959). These action dispositions are manifest in the somatic nervous system, even at incipient levels (Cacioppo, Tassinary, & Fridlund, 1990) and, particularly when intense or extended across time, enlist the logistical support of the autonomic nervous system (Lang, Bradley, & Cuthbert, 1990). Selected emotions such as happiness, sadness, fear, anger, surprise, and disgust have also been described universally as discrete and indubitable perceptual experiences, and each has been linked to distinctive cognitive appraisals, facial displays, and action implications.

SOMATOVISCERAL DIFFERENTIATION OF EMOTIONS

The principal issue in the contemporary literature is not whether there are distinctive biological substrates to discrete emotions but rather (1) to what extent do discrete emotions evoke differential *peripheral* (e.g., visceral) responses, and (2) what role do these peripheral responses play in emotional experience and behavior. Several years ago we reviewed the literature on the somatovisceral differentiation of emotions. We found clear evidence for the somatic differentiation of positive and negative emotions, limited evidence for the somatic differentiation of discrete emotions, and less evidence for specific emotions being associated with distinguishable and generalizable profiles of activation in the viscera (Cacioppo, Klein, Berntson, & Hatfield, 1993). We outlined several reasons that this state of the literature may not provide the final word on the ANS differentiation of emotion, however. The end-organ responses (e.g., tachycardia) of dually innervated viscera (e.g., the heart) provide little information about the activation of autonomic nerves innervating the viscera; the peripheral effects of the activation of emotional centers in the brain may be more apparent in autonomic traffic than in homeostatically organized visceral responses (Berntson, Cacioppo, & Quigley, 1991, 1993). Furthermore, the effects of specific emotions on neuroendocrine responses were and remain understudied.

Peripheral physiology also changes across the life span. If age-related changes in physiological function alter the autonomic manifestations of emotions, the autonomic differentiation of specific emotions might be masked. Thus, the autonomic differentiation of emotions may be more apparent when age is treated as a moderator variable. Finally, methodological problems have plagued much of the research on the autonomic differentiation of emotions, problems that diminish the definitiveness of null results (see Cacioppo et al., 1993; Stemmler, 1992). The methodological issues involved in testing this hypothesis are compounded, of course, when age is added as a factor (e.g., Nesselroade & Labouvie, 1985; Siegler, Nowlin, & Blumenthal, 1980).

In the present chapter, we reexamine the evidence for the physiological differentiation of and contributions to emotion with an emphasis on age-related effects, where possible. Numerous theories of emotion have been proposed since James (1884) proposed that emotional experiences were a function of peripheral responses, but those dealing with emotions accompanied by significant peripheral physiological changes are bracketed by: (1) theories that hold that discrete emotional experiences stem from distinct somatovisceral patterns (e.g., Ekman, Levenson, & Friesen, 1983; Levenson, 1988; Levenson, Ekman, & Friesen, 1990), and (2) theories that hold that discrete emotional experiences derive from cognitive appraisals that were initiated by the perception of undifferentiated physiological arousal (e.g., Mandler, 1975; Schachter & Singer, 1962). We begin by examining representative studies on the somatic differentiation of emotions and the role of somatic factors in emotional experience and behavior. We then review evidence analyses for the autonomic differentiation of emotions. Given the large number of studies and conflicting results in this latter area of research, we use meta-analytic techniques to guide this review and to examine age as a possible moderator variable. Although cognitive, social, and developmental factors influence human emotions (e.g., Izard & Malatesta, 1987; Lazarus, 1966), we focus in this chapter on the psychophysiological responses associated with emotions and their likely role in emotional experience. Thus, we end with a discussion of the role peripheral physiology may play in emotional experience and behavior.

SOMATIC ACTIVITY AND EMOTION

The classic observations of Charles Darwin (1872) suggested that facial expressions of emotion were universal. Contemporary developments in

facial expression as a marker of emotion can be traced to Tomkins' (1962) ascription of an instrumental role to facial movement and feedback in the experience of emotion and to his suggestion that high-speed filming be used to perform microscopic analyses of facial expressions and emotion. These proposals led to important methodological advances in facial coding (e.g., Ekman & Friesen, 1978; Izard, 1971, 1977). Building on this foundation, investigators over the past three decades have provided provocative evidence that: (1) at least a subset of discrete emotions have been associated with distinct overt facial expressions; (2) the induction of states in which individuals report positive and negative emotions are associated with distinctive facial actions; and (3) displays similar to those of the adult can be found in neonates and the congenitally blind (e.g., see Ekman, 1973, 1992a, 1994; Ekman & Friesen, 1978; Ekman et al., 1987; Izard, 1971, 1977, 1992; Steiner, 1979). Although observers across cultures attribute the same emotional meaning to the expressions of happiness, sadness, fear, anger, surprise, and disgust, these attributions are not perfect (Russell, 1994). Complicating research in this area, the specific emotion that is evoked (or the sequence or blend of emotions that are evoked) by a stimulus may vary across individuals and cultures; the individuals expressing emotions can invoke display rules to mask or hide the emotion they are feeling; and observers can confuse the meaning of expressions (e.g., fear and surprise).

Based on research that identified a small set of emotions which were accompanied by unique configurations of facial actions and which were labeled reliably across cultures, Ekman (e.g., 1973, 1992b) and Izard (e.g., Izard, 1977, 1992) have proposed that there is a small number of basic emotions. These basic emotions are hypothesized to be associated with distinctive innate response patterns and neural substrates. Happiness (or joy), sadness, anger, fear, and disgust are generally considered to be basic emotions, but a different five emotions (Fischer, Shaver, & Carnochan, 1990), fewer than five emotions (e.g., Panksepp, 1982), and more than five emotions (e.g., Frijda, 1986; Oatley & Johnson-Laird, 1987) have also been suggested. Ortony and Turner (1990) have challenged the very premise that there are basic emotions, and they have proposed instead that emotions are constructed from valent and nonemotional component processes. In addition, Russell (1994, 1995) has questioned whether the evidence for the universality of emotions is definitive. These are important and continuing debates that likely have implications for which emotions might be expected to have distinctive psychophysiological substrates (see

Ekman, 1992b, 1994; Izard, 1992, 1994; Panksepp, 1992; Turner & Ortony, 1992).

Facial Electromyographic (EMG) Responses as a Function of Emotion

Not all feelings and emotions are accompanied by visually perceptible facial actions, and this has limited the utility of analyses of facial actions in emotions. Approximately 20 years ago, therefore, facial electromyography (EMG) began to be used to investigate emotions. As Rinn (1984) noted, overt facial expressions are the result of varied and specific movements of the facial skin and connective tissue caused by the contraction of facial muscles. These movements create folds, lines, and wrinkles in the skin and the movement of facial landmarks, such as the brows and corners of the mouth. Although muscle activation must occur if these facial actions are to be achieved, muscle action potentials in the face can occur in the absence of any overt facial action if the activation of the muscle(s) is weak or very transient or if the overt response is aborted sufficiently early in the facial action. Facial EMG activity has therefore been especially useful in studies of emotions or emotional processes that are so weak that facial action coding is insensitive (Cacioppo & Petty, 1982; Cacioppo et al., 1990; Schwartz, Fair, Salt, Mandel, & Klerman, 1976).

Evidence from several laboratories now indicates that: (1) EMG activity over the brow (*corrugator supercilii*) muscle region is lower and EMG activity over the cheek (*zygomaticus major*) and periocular (*orbicularis oculi*) muscle regions is higher when mild positive than when mild negative emotions are evoked, and (2) EMG activity over the forehead (*medial frontalis*, *lateral frontalis*), perioral (*orbicularis oris*, *depressor anguli oris*) muscle regions does not consistently differentiate mild positive from mild negative emotions (see, also, Bush, Barr, McHugo, & Lanzetta, 1989; Cacioppo, Bush, & Tassinari, 1992; Cacioppo, Petty, Losch, & Kim, 1986; Cacioppo, Martzke, Petty, & Tassinari, 1988; Dimberg, 1986, 1988; Englis, Vaughan, & Lanzetta, 1982; Greenwald, Cook, & Lang, 1989; Lang, 1995; McCanne & Anderson, 1987; McHugo, Lanzetta, Sullivan, Masters, & Englis, 1985).

Research on facial EMG activity as a function of discrete emotions is more limited, but has produced a similar pattern of results. For instance, the early research was conducted by Schwartz and his colleagues using emotional imagery to study facial EMG responses as a function of discrete emotions. In an especially comprehensive study of facial EMG activity

in discrete emotions, Brown and Schwartz (1980) paced 60 subjects through 48 imagery conditions designed to elicit happiness, sadness, fear, and anger at three levels of intensity while EMG activity was recorded over the *corrugator supercilii*, *zygomaticus major*, *masseter*, and *lateral frontalis* muscle regions. Results revealed that fear, anger, and sad imagery were associated with higher EMG activity over the *corrugator supercilii* muscle regions than was happy imagery. EMG activity over the *zygomaticus major* region was highest during happy imagery, but was also elevated during fear imagery, and, to a lesser extent, during anger imagery. Whether these latter elevations reflect some subjects engaging in miserable or distress smiling (Ekman, Friesen, & Ancoli, 1980), to cross-talk from other muscles of the middle and lower facial regions, or to the putative phylogenetic origin of smiling and laughter in primitive agonistic displays (Andrew, 1963; van Hooff, 1972) is unclear. Increasing emotional intensity led to increased EMG activity, particularly over the *corrugator supercilii* muscle regions, during sad, anger, and fear imagery, and over the *zygomaticus major* muscle region during happy imagery. Again, EMG activity over the *masseter* and *lateral frontalis* muscle regions did not vary significantly.

Hess, Kappas, McHugo, Lanzetta, and Kleck (1992) also used emotional imagery to explore the facial EMG and autonomic patterns associated with discrete emotions. Twenty-seven female undergraduates performed three tasks: feel each of four emotions (sadness, anger, happiness, peacefulness); express these emotions without trying to feel them; and feel and express these four emotions. Participants pressed a button when they achieved the specified state, and EMG activity over the *zygomaticus major*, *corrugator supercilii*, *depressor anguli oris*, and *masseter* muscle regions were recorded during the baseline prior to each task and for 15 seconds before and after the button press during each task. Results, which were expressed as standardized difference scores from baseline, indicated that EMG activity over the *corrugator supercilii* muscle region was higher and over the *zygomaticus major* muscle region was lower during sad and anger states than during happy or peaceful states. This replicates prior research. Hess et al. (1992) further reported that “Qualitatively distinct reactions were found for the four self-generated emotions. . . . Facial EMG revealed tensional patterns that distinguished not only between negative and positive emotions, but also between emotions within the same valence” (p. 261). For instance, peacefulness was associated with relaxed facial muscles; EMG activity over the *corrugator supercilii muscle* region was lower during self-generated feelings of peacefulness than during

baseline, whereas EMG activity over the remaining facial sites did not differ from baseline. Happiness, in contrast, was associated with increased EMG activity over the *zygomaticus major*, *masseter*, and *depressor anguli oris* muscle regions (relative to baseline). In addition, Hess et al. (1992) reported that EMG activity over the *masseter* muscle region was higher in the anger than sad emotional states, but the figure and caption depicting these results showed the opposite effect. Schwartz et al. (1976) also reported that EMG activity over the *masseter* region was higher during anger than sad emotional states, but it was as high in happy as anger states in this study. In other studies, EMG activity over the masseter region has been comparable for the emotions of happiness, sadness, anger, and fear (e.g., Brown & Schwartz, 1980). These discrepancies may reflect differences in the intensity or social context of the emotional display.

Summary and Caveats

The evidence to date suggests that facial efference varies as a function of emotional valence at weak levels of emotional intensity (Cacioppo, Petty, & Tassinari, 1989), and that greater emotion-specific differentiation is achieved across the facial muscles at higher levels of emotional intensity (Ekman, 1980, 1989). Interestingly, developmental studies of overt emotional expressions reveal a pattern similar to that found for weak emotional states. Positive or negative hedonic reactions to olfactory and gustatory stimuli are detectable in neonates (Steiner, 1979) but the identification of distinct patterns of fear, anger, and sadness cannot be coded reliably until the end of the first year (Camras, Malatesta, & Izard, 1991). Fox (1991) further notes that the differentiation of emotions during the first year occurs through the process of addition and integration of new motor patterns associated with approach or withdrawal. Thus, facial EMG activity during low-intensity emotions may reflect a rudimentary bivalent evaluative disposition or motivational tendency (Cacioppo & Bernston, 1994), rather than discrete emotions.

There are also several important limitations to this research that warrant comment. First, college undergraduates have served as participants in virtually all of the research in this area. Studies with different age groups, preferably from across the life span, are needed. Second, one of the major reasons facial expressions (and somatic activity generally) has been of interest in studies of emotion is that they have been posited to play a role in the generation or modulation of an emotion. Thus, the reasoning goes,

if facial expressions contribute to discrete emotional experiences, these emotions should be associated with distinct configurations of facial activation. However, it is clear that the probability of distinct emotional expressions occurring as a function of discrete emotional states can differ dramatically from the probability of discrete emotional states as a function of distinct emotional expressions (see Cacioppo & Tassinary, 1990; Sarter, Berntson, & Cacioppo, 1996).

The research discussed thus far bears on the probability of distinct emotional expressions given discrete emotional states, whereas it is the probability of discrete emotional states given *distinct* emotional expressions that is of interest if facial EMG activity underlies or contributes to emotional experiences or indexes emotions. That is, prior research has demonstrated that mild negative emotional imagery and unpleasant sensory stimuli leads to greater EMG activity over the *corrugator supercilii* muscle region than mild positive imagery and stimuli, even in the absence of significant changes in visceral and general facial EMG activity. This corpus of research has not addressed whether EMG responses over the *corrugator supercilii* muscle region are a sensitive and specific index of emotion, however, because a multiplicity of events lead to changes in brow activity. To address this problem, Cacioppo et al. (1988) interviewed participants about themselves while facial EMG and audiovisual recordings were obtained. Afterwards, participants were asked to describe what they had been thinking during specific segments of the interview marked by distinctive EMG responses over the *corrugator supercilii* muscle region in the context of ongoing but stable levels of activity elsewhere in the face. Analyses of the videotapes indicated that observers could not differentiate the recorded segments associated with different emotions. Nevertheless, relatively low levels of EMG activity over the *corrugator supercilii* muscle region marked feelings of merriment and warmth, whereas relatively high levels of EMG activity over this region marked feelings of fear, sadness, disgust, tension, irritation, and contempt. That is, increased EMG activity over the *corrugator supercilii* muscle region was associated with lower reports of positive emotions and higher reports of negative emotions. Further differentiation based on facial EMG activity over this region was not reliable, consistent with the extant research linking EMG activity over the *corrugator supercilii* muscle region to various negative affective reactions rather than to a specific negative emotion.

Emotion as a Function of Somatic Activation

One can also examine emotional states by manipulating somatic activity (e.g., facial expression). Tourangeau and Ellsworth (1979) decomposed the facial feedback hypothesis into three specific hypotheses: (1) an appropriate (i.e., prototypical) facial expression is necessary for the subjective experience of an emotion (the necessity hypothesis); (2) the appropriate facial expression is sufficient to produce a subjective emotional experience (the sufficiency hypothesis); and (3) intensifying an appropriate facial expression in the presence of an emotionally salient stimulus intensifies the emotional experience (the monotonicity hypothesis). There is little support for the necessity or sufficiency hypotheses, but considerable evidence for the monotonicity hypothesis (e.g., see Hess et al., 1992; Rhodewalt & Comer, 1979; Strack, Martin, & Stepper, 1988; Vaughan & Lanzetta, 1981). Several of these studies have been criticized for methodological shortcomings (e.g., demand characteristics; cf. Matsumoto, 1987; Winton, 1986), and failures to support the monotonicity hypothesis also exist (Tourangeau & Ellsworth, 1979). Importantly, therefore, affectively relevant bodily movements, including arm contraction/extension (Cacioppo, Priester, & Berntson, 1993), head nods/turns (Petty, Wells, Heesacker, Brock, & Cacioppo, 1983; Wells & Petty, 1980), and postural variations (Riskind, 1984) have also been shown to modulate affective responses. Importantly, these collateral somatic influences are small and appear to be especially evident when the eliciting stimulus is neutral or unfamiliar (Cacioppo et al., 1993; Priester & Cacioppo, 1996).

A study by Levenson, Carstensen, Friesen, and Ekman (1991) on physiology, expression, and discrete emotions in old age also found evidence consistent with the contributory role of somatic activity to the emotions. Twenty elderly individuals participated in a study in which they were to express specific facial configurations that corresponded to prototypical expressions of anger, disgust, fear, happiness, sadness, and surprise. All subjects had been screened to ensure they were able to intentionally manipulate the facial muscles required to achieve the target configurations. The quality of the facial configurations, subjective reports of emotion, and autonomic patterning were recorded and compared to data from a sample of young adults initially reported by Levenson et al. (1990). Results revealed that the quality of the facial configurations was lower, subjective reports of a corresponding emotional state were less common, and autonomic activation was less intense in the elderly than young participants.

In sum, the literature on somatic response contains considerable evidence for the somatic differentiation of positive from negative affective reactions, as well as for weak somatic influences on affective reactions to stimuli. The evidence for the somatic differentiation of and influence on discrete emotional states is more limited, although it is clear that specific patterns of somatic activation are neither necessary nor sufficient for discrete emotional states. In the next sections, we provide a brief review of autonomic responses within the context of psychophysiological arousal theory, and we survey age-related effects on autonomic activation.

AUTONOMIC ACTIVITY

Psychophysiological Activation Theory

The notion of autonomic arousal has been central to analyses of emotion for more than half a century (e.g., Cannon, 1927; Mandler, 1975; Schachter & Singer, 1962). The groundwork for arousal theory can be traced to three important historical developments in the early part of this century. The first was the advent of the concept of drive in the behavioral literature (Yerkes & Dodson, 1908). The second was the concept of an ascending reticular activation system, in which the reticular formation in the lower regions of the brain was thought to control the nonspecific arousal of higher neural systems (Moruzzi & Magoun, 1949; cf. Steriade, McCormick, & Sejnowski, 1993). The third can be traced to the studies of Gaskell (1916) and Langley (1921) regarding the structure and function of the autonomic nervous system.

Cannon (1929) advanced the hypothesis that there was a diffuse, non-specific sympathetic outflow through the interconnections in the sympathetic ganglia during emergency states and that this sympathetic discharge was integrated with expressive/behavioral states—the so called “fight-or-flight” reaction. Cannon’s view emphasized the energy-releasing function of the sympathetic nervous system and the sympathetic adrenomedullary system in autonomic regulation. Research in the mid-1900s on brainstem and limbic structures reinforced the notion that autonomic, electrocortical, and somatic/behavioral states were highly intercorrelated (e.g., Lindsley, 1952; Moruzzi & Magoun, 1949), and research on the

effects of physical (Selye, 1956) and psychological (Mason, 1972) stressors on the actions of the hypothalamic pituitary adrenocortical system reinforced this thinking. Thus, a foundation was laid for a broad class of theories in which autonomic (Cannon, 1929; Duffy, 1934), somatic (Balshan, 1962; Malmö, 1959, 1975), and electrocortical (Lindsley, 1952, 1957) response channels are activated, and proprioception is intensified (Mandler, 1975; Schachter & Singer, 1962) as bodily resources are mobilized in intense motivational or behavioral states.

Differences among arousal theories typically centered on the neurophysiological implementation of the arousal mechanism, rather than on differential antecedents or functional properties of this arousal mechanism, or on its implications for social processes and behavior. In Duffy's (1957, 1962), Malmö's (1959), and Lindsley's (1952) arousal theories, cognitive and behavioral organization and efficiency were posited to increase as arousal increases to some optimal level, after which point cognitive and behavioral organization and efficiency were posited to decrease. The energization or intensive aspect of behavior, on the other hand, was posited to manifest in a straightforward fashion as general increases in physiological activity, observable in internalized responses (e.g., skin conductance, EEG) and in externalized responses (e.g., muscle tension, expressiveness).

In sum, variations on psychophysiological activation theories have been proposed to account for the low intercorrelations typically observed across autonomic indices (e.g., see reviews by Cacioppo, Uchino, et al., 1992; Fowles, 1980), but all are founded on the fundamental premise that the greater the stimulation, the greater the metabolic resources that are needed to support action demands, and the greater the autonomic change. From the perspective of activation theories, therefore, autonomic response may differentiate discrete emotions when the strength of the stimulation or consequent action implications varies, but the variability along these dimensions within discrete emotions across contexts is thought typically to be greater than the variability between (at least most) discrete emotions. Age-related changes in autonomic activation are also evident. If autonomic activity contributes to emotional experiences, these age-related changes in autonomic activation should have predictable effects on people's emotional experience. We therefore turn next to autonomic activity in adults as a function of age.

Autonomic Activity as a Function of Age

Peripheral physiology changes across the life span. If age-related changes in physiological function alter the autonomic manifestations of emotions, the autonomic differentiation of specific emotions might be masked. Fortunately, a good deal is known about the effects of aging on autonomic nervous response.

Between the ages of 30 and 70, for instance, decreases in the muscle mass of the heart and the contractility of the myocardium produce declines in stroke volume. Maximal heart rate (HR) declines by about 24 bpm, contributing to a 30% reduction in cardiac output and a 25% to 30% reduction in maximal work capacity in elderly individuals (Smith, 1984). Although cardiac performance and variability tend to decrease with age, resistance to blood flow tends to increase (Palmer, Ziegler, & Lake, 1978). Increases in systolic blood pressure (SBP) at rest and in response to physical and psychological stressors (Faucheux, Bourliere, Baulon, & Dupuis, 1981; Fleg, Tzankoff, & Lakatta, 1985; Garwood, Engel, & Capriotti, 1982; Harrison & Kelly, 1989; Johansson & Hjalmarson, 1988; Steptoe, Moses, & Edwards, 1990; Uchino, Kiecolt-Glaser, & Cacioppo, 1992) have also been associated with aging.

The age-related effects on cardiovascular activity are due to declines in vagal and sympathetic activation. Sympathetic adrenergic activity (e.g., Dambrink & Wieling, 1987; Schocken & Roth, 1977) decreases with age and there is a downregulation of beta-adrenergic receptors across age (for reviews, see Collins, Exton-Smith, James, & Oliver, 1980; Pfeifer et al., 1983). In addition, there is a significant reduction in vagal innervation of the heart across age (Hellman & Stacy, 1976; Low, Opfer-Gehrking, Proper, & Zimmerman, 1990; Vita et al., 1986; see Ingall, McLeod, & O'Brien, 1990). Consistent with the diminished innervation of the viscera with age, age-related decreases in HR reactivity have been demonstrated with psychological stressors (Barnes, Raskind, Gumbrecht, & Halter, 1982; Faucheux, Dupuis, Baulon, Lille, & Bourliere, 1983; Furchtgott & Busemeyer, 1979; Garwood et al., 1982; Uchino et al., 1992; but see Steptoe et al., 1990), physical challenges (Bertel, Buhler, Kiowski, & Lutold, 1980; Fleg et al., 1985; Hossack & Bruce, 1982; Johansson & Hjalmarson, 1988; Palmer et al., 1978), and postural changes (Palmer et al., 1978; Simpson & Wicks, 1988). Reductions in autonomic reactivity with age have also been found in pupillary functions (Pfeifer et al., 1983), and in skin conductance responses to thermal stimulation (Hellon & Lind,

1956; Low, 1993), and intradermal injection of the neurotransmitter acetylcholine (Ewing, Martyn, Young, & Clark, 1985), with changes in sudomotor activity due in part to decreases in sweat gland density with age (Ferrer, Ramos, Perez-Sales, Perez-Jimenez, & Alvarez, 1995).

If somatovisceral response contributes to emotional experience, and if the age-related diminutions in visceral activation are seen in response to emotional stimuli as well, then a dampening of emotional experience should be seen in the aged. Although the evidence is limited, this is precisely what has been found (Levenson et al., 1991). Individual response stereotypy in visceral responding—or the tendency for individuals to show a stereotypic pattern of visceral response to any excitatory stimulus—also appears to increase with age in adults (Garwood et al., 1982). This effect, combined with decreases in autonomic reactivity and a relative shift toward (relatively diffuse) sympathetic control of the viscera, should lessen any autonomic differentiation of emotions with age. We consider these issues next in our review of research on the autonomic differentiation of discrete emotions.

Autonomic Activity and Emotion

James (1884, 1890/1950) suggested that emotions were differentiated by somatovisceral responses, but James did *not* specify what these patterns should be, or for what reason particular somatovisceral patterns would be linked to specific emotions. Without theoretical guidance regarding what autonomic responses to measure and why, investigations have been reduced to descriptive explorations. Systematic empirical investigations of the autonomic differentiation of the emotions were therefore stimulated when Arnold (1945) proposed that fear and anger differed autonomically due to the differential involvement of the neurotransmitters epinephrine (fear) and norepinephrine (anger). Consequently, Arnold reasoned that blood pressure would be higher and, possibly, the heart rate lower, in anger than fear.

Wolf and Wolff (1947) subsequently described a patient with a gastric fistula whose stomach could be observed visually. Visual observations of this patient suggested that feelings of anxiety were associated with reductions in stomach acidity, blood flow, and motility, whereas feelings of anger were associated with increases in stomach acidity, blood flow, and motility. Although not strong evidence for the epinephrine/norepinephrine hypothesis, the appearance of different physiological responses being

shown during anxiety/fear and anger was seen as consistent with this hypothesis. Consistent with the epinephrine/norepinephrine hypothesis, anger was associated with higher peak diastolic blood pressures (Ax, 1953) and lower heart rate (Schachter, 1957) than fear. Unfortunately, research over the next several decades produced somewhat inconsistent results (Funkenstein, King, & Drollette, 1954) and, despite its early promise, the epinephrine/norepinephrine hypothesis is viewed as less plausible (Wagner, 1989).

This early research on the autonomic differentiation of discrete emotions emerged within the context of a literature that indicated autonomic activity varied as a function of the strength of the emotional stimulus but not as a function of specific emotions or even the valence of the emotion. Dysinger (1931), for example, monitored skin resistance as participants were presented with words that varied in their rated pleasantness. Dysinger found that skin resistance responses were positively and significantly correlated with the extremity of the words ($r = +.85$) but were unrelated to the pleasantness of the word. When early studies did differentiate the valence of the stimuli, the results could still be interpreted in terms of emotional intensity. Dickson and McGinnies (1966), for instance, exposed students who held positive, neutral, or negative attitudes toward the church to prochurch or antichurch opinion statements. A significant interaction revealed that prochurch students showed the largest skin resistance responses to antichurch statements, whereas antichurch students showed the largest skin resistance responses to prochurch statements (see review by Cacioppo & Sandman, 1981).

The early focus on electrodermal activity and emotion had its strengths and weaknesses. Skin resistance is a sensitive measure of sudomotor response that is under the control of the sympathetic branch of the autonomic nervous system. Unlike most viscera innervated by the sympathetic branch, however, the presynaptic neurotransmitter for the eccrine (sweat) glands is acetylcholine. Consequently, this measure may not mimic the effects of sympathetic activation generally on the viscera. Furthermore, electrodermal responses are unidirectional; the extent to which sweat is secreted and the number of glands activated may vary, but there is no inhibitory neural control of the sudomotor response. Thus, electrodermal responses may be exquisitely sensitive to changes in the level of stimulation but may be less sensitive to qualitative (e.g., valent) differences in the stimuli. The heart and the pupils of the eye, in contrast, are capable of a bidirectional response. Sympathetic activation elevates heart rate,

myocardial contractility, and blood pressure and produces pupillary dilation, whereas parasympathetic activation has the opposite effects. Prior research has examined the relationship of each to emotion.

Heart rate responses have been reported to differentiate pleasant from unpleasant stimuli, but the direction of the effect has been inconsistent. Significantly greater heart rate deceleration has been reported to aversive than nonaversive pictorial content (e.g., Cacioppo & Sandman, 1978; Greenwald et al., 1989; Hubert & de Jong-Meyer, 1991; Winton, Putnam, & Krauss, 1984). Imagery or negatively valent material, on the other hand, has been associated with greater heart rate acceleration (Jones & Johnson, 1980; Vrana, Cuthbert, & Lang, 1989; Vrana & Lang, 1990). Thus, the covariation between heart rate and valence is small and differs directionally across tasks.

Studies of pupillary responses were also initially encouraging, with early reports of pupillary dilation (measured in percentage difference in mean pupil area) to pleasant visual stimuli (Hess & Polt, 1960) and pupillary constriction to unpleasant visual stimuli (e.g., Hess, 1965). Hess (1965), for example, claimed that "constriction is as characteristic in the case of certain aversive stimuli as dilation is in the case of interesting or pleasant pictures" (p. 53), and reported evidence that female participants tended to show vasoconstriction to pictures of sharks. Most of the replication studies have failed to support Hess' hypothesis, however, especially in studies in which precautions were taken to control for possible methodological problems (e.g., differences in luminance and visual fixation) and potential confounding psychological variables (e.g., orienting, mental effort, fatigue, and arousal) (e.g., see Beatty, Barth, Richer, & Johnson, 1986; Goldwater, 1972; Kahneman, 1973; Stern & Dunham, 1990; Woodmansee, 1970). Furthermore, Skinner (1980) reexamined Hess and Polt's (1960) original data and reported that much of the support for the hypothesis was attributable to atypical responses from one subject. Perhaps most problematic is that no one has found a significant relationship between pupillary response and affective state when auditory, olfactory, or tactile stimuli were used (Goldwater, 1972). Thus, as in the case of heart rate and sudomotor responses, the cumulative evidence indicates that pupillary responses do not reliably differentiate positive from negative emotions.

Ekman et al. (1983), in an influential *Science* article, breathed new life into the hypothesis that the activity of the autonomic nervous system was emotion-specific. They argued that methodological problems were responsible for the null findings in prior research and reported evidence

of the autonomic differentiation of discrete emotions. Using the directed facial action task, they found that: (1) heart rate was higher in anger, fear, and sadness than in happiness, disgust, and surprise; and (2) anger could be further differentiated from fear and sadness by higher skin temperature. Ekman et al. (1983) further reported that “additional differentiation in the relived emotions task enabled distinction between sadness and other negative emotions on the basis of significantly larger decreases in skin resistance in sadness than in [fear, anger, and disgust]” (p. 1209).

This study stimulated activity and excitement in the literature, although considerable skepticism existed about the replicability of specific patterns of autonomic activation associated with discrete emotions (e.g., see Levenson, 1992; Zajonc & McIntosh, 1992). A report of replications by Levenson et al. (1990), which included data from the Ekman et al. (1983) study, determined four distinctions among negative emotions to be the most reliable: (1) heart rate increased less during disgust than anger; (2) heart rate increased less during disgust than sadness; (3) heart rate increased less during disgust than fear; and (4) finger temperature decreased less in anger than fear. These patterns, although much weaker, were reported by Levenson et al. (1991) in their study of emotion in an elderly sample.

Autonomic Responses as a Function of Discrete Emotions: A Meta-Analytic Review

Given the complexities and diversity of results that have been reported in this literature, we employed meta-analytic techniques to evaluate the reliability of these relationships. Table 2.1 lists in chronological order published research that has contrasted the effects of at least two discrete emotions on two or more autonomic measures in humans. Data from the Ekman et al. (1983) study served as Study 1 in the Levenson et al. (1990) study, so only data from the Levenson et al. (1990) studies were tabled and meta-analyzed.

The emotions of happiness, sadness, anger, fear, disgust, and surprise have been investigated in at least two independent studies. Data from the studies in Table 2.1 were subjected to meta-analysis, the significant results of which are summarized in Table 2.2. We focus here on meta-analyses that are based on data from at least two independent studies.

Consistent with Levenson et al.'s (1990) contention, meta-analyses revealed that (1) heart rate increased less during disgust than anger; (2) heart rate increased less during disgust than sadness; and (3) heart rate

increased less during disgust than fear (see Table 2.2). There was also a tendency for disgust to be associated with a smaller increase in heart rate than happiness. However, disgust was associated with the same heart rate response as control conditions; indeed, disgust did not differ from control on any autonomic measure. In an illustrative study, Levenson, Ekman, Heider, and Friesen (1992) found that heart rate was higher in Minangkabau subjects during directed facial expressions of fear, sadness, and anger than during the directed facial expression of disgust, but the mean change score for disgust was not greater than zero. Whether the absence of a change in heart rate during the expression of disgust reflects differences in the weak intensity of the emotion that was evoked, or instead an emotion-specific autonomic response (e.g., coactivation of vagal and sympathetic activity; see Berntson et al., 1991) remain an important question to address in future research.

Alternatively, Boiten (1996) suggested that differences in heart rate between emotions were attributable to effort-related changes in respiration. Boiten's suggestion was based on a study in which participants voluntarily adopted emotional facial expressions. Boiten found that anger, fear, and sadness were associated with larger increases in heart rate than disgust (and surprise), results that contributed to the meta-analytic findings summarized above. Based on cardiorespiratory responses to a nonemotional facial expression and self-report data, however, Boiten found that changes in heart rate could be interpreted in terms of effort-related changes in respiration rather than in terms of emotion-specific autonomic activation.

Heart rate responses were also found to be larger in anger than happiness, in fear than happiness (which also differed on finger pulse volume), in fear than sadness (which differed also on respiration rate), in anger than surprise, in sadness than surprise, and in happiness than surprise.

The only other replicable autonomic differentiation noted by Levenson et al. (1990, 1991) was that finger temperature decreased less in anger than in fear. Meta-analyses revealed this effect did not achieve statistical significance when the results of all studies were considered.

Several other reliable results also emerged from the meta-analysis. Consistent with prior claims, anger was associated with higher diastolic blood pressure than fear, and meta-analyses further revealed that anger was associated with more nonspecific skin conductance responses, smaller increases in heart rate, smaller increases in stroke volume and cardiac output, larger increases in total peripheral resistance, larger increases in

TABLE 2.1 Studies Comparing Two or More Physiological Measures as a Function of Two or More Emotions

Study	Age Range (Mean or Mode)	Emotions [Induction]	Dependent Variables
Ax, 1953	21–55 (27) <i>n</i> = 43*	Anger, Fear [Real life]	SBP, DBP, SV, HR, FCT, FT, NNSCRs, # MTP, SCL, EMG, RR
Funkenstein, King, & Dro- lette, 1954	19–24 <i>n</i> = 52*	Anger In (21 Ss), Anger Out (22 Ss), Fear (Anxiety; 9 Ss) [Psycho- logical stressor]	HR, SBP, DBP, SV, CO
Schachter, 1957	(normotensives: 38; potential hy- pertensives: 41; hypertensives: 42) <i>n</i> = 48 ¹	Anger, Fear, Pain [Real life]	HR, SBP, DBP, FCT, HT, SCL, EMG, II, RR, SV, CO, TPR
Sternbach, 1962 ²	all 8 years old <i>n</i> = 10	Fear, Happiness, Hu- mor, Sadness [Film]	SRL, gastric motility, RR, HR, EOG, FPV
Averill, 1969	17–24 (18) <i>n</i> = 54	Happiness, Sadness, Control [Film]	HR, SBP, DBP, FCT, FT, SCL, FPV, NNSCRs, RR, RI
Tourangeau & Ellsworth, 1979	undergrads <i>n</i> = 123	Fear, Sadness, Neutral [Film ³] crossed with Fear, Sadness, Neutral expression, Undirected as to expression [DFA]	HR, SRL, NNSCRs
Schwartz, Weinberger, & Singer, 1981	undergrads <i>n</i> = 32	Anger, Fear, Happiness, Sadness, Relaxation, Control [Imagery ⁴]	HR, SBP, DBP
Roberts & Weerts, 1982	undergrads <i>n</i> = 16*	Anger, Fear, Neutral [Imagery]	HR, SBP, DBP

TABLE 2.1 (*Continued*)

Study	Age Range (Mean or Mode)	Emotions [Induction]	Dependent Variables
Ekman, Levenson, & Friesen, 1983 ⁵	nonundergrads <i>n</i> = 16 Only "best faces" and "best imagery" trials were reported.	Anger, Disgust, Fear, Happiness, Sadness, Surprise [DFA, Relived emotion]	HR, FT, SRL, EMG
Stemmler, 1989	(23) <i>n</i> = 42	Anger, Fear, Happiness, Control [Real life, Imagery]	HR, FT, SCL, EMG, MVT (finger and head acceleration), RR, PTT, FPV, BV, NNSCRs, FCT
Tassinari, Cacioppo, & Geen, 1989	undergrads & grads <i>n</i> = 15	Anger, Happiness, Control [DFA]	SCL, HR
Levenson, Ekman, & Friesen, 1990	18-30 <i>n</i> = 62 ^{6*}	Anger, Disgust, Fear, Happiness, Sadness, Surprise [DFA]	HR, FT, SCL, EMG/ MVT
Levenson, Carstensen, Friesen, Ekman, 1991	71-83 (77) <i>n</i> = 20* Only "best faces" and "best imagery" were reported.	Anger, Disgust, Fear, Happiness, Sadness, Surprise [DFA, Relived emotion]	HR, FT, SCL, MVT
Hess, Kappas, McHugo, Lanzetta, & Kleck, 1992	undergrads <i>n</i> = 27	Anger, Happiness, Peacefulness, Sadness [Feel, Express, Feel-and-express]	Facial EMG, SCL, HR
Levenson, Ekman, Heider, & Friesen, 1992	16-27 <i>n</i> = 46 ^{7*} Only "best faces" were reported.	Anger, Disgust, Fear, Happiness, Sadness [DFA]	HR, FT, SCL, PTT, FPV, RSP (rate and depth)

(Continued)

TABLE 2.1 (Continued)

Study	Age Range (Mean or Mode)	Emotions [Induction]	Dependent Variables
Sinha, Lovallo, & Parsons, 1992	21–35 <i>n</i> = 26*	Anger, Fear, Joy, Sadness, Neutral state [Imagery]	HR, SBP, DBP, SV, CO, TPR, PEP, LVET
Boiten, 1996	undergrads <i>n</i> = 15* data also broken into emotional and nonemotional responders	Anger, Disgust, Fear, Happiness, Sadness, Surprise, Non-emotion, Standard control [DFA]	RSP (Ti, Te, Pi, Ttot, Vt, FRC), HR

Note: BV = Blood Volume; CO = Cardiac Output; DBP = Diastolic Blood Pressure; DFA = Directed Facial Action; EMG = Muscle Activity; EOG = Eyeblink Rate; FCT = Face Temperature; FPV = Finger Pulse Volume; FRC = Functional Residual Capacity; FT = Finger Temperature; HR = Heart Rate; HT = Hand Temperature; II = Inspiratory Index; LVET = Left Ventricular Ejection Time; MVT = Movement, # MTP = Number of Muscle Tension Peaks; NNSCRs = Number of Nonspecific Skin Conductance Responses; PEP = Pre-ejection Period; Pi = Postinspiratory Pause; PTT = Pulse Transit Time; RSP = Respiration; RI = Respiration Irregularity; RR = Respiration Rate; SBP = Systolic Blood Pressure; SCL = Skin Conductance Level; SRL = Skin Resistance Level; SV = Stroke Volume; Te = Expiratory Time; Ti = Inspiratory Time; TPR = Total Peripheral Resistance; Ttot = Total Cycle Duration; Vt = Tidal Volume

¹18 hypertensives, 8 potential hypertensives, and the same 15 normotensives as in Ax, 1953.

²Although this study is included in this descriptive table, it is not included in the meta-analyses because no inter-emotion comparisons were reported.

³No significant effects were found for differences in facial expressions during the film.

⁴Participants imagined a scene in which they felt the appropriate emotion as they were (in their imagination) exercising on a one-step.

⁵The DFA results of this study were subsequently incorporated into Levenson et al., 1990.

⁶This article combined results from three experiments: Ekman et al., 1983; a group of 16 Ss selected from 103 screened; and a group of 30 Ss selected from 109 screened.

⁷Participants were from the Minangkabau community in West Sumatra.

*Indicates that participants were selected based on ability to control facial muscles, on ability to produce appropriate imagery, or on whether they experienced the emotions of interest.

TABLE 2.2 Autonomic Differentiation of Emotion Across Studies

Emotion Contrast	Measure	<i>d</i> +	<i>p</i>
Anger-Control	DBP*	1.06	.000
	HR	0.22	.011
	SBP*	1.05	.000
Anger-Disgust	HR	0.65	.000
Anger-Fear	CO	-0.66	.000
	DBP	0.43	.000
	FCT	-0.25	.045
	FPV*	0.2464	.012
	HR	-0.16	.019
	NNSCRs	0.320	.014
	SV	-0.25	.015
Anger-Happiness	TPR	0.522	.002
	DBP*	1.00	.000
Anger-Relaxation	HR	0.18	.021
	HR*	0.84	.000
Anger-Sadness	DBP*	0.72	.000
Anger-Surprise	HR	0.62	.000
Disgust-Fear	HR	-0.43	.000
Disgust-Happiness	SCL	-0.27	.031
Disgust-Sadness	HR	-0.43	.000
Disgust-Surprise	SCL	-0.40	.012
Fear-Control	FCT*	-0.39	.012
	HR	0.32	.000
	NNSCRs*	0.23	.004
	SBP*	1.02	.000
	SCL	-0.18	.009
Fear-Happiness	FPV*	-0.31	.013
	HR	0.32	.000
Fear-Sadness	HR	0.15	.018
	RR*	-0.39	.005
Fear-Surprise	HR	0.64	.000
	SCL	0.31	.052
Happiness-Control	DBP*	0.32	.017
	MVT*	-0.33	.033
	NNSCRs*	0.72	.000
	SBP*	0.51	.000
	SCL	0.29	.001
Happiness-Relaxation	HR*	0.84	.000
	SCL*	0.65	.000

(Continued)

TABLE 2.2 (*Continued*)

Emotion Contrast	Measure	<i>d</i> +	<i>p</i>
Happiness-Sadness	DBP *	-0.69	.000
	SBP*	-0.42	.002
Happiness-Surprise	HR	0.33	.025
Sadness-Control	DBP*	0.94	.000
	FPV*	-0.48	.000
	HR	0.21	.000
	NNSCRs*	0.21	.014
Sadness-Relaxation	SBP*	0.96	.000
	HR*	0.92	.000
Sadness-Surprise	SCL*	0.52	.001
	HR	0.50	.001

*Indicates that for the particular measure, the emotion contrast was studied only in young populations. Therefore, no analyses of age-moderation is possible because there was no older comparison group.

facial temperature, and larger increases in finger pulse volume than fear. Thus, anger appears to act more on the vasculature and less on the heart than does fear. Whether these differences reflect the negative feedback effects of the baroreceptors requires further research.

The diastolic blood pressure response was also higher in anger than sadness or happiness, and in sadness than happiness (which also differed on the measure of systolic blood pressure); no other differences were reliable. The diastolic blood pressure response associated with fear did not differ from that associated with sadness or happiness. Most of these meta-analytic results were characterized by high heterogeneity, however, suggesting that anger, fear, sadness, and happiness may have differential effects on peripheral vascular function, and that one or more unspecified variables are also likely moderating these relationships.

There is little evidence for replicable autonomic differences in pairwise comparisons of the emotions on the measures of bodily tension, facial temperature, respiration amplitude, inspiration volume, and cardiac stroke volume. Furthermore, Ekman et al. (1983) reported that skin resistance level decreased (i.e., skin conductance increased) more during sadness than in fear, anger, and disgust. This differentiation was found in Ekman et al. (1983) only when imagery was used to elicit the emotions; however, these differences have not been replicated. Meta-analyses did show that

skin conductance level increased less in happiness than disgust and less in surprise than disgust but, as noted above, disgust did not differ from control conditions in terms of any autonomic response.

Finally, fear was associated with greater increases in skin conductance level than surprise, and greater increases in nonspecific skin conductance responses and smaller increases in skin conductance level than sadness. Too little data exists on several other measures (e.g., systolic time intervals, finger pulse volume, pulse transit time, body movement) to draw strong conclusions.

Autonomic Activity and Emotion Across the Life Span

Ancillary analyses were performed to determine whether age served as a moderator variable. It is important to note that research in this area has focused almost exclusively on young adults. The study by Levenson et al. (1991) represents a notable exception. As would be expected based on age-related changes in autonomic activity reviewed in the preceding section, the magnitude of the autonomic responses observed by Levenson et al. (1991) was much smaller than those observed in young adults using identical procedures (e.g., the directed facial action task). Interestingly, the elderly participants also showed a weaker subjective emotional response to these emotion-eliciting tasks. Although this result is nonexperimental, it raises the possibility that visceral as well as somatic feedback contributes to emotional experience.

For the meta-analysis, the studies by Levenson et al. (1991, $M_{\text{age}} = 77$ years), Schachter (1957, $M_{\text{age}} = 40$ years), and Ax (1953, $M_{\text{age}} = 27$ years) were classified as testing older participants, and the remaining studies were classified as testing younger participants. (Finer distinctions, treating for instance Ax, 1953, as moderate age did not alter the results of the meta-analyses.) The results are summarized in Table 2.3. It is worth keeping in mind that the effect size statistics refer to the size of the difference between the specified conditions, not the magnitude of the autonomic response. For instance, the effect sizes for diastolic blood pressure of .21 and .67 for the older and younger subjects, respectively, mean that: (1) the discrimination of anger from fear by diastolic blood pressure was greater for the younger than older subjects; and (2) in both cases, the change scores reported in the literature for diastolic blood pressure were larger in anger than fear. The number in the right column

TABLE 2.3 Age-Moderated Autonomic Differentiation of Emotion

Emotion Contrast	Measure	<i>d</i> +		<i>p</i>
		Older	Younger	
Anger-Fear	DBP	.21	.67	.032
	FCT	-.28*	.57	.001
	FT	-.13	.24	.030
	HR	-.37	-.05	.021
	NNSCRs	.85*	.06	.004
	RR	-.31	.09	.027
	SCL	-.61	.12	0.00
	SV	-.09	-.67	.012
Anger-Surprise	HR	.00*	.79	.027
Fear-Control	SCL	.00*	-.71	.028
Fear-Surprise	HR	.00*	.82	.022

*The *d*+

 estimate is based on a single study.

of Table 2.3 represents the *p* value for the meta-analytic test comparing the difference in effect sizes for younger and older participants.

As in the general meta-analysis, the pair of emotions that has received the most attention is anger-fear. The effect size for older participants in the comparisons of anger-fear for NNSCRs, and of anger-surprise, fear-control, and fear-surprise are based on a single study and, therefore, are summarized in Table 2.3 for descriptive purposes only. The remaining entries suggest greater autonomic differentiation of anger-fear in younger than older participants on the measures of diastolic blood pressure, facial temperature, finger temperature, and stroke volume, and greater autonomic differentiation in older than younger participants on the measures of heart rate, respiration period, and skin conductance. Respiration can affect both heart rate and skin conductance, so research is needed to determine whether the latter effects (wherein autonomic differentiation is greater for older than younger participants) are due simply to older participants showing larger changes in breathing during anger than fear. The balance of the data are consistent with a diminution of autonomic specificity with age.

Summary and Caveats

Although some evidence was found for selected differences in autonomic response between some emotions, it is not yet clear that this differentiation

is a function of the discrete emotions per se. The meta-analytic results summarized in Table 2.2 represent the outcomes of 281 comparisons of different sets of effect sizes in this literature. Given the large number of comparisons that were performed, even the significant comparisons, and especially those that are based on only a few studies, should be interpreted cautiously. Additional research is required to determine the mechanisms contributing to the significant effect sizes uncovered in this meta-analysis, whereas the various null effects revealed by this meta-analysis may help steer research to potentially more productive areas of inquiry.

For instance, potential patterns of autonomic activation that discriminate emotions may not be describable by gross measures of end-organ response (e.g., heart rate). A major obstacle in identifying autonomic patterning as a function of emotion, particularly for dually and antagonistically innervated organs such as the heart, is the many-to-one mappings that may obtain between underlying neural changes and organ response. Emotional stimuli do not invariably evoke reciprocal activation of the sympathetic and parasympathetic branches of the autonomic nervous system. For instance, the presentation of an aversive conditioned stimulus can produce coactivation of the sympathetic and parasympathetic nervous system, with the consequent heart rate response being acceleratory, deceleratory, or unchanged from prestimulus levels, depending upon which activational input was greater (see Berntson et al., 1991). Berntson et al. (1991) recently proposed a theory of autonomic control and modes of autonomic activation that resolves the loss of fidelity in the translation between changes sympathetic and parasympathetic activation and organ responses. It is possible that emotions (e.g., disgust), or components of emotions (e.g., attention), could be differentiated if the focus were on indices of the sympathetic and the parasympathetic innervation of the viscera rather than on visceral responses per se. For instance, Quigley and Berntson (1990) found the deceleratory heart rate response to a low-intensity nonsignal ("orienting") stimulus was small because both parasympathetic and sympathetic activity increased. The acceleratory heart rate response to a high-intensity nonsignal ("defense") stimulus, on the other hand, was larger not because sympathetic activation was greater than shown to the low-intensity stimulus, but because parasympathetic activity was unchanged or decreased slightly in response to the high-intensity stimulus.

An additional issue that requires further study concerns the elicitation procedures that have been used. Imagery is not an emotional elicitation procedure that has produced reliably differentiated ANS activity, even though subjects have reported differential emotional experiences (see

Stemmler, 1989; Zajonc & McIntosh, 1992). It is unclear why this would be the case unless ANS activity is responsive to the metabolic requirements of the anticipated or realized response to the emotional challenge—a requirement that would tend to be uniformly low in emotional imagery. The procedure that has produced the greatest differentiation of emotions appears to be Ekman, Levenson, and their colleagues' directed facial action task, whereby subjects are instructed to contract specific configurations of facial muscles to form prototypical emotional expressions. The subjects who qualify for participation for this procedure, however, are highly select, representing either experts in facial behavior (e.g., Ekman et al., 1983) or only about a quarter to a third of the subjects who were prescreened for their ability to contract specific facial muscles and combinations of muscles on command (e.g., Levenson et al., 1990). Even for these selected individuals, analyses have sometimes been based on fewer than half the trials (e.g., Levenson et al., 1991). These features may affect the generalizability of the significant results that did emerge from the meta-analyses.

Finally, emotion-specific ANS activity was thought by James (1884) to underlie the percept of a discrete emotional state. Due to the *causal* nature of this relationship, the following conditions are implied, at least idiographically (see James, 1890/1950, pp. 447–449): (1) emotion-specific somatovisceral patterns exist which generate emotional experiences, (2) a somatovisceral pattern begins before the experience of the corresponding emotion, and (3) the somatovisceral pattern is always followed by the experience of the corresponding emotion. Importantly, to the extent that emotional experiences are multiply determined, the experience of a discrete emotion can occur in the absence of the “corresponding” somatovisceral pattern even if somatovisceral afference is an antecedent of the emotion (Cacioppo & Tassinari, 1990). As we noted in the review of somatic activity and emotion, an important implication of this reasoning is that it is more informative to ask under what conditions and for what emotions is differential physiological activity observed than to search for an invariant relationship between emotional experience (or expressions) and physiological response. Additional research is needed on age-related changes in emotional experience as a function of variations in autonomic feedback rather than, as has tended to be the focus, looking for autonomic patterns as a function of discrete emotions (Cacioppo & Tassinari, 1990; Sarter et al., 1996).

The notion that autonomic activation and its associated feedback can influence emotional states was advanced perhaps most forcibly by

Schachter and Singer (1962, 1979). According to Schachter and Singer (1962), the sensation of physiological arousal, if unaccounted for, creates an "evaluative need" that leads to an active search for a plausible cause of, and label for, the experienced change in arousal (see, also, Mandler, 1975; Reisenzein, 1983; Schachter, 1964). What begins as a diffuse and ambiguous (general arousal) signal from the body is thereby transformed into a specific feeling of emotional experience by the addition of an appropriate cognitive label. Investigators have subsequently questioned the likelihood that sudden physiological changes are perceived as being neutral, but two principles derived from Schachter and Singer's (1962) model can be found in numerous psychological theories: (1) changes in perceived autonomic activation are thought to be elicited by a wide variety of emotional stimuli; and (2) when an explanation for such a change is not apparent, the individual is thought to utilize the available contextual information to interpret the somatovisceral sensations.

An interesting example is provided by Berscheid and Walster's (1978) theory of the development of intense sexual or romantic attraction (i.e., passionate love). According to this model of interpersonal attraction, the detection of a new and high level of autonomic arousal, regardless of the source of the activation, leads to passionate love as long as one attributes his agitated state to passion (see, also, Zillmann, 1984). Thus, passionate love is posited to result from a combination of perceptible visceral activation and a passion-appropriate label gleaned from situational cues associated with that activation. If the situational cues lead an individual to label his or her felt arousal in a manner inconsistent with passionate love, then passionate love will not be realized, even though the physiological reaction may be identical to one that, when coupled with a passion-appropriate label, results in the feelings of passionate love. Moreover, even if a passion-appropriate label is selected, passion wanes as the feelings of arousal diminish. In an interesting variation on this principle, Zillmann (1978, 1983) reviews evidence that affective and behavioral responses can be intensified by the *residual* autonomic activation produced by an irrelevant event.

THE ROLE OF SOMATOVISCERAL AFFERENCE IN EMOTION

Whether or not the conditions for and the elements of emotion-specific autonomic patterns of activity can be identified, two findings do appear

warranted: (1) discrete emotional percepts can occur even when the autonomic changes do not discriminate fully the emotions that are experienced; and (2) autonomic activation can alter the intensity, if not the nature, of emotional experience. If discrete emotional percepts can occur even when the autonomic changes do not discriminate fully the emotions that are experienced, does it necessarily follow that somatovisceral afference plays *no* role in defining these discrete emotional percepts? Cannon's (1927) answer to this question was yes; autonomic events were too slow, too insensitive, and too undifferentiated to contribute to emotions. Schachter and Singer (1962) revolutionized thinking about emotions when they suggested that undifferentiated autonomic activity *could* subserve discrete emotions. The mechanism by which this was accomplished, according to Schachter and Singer (1962; Schachter, 1964; see, also, Mandler, 1975; Reisenzein, 1983), was the arousal of an "evaluative need," which motivates the individual to understand and label cognitively his or her bodily feelings. The consequent attributional processes were thought to produce specific emotional states and influence emotional behavior. There is yet another distinct way in which peripheral bodily reactions may contribute to emotional experience—an active *perceptual* process by which an ambiguous pattern of somatovisceral afference is disambiguated to produce an immediate, spontaneous, and indubitable emotional percept (Cacioppo, Berntson, & Klein, 1992).

Somatovisceral Model of Emotion

These considerations led to the development of a general framework within which to view the various mechanisms by which somatovisceral afference may influence emotional experience (see Figure 2.1). The Somatovisceral Afference Model of Emotion, or SAME, specifies psychophysiological conditions under which (1) the *same* pattern of somatovisceral afference leads to discrete emotional experiences, and (2) quite different patterns of somatovisceral afference lead to the *same* emotional experience (Cacioppo et al., 1992; Cacioppo, Klein, et al., 1993). A stimulus is depicted in Figure 2.1 as initially undergoing a rudimentary evaluation. This rudimentary evaluation is represented in a central state that determines the initial motivational (e.g., approach/withdrawal) tendency and generates peripheral and central changes.

Somatovisceral changes are not depicted as being involved in this initial appraisal, but may nevertheless play an important role in the arousal of discrete emotional states. Specifically, the model considers the possibility

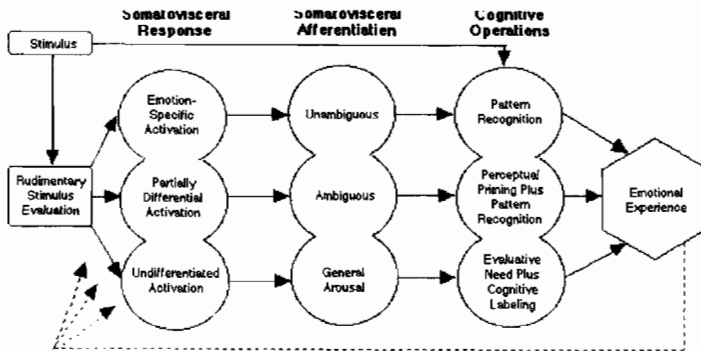


FIGURE 2.1 The somatovisceral afference model of emotion (SAME). The same pattern of somatovisceral activity has been associated with surprisingly different emotions, and the same emotion has been associated with quite different patterns of somatovisceral activity. These results have been viewed as evidence against the importance of somatovisceral afference in emotion. The SAME, depicted above and described in the text, encompasses both of these findings while emphasizing the instrumental role of somatovisceral afference and cognitive/perceptual processes in producing each.

From "What Is an Emotion? The Role of Somatovisceral Afference, with Special Emphasis on Somatovisceral 'Illusions,'" by J. T. Cacioppo, G. G. Berntson, D. J. Klein, 1992, *Review of Personality and Social Psychology*, 14, p. 87.

that somatovisceral activity could range from emotion-specific patterns of activation to completely undifferentiated activation, with ambiguous somatovisceral activation (i.e., partially differentiated activation patterns specific to multiple emotions) falling between these two endpoints along a continuum of somatovisceral patterning (see Figure 2.1, left column). The nodes along this continuum represent important transitions in the constitution of the autonomic response, but the openings between these nodes underscore the continuous nature of this dimension. The pattern of somatovisceral activation produces a parallel continuum of somatovisceral sensory input to the brain. The arrows between nodes denote the major pathways for information flow.

In addition to these peripheral events, the emotional significance of the stimulus and the somatovisceral afference undergo more extensive cognitive evaluation in normal adults. Thus, Figure 2.1 also depicts the cognitive operations performed on the somatovisceral afference required to produce discrete emotional states. The extent of the cognitive elaboration

tion of the somatovisceral afference required to produce an emotional experience ranges from simple informational analyses such as pattern recognition (e.g., James's theory of emotion as the perception of discrete patterns of somatovisceral afference) to much more complex attributional analyses and hypothesis-testing (e.g., Mandler's theory of emotion), with simple cognitive appraisals of the stimulus and perceptual priming of an emotion-schema falling between these two endpoints. The more extensive these cognitive operations, the longer it requires for them to be completed and, consequently, the longer it takes for the somatovisceral afference to affect emotional experience. Thus, simple pattern recognition can produce an emotional experience relatively quickly, whereas detailed cognitive appraisals, attributional analyses, and systematic hypothesis testing can take longer. Note that quite different patterns of somatovisceral afference (see Figure 2.1, left column) can lead to the same emotional experience via three very different psychophysiological mechanisms (see Figure 2.1, right column), whereas the same pattern of somatovisceral afference can lead to discrete emotional experiences by two distinct psychophysiological mechanisms: (1) somatovisceral "illusions," when the afference is ambiguous and an emotion-schema has been primed (see below); and (2) cognitive labeling, when the perception of the afference is undifferentiated with respect to an emotion and there is an evaluative need. The former of these mechanisms is outlined briefly here.

Emotional Percepts as Somatovisceral Illusions

The essential feature of the proposition that discrete emotions can result from "somatovisceral illusions" can be illustrated by analogy using the ambiguous visual figure depicted in Figure 2.2 (see Cacioppo, Uchino, et al., 1992, for a more complete description of the model). Even though there is only one set of visual contours and features in Figure 2.2, top-down processes make it possible for a person looking at this picture to see or experience two very different perceptual images: the face of an old woman, or the face of a young woman. Once these images have been identified, individuals can alternate quickly between seeing these discrete images, but they cannot both be seen at once. That is, the same visual afference can lead to two different, discrete, and indubitable perceptual experiences.

Ambiguous visual figures such as the one depicted in Figure 2.2 are constructed using elements from two (or more) unambiguous images in



FIGURE 2.2 An ambiguous figure constructed from overlapping unambiguous elements. The picture can be seen as an old woman or a young woman. These discrete images are derived from the same line drawing and, although one can switch rapidly between these images, one cannot perceive both images simultaneously.

“My Wife and My Mother-in-Law,” by W. E. Hill, 1915, *Puck*.

such a way that the figure created by overlapping or slightly modifying the elements of the unambiguous images can be interpreted in multiple discrete ways (Sekuler & Blake, 1985). Because the same sensory information in an ambiguous figure can produce such strikingly different, immediately obvious, and unambiguous perceptions, Leeper (1935) referred to ambiguous figures as reversible illusions. These illusions do not decay with age; consequently, aging would be expected to be associated with diminished emotional intensity as autonomic reactivity to emotional stim-

uli declined, but the experience of discrete emotions should be just as possible through this mechanism in the aged as in the young.

The middle nodes of Figure 2.1 denote that the active perceptual processes underlying reversible visual illusions are not limited to visual information processing, but can also operate on interoceptive (e.g., visceral) and proprioceptive (e.g., postural, facial, vocal) input. For instance, the architecture of the somatovisceral apparatus is more likely to yield ambiguous afference than is the visual system (Reed, Harver, & Katkin, 1990), and it seems likely that events as important and commonplace as the emotions have cognitive representations which include somatovisceral attributes. Thus, two important features required for the production of somatovisceral illusions are plausibly in place. A unique implication of somatovisceral illusions is that discrete emotions can result from the perception of the *same* somatovisceral input when this input contains somatovisceral attributes of two or more discrete emotions. A second important implication is that these discrete emotional percepts are “reversible” (but can not be blended) as different emotional schema are serially activated. Thus, just as top-down processes make it possible for a person looking at Figure 2.2 to alternate quickly between seeing the face of an old woman and a young woman, they may also make it possible for the person on a ride at an amusement park to alternate rapidly between the states of happy excitement and near-panic fear.

Finally, inspection of Figure 2.1 indicates boundary conditions for each of these theories. For instance, James’ (1884) theory focused on the mechanism outlined in the nodes at the top of the continua, and he did not consider the direct effects of the evaluation of the evocative stimulus on the emotional state. Cannon’s (1927) theory of emotion was limited to the direct effects of the evaluation of the evocative stimulus on the rudimentary evaluative processing circuit and on the resulting activation of the viscera. Cognitive labeling theories such as Schachter and Singer’s (1962) and Mandler’s (1975) have focused more on the mechanism represented in the nodes at the bottom of the continua in Figure 2.1. And the processes underlying discrete emotions as somatovisceral “illusions” are represented by the middle nodes in these continua.

The framework outlined in Figure 2.1 is heuristic at this point. It remains important to determine what are the moderating variables governing whether discrete, ambiguous, or undifferentiated somatovisceral responses are evoked by an emotional stimulus. Once this is achieved, it may be possible to specify the mechanism by which discrete emotions

are linked to particular ANS changes (although the SAME does allow for the possibility that the discriminating features of somatovisceral afferences may be largely somatic in origin). Nevertheless, the model does posit a role for somatovisceral afference in emotional experience even when that somatovisceral afference is not unique across discrete emotions; it points to the fact that diminished emotionality in old age corresponds to the reduction in somatovisceral afference with aging; and it underscores the importance of going beyond the search for distinguishable somatovisceral patterns across the discrete emotions to examine emotional states as a function of somatovisceral afference across the lifespan. At the very least, it should diminish the tendency to view the psychophysiological mechanisms underlying emotion in terms of a simple central-peripheral dichotomy or as static across the lifespan.

CONCLUSIONS

The biological substrates of emotions are beginning to be understood. In addition to behavioral data (see reviews by Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1997), evidence from the neurosciences suggest the partial independence of positive and negative evaluative mechanisms or systems (Berntson et al., 1993; Gray, 1987, 1991). The notion dates back at least to the experimental studies of Olds (1958; Olds & Milner, 1954), who spearheaded a literature identifying separate neural mechanisms to be related to the subjective states of pleasure and pain. Gray (1991) has proposed that the septohippocampal system, together with closely related structures such as central noradrenergic and serotonergic fibers ascending from the locus coeruleus and raphe nuclei respectively, play a central role in fear and anxiety in animals. Reiman et al. (1986) used positron emission tomography (PET) scanning to compare patients who suffer from spontaneous panic attacks to normal controls (cf. Fredrikson, Wik, Annas, Ericson, & Stone-Elander, 1995; Zohar et al., 1989). Consistent with Gray's theory, the PET scans from the two groups differed in only one brain region, the area containing the major neocortical inputs to the septohippocampal system (the entorhinal area) and its major output (the subicular area). Gray has termed this brain subsystem the behavioral inhibition system, which at the behavioral level organizes reactions to conditioned stimuli associated with punishment or the termination or omission of reward.

Gray (1991) also posits the existence of what he terms the "approach system," so named because it is responsive to conditioned appetitive stimuli. In Gray's theory, the specific response to a reward differs dramatically depending on the particular reward (e.g., food, sex partner, omission of shock), "but the successful gaining of rewards would not normally differ in this way as a function of the nature of the reward concerned. Thus, it is reasonable to suppose the existence of a single system for approach to rewards, whatever these may happen to be" (p. 282). Although the neurological basis of this system is not yet fully delineated, an important role appears to be played by the dopaminergic fibers that ascend from the substantia nigra and the ventral tegmental area and innervate regions in the basal ganglia, neocortex, and limbic system, with the dopaminergic projections to the nucleus accumbens particularly important in mediating incentive motivation (see, also, Hoebel, 1985, 1988).

Davidson (1992) reviews evidence for approach and withdrawal-related systems being localized in different cerebral hemispheres, with the left frontal region implicated in approach-related emotional behavior and the right frontal region in withdrawal-related emotional behavior. For instance, Davidson and his colleagues have found that individual differences in the relative activation of the right and left frontal EEG are related to dispositional differences in positive and negative moods (Tomarken, Davidson, Wheeler, & Doss, 1992), and relative right versus left frontal EEG activity varies as a function of positive and negative events (e.g., Ahern & Schwartz, 1985; Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Fox, 1991). More importantly in the present context, Davidson and his colleagues have reported electrocortical data bearing on the separability of positive/approach and negative/withdrawal substrates, including that: (1) the experimental arousal of disgust and fear is associated with an elevation of right-sided frontal activation compared with either a nonemotional baseline or a positive emotional state (Davidson et al., 1990), (2) left frontal EEG activity is diminished in depression (Henriques & Davidson, 1990, 1991; Schaffer, Davidson, & Saron, 1983), (3) toddlers whose temperamental style it is to be reticent about approaching novel and unfamiliar people and objects show lower left frontal activation when compared to toddlers who display an uninhibited temperamental style (Davidson, Finman, Straus, & Kagan, 1992), and (4) the administration of diazepam, a benzodiazepine that reduces freezing and avoidance behavior in novel and unfamiliar settings, increased left-frontal activation in rhesus monkeys (Davidson, Kalin, & Shelton, 1993).

Brain imaging research in humans is also consistent with the notion that different cerebral structures are involved in positive and negative hedonic processes. In a recent study by George and his colleagues (George et al., 1995), regional cerebral blood flow was measured using PET in 11 healthy women who induced happiness, sadness, or neutral emotions by recalling affect-laden or neutral memories while looking at congruent happy, sad, or neutral human faces. Comparisons between the sadness-minus-neutral and the happy-minus-neutral conditions revealed that, rather than reciprocal changes in blood flow to the same brain regions, a change from sad to happy affective state produced increased cerebral blood flow to entirely different brain regions. These results supply suggestive human evidence that the neural mechanisms involved in the experience of positive and negative states differ.

Emotions, particularly *negative* emotions, have also been linked to increases in health problems, including an enhanced susceptibility to infection (see review by Cohen & Herbert, 1996), poorer response to an influenza vaccine (Kiecolt-Glaser, Glaser, Gravenstein, Malarkey, & Sheridan, 1996), and impaired wound healing (Kiecolt-Glaser, Marucha, Malarkey, Mercado, & Glaser, 1995). The mechanisms underlying the relationship between emotion and health are complex and are not yet fully understood, but several different mechanisms are likely involved, some of which imply autonomic differentiation of positive from negative affective states. Health problems increase with aging, as well, with negative emotions augmenting age-related declines in health and well-being (e.g., Kiecolt-Glaser, Dura, Speicher, Trask, & Glaser, 1991) and positive emotions having less an impact (Ewart, Taylor, Kraemer, & Agras, 1991). Given this backdrop, it is understandable why investigators have been receptive to the idea that the emotions have distinct somatovisceral effects.

Although the present review points to some distinctions, one of the more interesting questions concerning the psychophysiology of emotions is the role of somatovisceral afference in emotional experience. Although the data indicate that neither somatic nor visceral feedback is necessary or sufficient for emotional experience, we did find evidence for somatic and visceral afference playing a role in emotional experience, and we reviewed three routes by which somatovisceral afferentiation may exert this influence.

We also found that age has been largely ignored in research on the psychophysiology of emotion. This is regrettable, because age-related effects on somatovisceral activity may help illuminate the means by which

somato-visceral afference influences emotional percepts. For instance, somato-visceral reactivity declines with age. If the somato-visceral afferentiation associated with an emotional stimulus contributes to emotional percepts, the diminished somato-visceral reactivity with age would foster reductions in the intensity, if not the frequency, of discrete emotional experiences. Of course, the events that evoke emotions are not constant across the life span, and little research is available to gauge whether the somato-visceral responses to emotional stimuli that are matched for extremity across age would or would not be diminished. Only a single study (Levenson et al., 1991) has examined somato-visceral response and emotions in an elderly population. Additional research, therefore, is needed to determine whether age-related changes in somato-visceral response are mirrored in changes in somato-visceral responses to emotional stimuli; whether these somato-visceral responses and emotional experience are related; and whether any such relationships are causal or adventitious across the life span.

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**The Independence of Affects
Is Context-Dependent:
An Integrative Model
of the Relationship
Between Positive and Negative Affect***

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Most of us believe that positive feelings are the opposite of negative feelings, and that a person who is unhappy is also sad. These statements are truisms in the language of feelings, affects and emotions, as fundamental as one plus one equals two. In this chapter we ask the reader to consider the possibility that in many cases one and one does not equal two, at least when it comes to comparing positive and negative affective states. Instead, we suggest that the degree of relationship between the level of happiness and sadness (or stated more accurately, between positive and negative affect) depends on the state of the organism (that is, the person), at the time of the experience. Indeed, it appears, that most of the time, positive and negative feeling states are independent of one another: a

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person can be both happy and sad, or even unhappy and not sad. Furthermore, if we adopt our model of how people experience affects, there are some pretty extraordinary implications for how people's needs and problems are assessed, and how effective various therapeutic interventions will be. We begin, as a point of departure, with a review of some of the ways researchers have differentiated affective states. Along the way, we cover some of the current models of the relationships between positive and negative affects, briefly sketch the model we have recently adopted to account for the rather diverse set of findings of recent studies, and present some data from analyses designed to probe the validity of the model. We then discuss the implications of the model for assessment and therapeutic interventions.

Everyday understanding of affects is based in part on how we classify those emotionally charged words that we speak and those we hear said to us. A classic model of affect based on these semantic judgments was that of Osgood, Suci, and Tannenbaum (1957). Through factor-analyses of ratings of degrees of difference between affect-laden words, they identified three primary dimensions of affective judgment: Evaluation, activity and potency. The dimension of evaluation ranged from highly positive to highly negative, along a single bipolar dimension. With improvements through more sophistication in methods (e.g., Russell, 1980), these dimensions of affective judgment are still considered primary in the classification of affective aspects of language. They also fit our everyday schemas for judgments in semantic space.

These dimensions represent judgments about affects, however, and not the affects themselves. Bradburn and Caplovitz (1965) uncovered something quite different when they asked survey respondents to report directly on their affective experiences. As part of a national study of avowals of happiness, they asked participants whether they had experienced feelings such as "depressed or unhappy" and "very lonely, or remote from other people" over the past few weeks. They also asked about positive feelings such as being "on top of the world" and "particularly excited or interested in something." When asking the questions in this way, they found that the number of positive affects reported was independent of the number of negative affects. In other words, one could not predict how happy the people were from their scores on unhappiness, i.e., their negative affects.

To understand the significance of a bidimensional approach it might be useful to contrast it with a fairly well accepted model of how life

circumstances influence a person's sense of well-being: Helson's (1964) adaptation-level theory. In this model, affects are experienced along a continuum from positive to negative, and the organism adapts to each new input by resetting the neutral point for its judgment of the quality of new events based on prior event valences. Many highly positive experiences would lead the organism to reset its neutral point higher, so that each new event would be evaluated as less positive because of the resetting of the "adaptation level." Thus, all happiness is relative, and can even bring about unhappiness through changes in the adaptation-level (Brickman & Campbell, 1971).

From Bradburn's perspective, events are viewed differently. A highly positive event would increase positive affect, and its impact may influence how other affective experiences influence happiness according to adaptation-level dynamics, but that event would have no effect on negative affective states. Thus, lottery winners do not become more unhappy as a natural consequence of cashing in the winning ticket in Bradburn's model, but they would in Helson's and other unidimensional models.

CURRENT MODELS OF THE RELATIONSHIP BETWEEN POSITIVE AND NEGATIVE AFFECT

Since these early investigations of bidimensional models of affect, a number of studies have been conducted on these issues with ever-increasing precision in measurement and statistical analysis. Specifically, factor analytic procedures have illuminated empirical distinctions between positive and negative affect. For instance, Watson and Tellegen (1985) selected six published studies of transient self-reported affect, subjected the individual correlation matrices to oblique factor analysis, and discovered that two principal factors consistently emerged. Other researchers have reached similar conclusions. Numerous principal components analyses and principal factor analyses, conducted on emotion items with unipolar response scales, regularly produce the two factors of positive and negative affect (Diener, Larson, Levin, & Emmons, 1985; Lawton, 1983; Watson & Clark, 1992; Watson, Clark, & Tellegen, 1984; Zevon & Tellegen, 1982). These two largely independent affects routinely account for between one-half and three-quarters of the variance in mood inventories (Watson & Clark, 1992). Furthermore, the variance overlap between positive affect and negative affect may be quite small. The prominent affect assessment

device validated and built on the two-factor model reported correlations between positive and negative affect of $-.12$ to $-.23$, depending on the time frame involved (Watson, Clark, & Tellegen, 1988). Higher inverse correlations have been reported for older compared with younger adults, but two separate affects arise from the self-reports of all age groups (Lawton, Kleban, Dean, Rajagopal, & Parmelee, 1992). In sum, when item response choices do not force bipolar conceptualizations, positive affect and negative affect may overlap no more than 5%.

The neurophysiological basis for a bivariate approach to affects has been investigated, with findings suggesting that negative affect is processed primarily in the right cerebral hemisphere and positive affect processed in the left hemisphere (Davidson, 1983). Emotionally disturbing films projected only to the left visual field (right cerebral hemisphere) elicited higher ratings of negative affect than those same films projected solely to the right visual field (left hemisphere) (Dimond, Farrington, & Johnson, 1976).

Study of abnormal central nervous systems also supports the neuroanatomical differences between positive affect and negative affect. Deactivation of one cerebral hemisphere through damage often produces exaggerated emotional expression embodied by the intact hemisphere (Lee, Loring, Dahl, & Meador, 1993; Sackheim, Greenberg, Weiman, Gur, Hungerbuhler, & Geschwind, 1982). This contralateral phenomenon has been characterized by euphoric reactions after lesioning of the right hemisphere or by depressive reactions resulting from a damaged left cerebral hemisphere.

EMPIRICAL EVIDENCE CHALLENGING THE INDEPENDENCE OF POSITIVE AND NEGATIVE AFFECTS

While the evidence has mounted for separate affect systems, there also have been a number of challenges to a simple bivariate conception of positive and negative affects. The study of the effects of life events has led to findings not wholly consistent with the independence of affects. In these studies, the central empirical issue has been the extent to which positive and negative life events influenced positive and/or negative affects. Same-domain relationships are present when positive events increase positive affects and negative events influence negative affects. Cross-domain relationships are present when positive events reduce negative

affects, or negative events decrease positive affect. In an early review of this literature, Zautra and Reich (1983) analyzed a set of 17 studies in which positive and negative life events had been measured separately and their relationships with both positive and negative facets of mental health and well-being were tested. With few exceptions, positive events tended to relate to positive aspects of well-being (e.g., positive affect and improved life satisfaction), but they had few significant relationships with negative affective states. Negative events, on the other hand, generally showed more pervasive effects, crossing domains to lower positive affect as well as increase negative affect.

Nonindependence of events and affect, if present, would tend to call into question the notion that affective states are independent. These cross-domain effects, in which events of one affective type relate to opposite-valence affect have been reported by other investigators (e.g., Hammen & Glass, 1975; Moss, Lawton, & Glicksman, 1991; Nelson, 1990; Reich & Zautra, 1981). In overview, no "pure" model fit the data. In general, a partial independence of affects appeared most valid, with negative events showing widespread effects, contrary to the model, and positive events fitting the independence proposition.

Research involving several different approaches has also brought into question the independent affects approach. Reformulations have been proposed, fueled by advancements in (1) methodological/design considerations and (2) statistical procedures. Some researchers have investigated the "timing" issue by using longitudinal and/or multiple time-points assessment techniques; these provide greater control over reliability concerns. For instance, Diener and Emmons (1985) had subjects rate their positive and negative affect over the past year, the past month, or daily. The two factors were not correlated for the prior year's length, but were inversely correlated for the prior month's and for the daily ratings. The authors concluded that shorter time spans will result in higher inverse correlations: Bipolarity as a function of time, in effect. A similar finding was reported in a more recent paper (Suh, Diener, & Fujita, 1996). However, Watson (1988) assessed the correlations of NA and PA across six time frames (from momentary to the past year) and found nonsignificant correlations at all time periods, supporting once again a two-factor model. He attributed the difference to the actual wordings of the affect-assessing items (those which are not factorially independent, "pure measures" of affect), but those which relate to broader pleasantness-unpleasantness will be more highly inversely correlated.

Diener and Emmons (1985) and Diener and Iran-Nejad (1986) also found that the degree of the inverse correlation between positive and negative states increases at high levels of emotional intensity. Although people experience a moderate inverse correlation between the two affects at moderate or lower levels of affect, at high levels of intensity, affects become strongly inversely correlated. Presumably, people cannot experience both simultaneously when intensity is high. Thus the intensity dimension appears to be an important one, acting as a moderator of the relationship between affective states.

The independence of affects has also been attacked on statistical grounds by Green, Goldman, and Salovey (1993). They argued that correlated errors between measures of different affects obscured the inverse correlation between the "true" scores on the presence of positive and negative affect. They developed a multimethod longitudinal design that allowed estimating errors of measurement for affect and also for systematic response bias and random error. Confirmatory factor analyses incorporating these components resulted in a two-factor model with highly inversely correlated positive and negative components. Additional analyses employing the PANAS scales (Watson et al., 1988) but correcting for correlated errors among the indicators resulted in a high inverse correlation of $-.57$ between "error-free" latent constructs for positive and negative affect. The investigators concluded that positive and negative affect are "approximately bipolar."

Cacioppo and Berntsen (1994) have conducted the most comprehensive critique to date of the bipolarity assumption as it applies to attitude research. In place of a bipolar model, they developed a model of how two separate motivational substrates could lead to the presence of positive and/or negative evaluations of the same objects. Their model is a nonprescriptive one, allowing for any of three types of relationships to occur between positive and negatively valenced attributes, depending upon the particular combination of object and event variables operating at the time: 1) inverse relationships consistent with a bipolar model; 2) independence consistent with the two-factor model; and 3) positive relationships between positive and negative domains. They also discuss neurological/physiological structures and processes that provide for the potential for the full range of interactions among different affective processes. In essence, they lay the foundation for the development of new theoretical models of the relationships between positive and negative affects, through their dissection of the bipolarity assumption. We offer one such model below.

Context-Dependent Independence of Affects: The Role of the Stress Response

Our model for understanding the variable relationship between positive and negative affects is based on the premise that differences in the state of the organism at the time of the assessment influence the degree of separation between the affects. One key difference in the state of the organism which can result from exogenous events is the level of stress. It would be beyond the scope of this paper to address the many meanings of "stress" found in the literature (see Goldberger & Breznitz, 1983; Stanford & Salmon, 1993). One defining characteristic of stress that is shared by many researchers is based on information theory; stress refers to those times when the state of the organism has changed to a state of increased uncertainty (e.g., Ursin & Olf, 1993). Here, we mean uncertainty in an information-processing sense (Attneave, 1959). The organisms are faced with a change in their social/physical environment. Whether small or large, the change represents a departure from what was expected, and places some demand on the organism to identify and implement an adaptive response. These demands often take the form of events perceived to be uncontrollable, such as the termination of a highly valued relationship. The organism's response can take many forms, ranging from increased focus of attention on resolution of the problem to minimization or denial of the experience. Common to all responses is that they are methods of control over the impact of the stressor through a reduction in uncertainty in the information contained in the stressor and a narrowing in the range of behavioral choices to produce an effective stress response (Easterbrook, 1959; Paulhus & Lim, 1994).

Independent affects pose a complex set of informational requirements: Separate affective registers for incoming stimuli, and perhaps even separate motive systems for mounting responses to those inputs. When the affects are completely independent, a condition of maximal uncertainty exists, where knowledge of level of one affect provides no information on the level of the other affect, and further, response in one affective domain does nothing to change the affect level on the other domain. The maintenance of these separate systems maximizes the organism's ability to discriminate and respond appropriately to widely divergent environmental stimuli.

Under conditions of stress, we suggest that the pressures for reduction of uncertainty can mount and override any benefits that derive from a

more differentiated response to affect-laden stimuli. These pressures are mediated by central processes, and both physiological and psychological models can offer insights and predicted effects, such as stress-induced narrowing of the range of attention, increased difficulty in performance of complex judgments, and more unified, "single-minded" response to environmental inputs (Easterbrook, 1959). In our model, a principle of conservation of resources is followed: what is maintained is a steady state of informational processing capacity, i.e., uncertainty. When stress levels are high, separate affect systems are merged to simplify response options and maintain the same total level of uncertainty that the organism has established as the optimal level for its functioning.

Evidence for the Model

One of the valuable features of this model is that it provides for a testable explanation of a diverse set of findings in the literature. The frequent finding of low to moderate inverse correlations between positive and negative affect may be understood as individual differences in the level of stress for those rating their affective states. Diener and Emmons' (1985) model calls for a breakdown in the independence of the affects at the extreme ends of the two continua. Since extreme levels of negative affect describe a stressful state, by definition, Diener and Emmons' (1985) findings are consistent with the model we propose. Further, extremes of positive experience are not necessarily stressful since they are often both predictable and controllable, i.e., the type of events that do not increase uncertainty. Thus we would predict some asymmetry in the impacts of extreme positive versus extreme negative affects. Indeed, there is wide support in the literature for asymmetries in the impact and concern for negative versus positive life experiences (Taylor, 1991). The evidence includes a number of studies showing a reduction in positive affect with highly stressful negative life events, but no symmetrical decrease in negative affect with many positive life experiences. The risk-averse bias in selection of responses has also been demonstrated across many different decision-making tasks (Tversky & Kahneman, 1981). Such choices reflect a central concern for control of uncertainty in interactions with the everyday physical and social environment.

More evidence of the role of stress in establishing the context for bipolarity in positive and negative affect comes from those studies which have examined conditions under which positive events and their accompa-

nying affective states have value in reducing the level of negative affect (see Reich & Zautra, 1988 for one review). Reich and Zautra (1981) instructed one group of college students to engage in many pleasurable activities. They compared the impact of this manipulation on subsequent changes in level of psychological distress for this group and on controls who received either no instructions or who were instructed to engage in only two new pleasurable activities. While the manipulation enhanced positive affect overall compared to controls, negative affective states were lowered only for those subjects given the many-event manipulation who also had high levels of life stress at baseline. Other studies have investigated this question in correlational designs, where the interaction between the occurrence of many positive events and the occurrence of stressors is examined in the prediction of measures of psychological distress. Cohen and Hoberman (1983) found positive events interacted with negative events to lower depression, and Cohen, Burt, and Bjorck (1987) found similar results for anxiety. Nelson (1990) examined how active coping and social support influenced negative affect both cross-sectionally and longitudinally for a sample of women who varied in their levels of life stress. In support of stress-dependent relationships between positive experiences and negative affect, coping and positive support showed main effects on positive affect, but interacted with "life strains" to lower negative affect only for those with particularly stressful lives.

Zautra, Reich, and Guarnaccia (1990) investigated the role of small desirable and undesirable events in the lives of three groups of elders: those experiencing a worsening of a disabling physical condition, those suffering from a recent bereavement, and those with neither stressful experience. The disabled elders experience a chronically stressful condition where there is daily uncertainty over the next exacerbation of their illness and its consequences in terms of pain and activity limitation. That context may be especially likely to increase the level of covariance between positive and negative affective experiences. For controls, desirable events related only to positive aspects of well-being. The disabled showed a strong "cross-domain" effect, with those elders reporting many small desirable events showing considerably less psychological distress than those disabled with few desirable events. Interestingly, the bereaved did not show a similar pattern. For them, desirable events were either neutral or negative in their impact on well-being. Indeed, major loss events, such as the death of a spouse, may be qualitatively different in their impacts, potentially affecting internal mechanisms regulating motivation and incen-

tive systems (Klinger, 1975). If the death is anticipated, which was likely in the older adult sample, little additional uncertainty may have been introduced.

An Empirical Test of the Model

Missing in the group comparisons above is a direct test of the stress-context hypothesis. Since the disabled differed from controls in ways other than the level of chronic stress, there are many alternative explanations for the findings of an expanded role for positive events for that group. We sought to examine this question more directly through studies of weekly variations in events, affect, and pain for a group of rheumatoid arthritis patients.

Subjects

Study participants were 41 female rheumatoid arthritis patients (mean age 54.5, $SD = 9.84$). Each had volunteered to participate in an investigation of the prospective relationship between stressful life events, affect, and rheumatoid arthritis disease activity. All women were assessed once a week for up to 12 consecutive weeks, responding to telephone interviews which consisted of measures of negative affect, positive affect, small life events, and arthritis pain estimated over the previous 7 days.

Measures; Affect

The Positive and Negative Affect Scale (PANAS) was employed (Watson et al., 1988). This instrument has been shown to yield two separate scores on affect. Zautra, Burleson, et al. (1995) found an average correlation of $-.30$ between positive and negative affect scales from the PANAS in three samples of rheumatoid arthritis patients.

Small Life Events

A modified version of the Inventory of Small Life Events (ISLE; Zautra, Guarnaccia, & Dohrenwend, 1986) was utilized to identify weekly changes in levels of interpersonal positive and negative life events. Negative life events across four domains (spouse, family, friends, and co-workers) were summed to provide the weekly stress measure. Positive events across the same domains were similarly aggregated. The ISLE produces frequency

counts for discrete, objective events, as great caution was taken in its development to minimize confounds with health problems and affect. Interpersonal stressful events have been shown to be excellent predictors of arthritis symptoms (Zautra, Burleson, Matt, Roth, & Burrows, 1994).

Self-Rated Arthritis Pain

Each week the subjects responded to three questions regarding their arthritis pain. On 101-point analog scales, they were asked to rate (1) current level of pain, (2) average level of pain over the past 7 days, and (3) worst level of pain over the past 7 days. These three scores were summed to provide a single weekly pain index.

Results

In all, 423 weekly telephone interviews were conducted. Each participant was assigned two "baseline" interpersonal events scores. The positive baseline was defined as the average number of weekly positive events gathered over the first 3 weeks. Conversely, the negative baseline was the average number of negative events over those same 3 weeks. Then, a "high negative week" condition was derived from the negative baseline. Interviews conducted during weeks in which the small negative events score was greater than 3 times baseline were deemed highly negative. From this criteria, 33 weeks were considered highly negative. The other 390 weeks were identified as "low" negative events weeks.

The overall correlation between positive affect and negative affect across both conditions, high negative events week plus low negative events week ($n = 423$), was modest but significant ($r = -.153, p = .002$). This is quite typical of the relationship between affects often reported elsewhere (Watson et al., 1988). We then investigated this correlation within conditions. The 390 low negative events weeks also showed the usual modest negative correlation between affects ($r = -.115, p = .023$). However, results from the 33 highly negative weeks were vastly different, as shown in Table 3.1. During these weeks, positive and negative affect were inversely correlated to a substantial degree ($r = -.558, p = .001$). A Fisher's z transformation showed these two correlations to be significantly different from one another ($z = 2.70, p = .006$).

The large correlation between positive and negative affect was not manufactured through changes in mean affect scores between conditions.

TABLE 3.1 Zero-Order Correlations Across Varying Negative Events' Conditions

	Low Negative Events Weeks (<i>n</i> = 390)			High Negative Events Weeks (<i>n</i> = 33)		
	Negative Affect	Pain	Positive Events	Negative Affect	Pain	Positive Events
Positive Affect	-.115	.011	.297	-.558	-.596	.740
Negative Affect		.262	.192		.628	-.414
Pain			.096			-.464

Note. **Bold** correlations are significant at $p < .001$.

Positive affect mean levels were no different ($t(421) = .860$, ns) from low negative events weeks ($M = 3.04$, $SD = .76$) to high events weeks ($M = 2.92$, $SD = .92$). Mean levels of negative affect also were unchanged ($t(421) = .852$, ns) from weeks with low events ($M = 1.67$, $SD = .63$) to high events ($M = 1.76$, $SD = .57$). A follow-up analysis was also conducted to rule out the possibility that the large correlation was a function of increased interpersonal activity, be those events positive or negative interactions. Therefore, a "highly positive" condition was developed and defined as a week whose positive interpersonal events scores were 2 times their baseline positive events number. This definition yielded 31 highly positive weeks. Once again, the correlation between positive affect and negative affect was analyzed within conditions. During the 392 weeks considered low positive, the usual small but significant inverse correlation was noted ($r = -.159$, $p = .002$). However, unlike during highly negative times, highly positive events weeks were not met with highly correlated affects ($r = .030$, ns). A Fisher's z transformation demonstrated that these two correlations were not different from one another ($z = .67$, ns).

Finally, we investigated the influence of stressful times on affective correlates. Generally, physical symptoms are closely associated with negative affect, but not positive affect (Watson, 1988). However, given that stress modified the relationship between affects, we reasoned that other affective correlates might also be altered as a function of the stress context. Therefore, we investigated the relationship between positive affect and another negatively charged variable, pain, across stressful periods. During low stressful event weeks, correlations between affects and arthritis pain

were as expected. As shown in Table 3.1, a small but significant correlation can be seen between negative affect and pain, but not between pain and positive affect. This variable configuration agrees with the Watson (1988) conclusions. However, a radical deviation was demonstrated during highly stressful weeks. Negative affect and pain became strongly correlated, as did pain and positive affect, albeit in an inverse direction. This suggests that all three variables began to share the same “data space” when conditions were extreme and negative, as depicted in Figure 3.1. A subsequent multiple regression analysis demonstrated that pain and negative affect functioned to lower scores and predict 41.1% of the variance in positive affect during periods characterized by large numbers of negative interpersonal interactions.

Conclusions

The data suggest that positive and negative affect are two separate systems during periods of minimal negative interpersonal events, and at all levels of positive interpersonal events. These “normal” or “nonstressful” conditions characterize our environments a majority of the time. However, when the environmental context is altered such that we must endure abnormally high amounts of negative events, positive and negative affect become substantially inversely correlated.

Relationships with other variables also differed as a function of high versus low stress. During usual conditions, negative affect and pain were correlated. Positive affect and pain were independent of one another. However, under more extreme circumstances, the correlations changed. Negative affect and pain were more highly related, and positive affect and pain demonstrated a large inverse correlation. Thus, during stressful times, these normally unrelated affect systems may begin to collapse to produce a more unified response in order to conserve finite information-processing resources.

IMPLICATIONS OF A CONTEXT-DEPENDENT MODEL OF AFFECT RELATIONS

Assessment

If the model we have sketched out approximates the interrelationships between negative and positive affective states better than the conventional

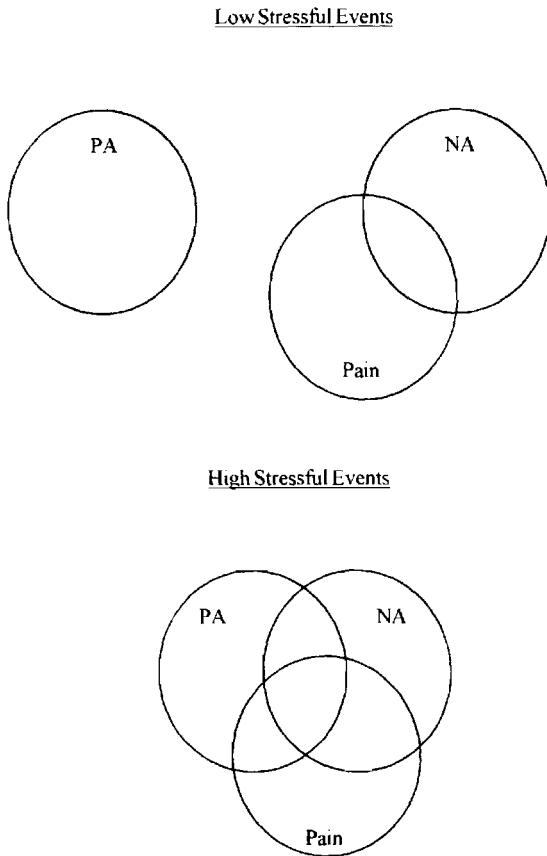


FIGURE 3.1 Shared variance changes as a function of stressful events differences.

Note. PA = Positive Affect; NA = Negative Affect.

way of conceptualizing affective states, then the methods we use to assess and intervene, across the life span, with individuals, groups, and communities need to be modified. Indeed, the scope of these changes is broad, for they challenge the appropriateness of two well-established measurement methods. First is the use of Likert scaling for the assessment of attitudes and other measures of the person for which both positive and negative affective states are relevant. For instance, the scale may vary from “highly

satisfied” to “highly dissatisfied,” or even “very positive” to “very negative.” These scales place positive affective judgments on the same continuum as negative ones, effectively subtracting “apples” from “oranges.” In order to arrive at a summary judgment which integrates the positive and negative aspects, the individual often needs to apply cognitive heuristics. The idiosyncratic mental formulas for weighing positive and negative affects in those judgments cannot be identified unless the assessments of the two underlying affective conditions are kept separate. The failure to do so may be responsible for lack of concordance in the results from similar attitude measures, and unnecessarily low levels of prediction of behavior.

Second, the person’s level of stress cannot be ignored when assessing affective states. The implication is that the very phenomenon under study changes its form and function when the person is under stress compared to when they are at rest. Thus, studies of causes and correlates of negative and positive states would need to examine such relationships under at least two different contexts in order to fully understand the ebb and flow of affects in a person’s life.

Measures of Well-Being

There are highly sophisticated models for the assessment of psychopathology, but few comparable assessments of positive states (Ryff, 1989). More to the point is the frequent failure of investigators to assess positive affective states in addition to negative affective states as outcomes of interest. Measures of adjustment as well as psychological distress typically do not assess levels of positive affect. Measures of positive mental health (Ryff, 1989) and psychological well-being, including quality of life, often include measures of positive affect (Veit & Ware, 1983), although for many of these instruments, the Likert scaling and/or item wording force higher inverse correlations between positive and negative items than is warranted. It is not surprising, therefore, to see studies continue to appear in the literature that claim no beneficial effects of positive life experiences on the person’s adjustment (e.g., Lehman et al., 1993). Inspection of the study measures typically shows either that only negative affective outcomes were assessed, or that the subjects were not assessed at varying levels of stress, or both. Only with separate assessments of positive affective conditions, and knowledge of the stress context, can a comprehensive picture of the person’s well-being be obtained.

Measures of Person-Environment Transactions: Event Methodologies

There is now ample evidence that positive events are not the opposite of negative events (Reich & Zautra, 1988). Indeed, any event may have positive as well as negative outcomes. Scaling of the impact of events with end-point descriptors ranging from "highly positive" to "highly negative" overlooks these features. Apart from the exclusion of important and separate positive life events, another problem in event measurement is overlooked. From our perspective, negative events not only contribute directly to the experience of negative affect, but they also contribute indirectly, as stressors, to increase attentional focus on the negative experiences. This dual role for negative events would explain why they often have more pervasive effects on affective states than positive events.

Gannon, Vaux, Rhodes, and Luchetta (1992) showed that everyday hassles and uplifts differ from one another in their relationship to outcomes such as symptoms of ill health and positive and negative affects. Of further interest is how these everyday events of different valences interrelate to influence affective states over time. There is considerable interest in the study of day-to-day fluctuations in negative affective states and also symptoms of ill health such as pain and fatigue, and how those negative states might be predicted by the occurrence of small negative events (Affleck, Tennen, Urrows, & Higgins, 1994). From the perspective outlined here, it would be important to identify changes in levels of positive events and affect across those same days to fully understand how everyday transactions influence affective health when the person's life is fairly calm, in contrast to times when daily life is highly stressful.

Personality Assessment

Just as there is evidence that positive and negative events are separate, there is mounting evidence that basic personality dimensions, such as extroversion and neuroticism, may be classified according to separate affective dimensions (Watson, Clark, McIntyre, & Hamaker, 1992). Thus, individuals rated more highly on extroversion tend to experience more positive affect but not less negative affect, and those classified as neurotic experience more negative affect but not less positive affect in their everyday life. Internal locus of control has been examined along these lines (Gregory, Steiner, Brennan, & Detrick, 1978) as has the Pearlin and Schooler (1978) mastery scale, and separate control dimensions for positive versus negative experiences have been identified (Reich & Zautra,

1991). Zautra, Guenther, and Chartier (1985) found a similar division of the Attribution Style Questionnaire (Peterson et al., 1982). Attributions of internality, globality, and stability for positive events were intercorrelated but unrelated to attributions of internality, globality, and stability for negative events. Further, the types of attributes had different impacts, with attribution style for negative events related to psychological distress, and attributions for positive events related only to self-esteem.

Little is known about the contribution of personality features to positive and negative affects under different levels of stress. The exception has been those studies which have examined neuroticism as a potential vulnerability factor. There is evidence that individuals high on neuroticism show a greater increase in ill health and psychological distress under stress (Affleck et al., 1994; Bolger & Zuckerman, 1995) than those low on that trait. The assumption underlying these studies has been that neurotic individuals may cope less well with stressful events. From the perspective offered here, a different explanation may be given: That stress creates a context within which linkages among all affect-laden features are strengthened, including the association between personality dispositions, such as neuroticism and negative affective states. Since personality dispositions themselves reduce uncertainty through the narrowing of response alternatives, they may indeed play a greater role in defining behaviors when stress is high. We would urge further thinking and empirical research along these lines, because the model provides a parsimonious way to understand how personality factors often vary over time in their influence health and mental health.

Therapeutic Interventions

When a person seeks help, how should the therapist intervene? From the perspective of bipolar models, the source of distress is identified, and treatments are applied that will maximize the person's chances of recovery from those problems. What if the intervener adopted the model sketched above? How would he/she respond differently to the needs of the person? If a community were interested in prevention of mental health problems, would they design different programs when adopting our model?

The answer to both questions is "yes." The very nature of individual as well as community needs changes when adopting the perspective we offer here. First, positive affects, as well as the amelioration of negative affective experiences, become targets for intervention and health/mental

health promotion activities. Secondly, interventions need to be designed that take into account the state of the person at the time they are being implemented. Indeed, what is effective when the person is in crisis from stressful events is very different from what may work for a person under normal circumstances.

Pharmacological Therapies

There has been a tremendous surge in the use of antidepressive medications since the advent of a new class of medications which function at least in part as serotonin reuptake inhibitors (SRIs; Hyman, Arona, & Rosenbaum, 1995). Newer versions of these medications stimulate the production of other neuropeptides as well, such as norepinephrine and dopamine, which are thought to regulate emotive processes. The reach of these medications now extends into the treatment of obsessive-compulsive disorders, and chronic pain, where low dosages have proven effective. The medications may also be used as a means of reducing feelings of stress for those overburdened by the events of the day, even though they are not approved for use in this fashion. These medications could be lowering negative affect, increasing positive affect, or both through their stimulation of various neuropeptides. These medications may also have their primary influence in lowering the level of physiological signs of stress. As stress reducers, these SRIs may be unlinking low positive affect and negative affect, and in doing so, reduce the burden of an unfulfilled life on the depressed state of the individual. In that way, they would be serving more as modern-day tranquilizers than antidepressants. They may be also be reducing the level of negative affect that arises from personality features, thus freeing the person from the impact of cognitions and affects that derive from neurotic patterns of interpreting and responding to their social world. The point is that we need to know how levels of stress and affects are changed biochemically by these medications, before we can fully understand their benefits for depressed patients and for others who might use these drugs.

Medications may eventually be designed for specific affective and/or stress systems. Examples of this are medications under consideration as agents to slow the course of neurological impairments, such as Alzheimer's or multiple-infarct dementia. A study by Isen, Daubman, and Nowicki (1987) suggests that enhancing positive affect facilitates problem-solving possibly through "an awareness of more aspects of stimuli, and more

possible ways of combining them'' (p. 1130). Medications targeted to enhance positive affect may be useful, therefore, in slowing the rate of deterioration among those with various forms of dementia.

Efficacy trials for drugs also would be more accurate if they were designed so as to evaluate the utility of psychoactive medications when the person is under stress, as well as at rest psychophysiologicaly. According to our model, the level of stress may determine how the affect systems influence one another. This is a new way of thinking in the evaluation of the efficacy of medications: the drug's effects may be context-dependent. Such complexities are overlooked currently, but, if our model is correct, attention to the state of the organism when evaluating medications should yield more effective methods of administration of pharmacotherapies, and even better medications, in the long run.

Cognitive-Behavioral Interventions

The focus of much therapeutic work presently is cognitive-behavioral. In these models, affects are seen as the outcomes of a complex interplay of a number of related cognitive processes, including appraisals of threat and/or challenge from environmental events, attributions concerning the cause of positive and negative life events, perceptions of control, and a sense of efficacy in one's ability to cope successfully with life's difficulties. Much attention is focused on ways of thinking that are maladaptive (Beck, 1967) such as thoughts of feeling helpless or overwhelmed with life's difficulties, and without options to improve ones' life chances. There is little or no attention to the identification of cognitions that might influence one set of emotions, such as negative affect, and yet have no influence on positive affects. Likewise, cognitions that are thought to increase feelings of happiness are typically treated as useful to help patients reduce their distress.

There actually is considerable evidence that unidimensional models of how cognitions influence affects are not accurate. Goodhart (1985) addressed the value of positive thinking in coping with stressful events and found that such thinking had no value for reducing negative feeling states, in direct contradiction to Norman Vincent Peale (1956)'s promotion of the power of such thinking. Earlier, we reviewed evidence that causal attributions and ratings of internality have been shown to have positive and negative dimensions. There is also evidence that self-efficacy falls in two domains (Zautra, Hoffman, & Reich, 1997). Persons can see them-

selves as ineffective in producing positive experiences, even though they are confident in their ability to cope with negative events.

One of the most challenging implications of this way of thinking is in the evaluation of cognitive restructuring and other adaptive strategies for coping with stress. Indeed, a number of studies suggest that these active coping strategies do little to reduce psychological distress and other negative affects. Felton and Revenson (1984), and Zautra, Burleson, et al. (1995) found that active forms of coping such as problem-solving primarily impact positive affective states, and do not reduce negative affects, among those suffering from rheumatoid arthritis. Such findings are formidable challenges to stress and coping models of intervention in chronic pain and other biobehavioral conditions.

Returning to the illustrative example from the arthritis patients presented earlier, it would appear that positive coping may be useful in deterring negative affective states, but only during times of significant stress. It is during such times that positive actions can reduce negative affects as well as increase positive feeling states. Zautra, Reich, et al.'s (1995) findings on the usefulness of coping efficacy for older adults is consistent with this type of model. In that study, elders rated how satisfied they were with their own responses to specific stressors *as they occurred*, and also rated the likelihood that they would be able to cope successfully with similar stressors, should they reoccur. This coping efficacy measure, aggregated across several months of interviews, was the single best predictor of the preservation of mental health over a 4-year period. Other measures of coping derived from an elder's attributions of cause and control over positive events had no influence on mental health .

In the almost exclusive attention given to negative states in cognitive-behavior therapies, the potential value of positive affects is overlooked. Indeed, in Zautra, Reich, et al.'s (1995) study, efficacy for positive events showed prospective benefits in the preservation of physical functioning, a key to feelings of personal autonomy, even though it had no direct effects on mental health. There is also evidence that the loss of autonomy leads to deficits in positive affect (Zautra, Burleson, et al., 1995). These relationships suggest that goal-directed activities may be furthered by increased positive affects, or lowered with the loss of those incentives. Importantly, therapeutic advice to the client to engage in approach strategies could have little impact on negative states, but, at the same time, could increase positive states significantly.

Attention to maladaptive cognitions, so-called "negative thinking," does appear to be highly effective in reducing psychological distress and

other negative affective states. If the current model is accurate, therapists could assist their clients in understanding how stressful circumstances can increase the range and extent of the impact of negative events. Thus, neurotic traits might predominate under stress and threaten to thwart efforts of the person to neutralize negative cognitions with skills taught in therapy. Further, positive emotions may be eroded under conditions of chronic stress, because of the presence of negative affective states. In those circumstances, it may be very sage advice to suggest that the person find a useful distraction temporarily, if only to avoid being overcome by negative affects. Nevertheless, in the long run, attention to negative cognitions is likely to yield the most success in assisting recovery from states of anxiety and depression.

Social Support Interventions

How does a bifurcation of affects inform us on the utility of social supportive interventions? If our model is correct, positive social supports would do little to reduce psychological distress, except under conditions of significant life stress. Guidance in how to reduce negative social interactions would appear more salient for the treatment and prevention of negative affective states. Along these lines, there are a number of demonstrations that negative social relationships have a more powerful and harmful effect on mental health than positive relationships for elders (Finch & Zautra, 1992), caregivers of Alzheimer's patients (Kiecolt-Glaser, Dyer, & Shuttlesworth, 1988), and other adults (Rook, 1984; Taylor, 1991).

Finch, Okun, Barrera, Zautra, and Reich (1989) showed that positive and negative social ties were independent of one another when measurement was done in a way that allowed for separate scores on positive and negative social interactions. As expected, positive ties related to positive affects, and negative ties to negative affects. Lawton, Moss, Kleban, Glicksman, and Rovine (1991) found that spouses who were caregivers often experienced both greater distress from the burdens of caregiving and greater positive affect from the helping relationship. Cohen and Wills (1985) in their review found considerable evidence that social support often buffered a person from the deleterious effects of stress. This interaction effect between support and stressful events would be consistent with our model, but not for the same reasons usually given. In the standard model, support is thought to be useful to help the person cope more effectively with stress. In the affect model proposed here, support blends

with other sources of positive affect more readily and relates inversely with negative affective conditions under stress, regardless of the form of coping that may be encouraged by the support provided.

One major implication of this model for support intervention is that support providers should anticipate less dramatic impacts of their involvements with patients than current models of helping would suggest. Further, the value of support should be most evident during times of stress. If our model is correct, the harm done by negative social interactions should also be most distressing when stress is high: increasing negative affective states and decreasing positive ones as well. The goal of enhancing positive affects and accompanying cognitive schemas for self-esteem, self-efficacy, and goal-oriented activities is of value, even if these improvements in quality of life do not lower the person's psychiatric distress.

The Community

Several years ago, one of us reported on the mental health of a particular census tract in Arizona, which defined the boundaries of a small Mexican-American community (Zautra, Kochanowicz, & Goodhart, 1983). The area was 87% Spanish-speaking, with high unemployment rates, poverty, and high rates of psychological distress relative to the other 45 census tracts, based on our in-home interviews of a sample of residents from each of the census tracts. If we focused on its negative attributes alone, however, important information would have been lost. This community also had high levels of positive affect and positive life events. It would have been inappropriate to characterize that Spanish-speaking enclave as having poor mental health. It would have been worse yet to intervene in that community's life in ways designed to serve those distressed, if that intervention had the iatrogenic effects of lowering the positive interactions which helped define that community as a good place to live.

Parallels exist today in attempts to govern the "mental hygienics" of those institutions designed to serve older adults. An overemphasis on protecting against negative affective experiences can lead an organization to reduce opportunities for positive affective engagement through an overmanagement of the institutional environment. Further, the interest in increasing sense of control and autonomy for elders in these environments would be useful in two ways, if the model we have adopted here is correct. Greater autonomy for the older adult increases opportunities for positive engagements, and a greater sense of control over the environment reduces

the likelihood of uncontrollable events, thus reducing the level of stress in the person's everyday life. However, behavioral uncertainty is also increased when greater autonomy is permitted, so appropriate limits need to be set to balance these various objectives within institutional life: the stability, but often arbitrariness, of institutional rules, versus the burden of choice granted to the person through empowerment programs designed for elders.

In our efforts to change community structures, what we must avoid most of all is the mistake of equating the absence of discomfort with a high quality of life when evaluating efforts toward social and institutional change. W. H. Auden (1975) put it this way in the first and last two lines of his poem, *The Unknown Citizen*:

He was known by the Bureau of Statistics to be
 Someone for whom there was no official complaint
 . . . Was he free, was he happy, the question is absurd
 Had anything been wrong, we should certainly have heard. (pp. 146–147)

Conclusions

In this chapter, we have attempted to take the usual review of the literature one step further in our examination of the independence of affective states. We proposed an integrative model that accounts for many of the contradictory findings in the literature, one which was supported in our analysis of new data from a sample of arthritis patients. By discussing the implications of the model at some length, and highlighting the contrasts between our model and unipolar conceptions of affect, we hope to have demonstrated that the assumptions we make regarding the nature of the relationships between affective states are fundamental to psychological discourse. Indeed, the validity of many of the tools used in the assessment of psychosocial factors, and the interventions designed to improve psychological well-being, depend on the assumptions that affective states are unidimensional, and that the underlying structure of affective states does not change. In our view, there is ample evidence to challenge those assumptions. We believe it is time to reform our methods of assessment and our expectations for change when evaluating the efficacy of our interventions, so that these efforts are more consistent with the view that positive and negative affects are separate rather than opposing states: states, which vary in degree of independence from one another as a

function of stress and other changes in the informational demands, and individual differences in cognitive processing.

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The Interpersonal Basis of Emotional Behavior and Emotion Regulation in Adulthood

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INTRODUCTION

Emotional behaviors of adults must be viewed within the overall context of the basic motivational structure of personality. Silvan Tomkins (1962, 1963, 1991, 1993), one of the foremost emotions theorists of this century, proposed that there were four basic human goals organized around the regulation of emotion: goals involving the maximization of positive affect, the minimization of negative affect, the minimization of affect inhibition, and the means-ends competence to achieve the other three goals. In other words, individuals will strive to do that which allows them to feel good most of the time, to limit the occasions of feeling pain and distress, to experience their emotions and express them without undue restriction, and feel empowered to guarantee the other goals. What this formulation

neglects to mention, however, is that these goals are not achieved in an interpersonal vacuum and that they require other individuals for their fulfillment.

Indeed, other human beings are the primary sources of feeling good and feeling bad. When the playwright and philosopher, Sartre, said that "Hell is other people," he did not mean that they are invariably sources of pain, but that the very socially constitutive nature of being human means that others have extraordinary influence over the way that we feel and the ways in which we conduct our lives and fulfill our emotional goals. In a large-scale survey of community-dwelling individuals (Malatesta & Kalnok, 1984), young, middle-aged, and older adults were asked to describe recent episodes in which they had experienced each of a variety of emotions. The narratives were coded on the basis of whether the emotion in the described scene was caused by the self or other. The frequency of other-caused affect was greater than self-caused affect in each affect category except shame. Thus, the majority of adult emotional experiences in this sample were generated by reactions to the behavior of others. Even shame, which was coded as "self-caused," is an emotion that can only have meaning in reference to other individuals.

According to more recent formulations by Thompson (1994), emotion regulation involves monitoring, evaluating, and adjusting affective reactions in the context of goal-related behaviors, and includes intrinsic as well as extrinsic processes. Intrinsic processes refer to acquired strategies of self-management, whereas extrinsic factors involve the influence of social partners, circumstances of life, and use of mood-regulating stimulants or depressants (Cooper, Frone, Russell, & Mudar, 1995; Magai, 1996; Thompson, 1994).

In infancy, parents play an important role in helping the child to achieve affect regulation by adjusting their own behavior vis-à-vis the child's level of arousal (Fogel, 1982; Malatesta & Haviland, 1982). In later development, they teach children how to use language in the service of expressing needs and feeling states (Dunn, Bretherton, & Munn, 1987). The field of child development has paid increasing attention to the topic of emotion regulation over the past decade, with two special issues of child developmental journals devoted to the topic in recent times (Fox, 1994; Cicchetti, 1996).

In comparison, research on emotion regulation in adulthood is rather limited, although important conceptual and empirical contributions have been made by Labouvie-Vief and DeVoe (1991), Lawton (1989), Leven-

thal (1982), Schulz (1982), and Carstensen (1991). Labouvie-Vief and DeVoe (1991) provided an integration of several literatures in their chapter on emotion regulation in adulthood and later life in Volume 11 of this series, treating changes in emotion regulation within the framework of a cognitive and normative-developmental approach.

In the present work we take a different tack, one that emphasizes the interpersonal nature of affect regulation; moreover, we take an individual-difference as well as a normative-developmental approach. To this end we address the role of emotional communication in affect regulation, treating the construct from a life span developmental point of view. Hence, we cover aspects of behavioral communication (facial and vocal affect) as well as verbal emotional expression. We then consider the broader social context of emotion expression, taking particular note of its application in close relationships.

EMOTION EXPRESSION AND COMMUNICATION

As conceived of by Izard and colleagues (Izard, 1971, 1977; Izard & Malatesta, 1987; Malatesta & Izard, 1984), emotion expression has two facets or aspects. Expressive behavior serves as a signal to the self, providing motivational cues for the regulation of behavior, and also serves as an important informational signal to others. As a signal to the self, and at the most general level, feeling bad or good often is often the necessary and sufficient impetus to stop doing something, on the one hand, or to engage in more of what one is doing, on the other. According to Tomkins (1962, 1963) and Izard (1971, 1977), feedback from the face, voice, and body provides differentiated feeling states; this patterned expressive behavior is as well associated with differentiated response dispositions which have adaptational goals. Feeling afraid motivates defensive behavior, shame, efforts to reduce exposure, anger, efforts to overcome obstacles, and so forth (Malatesta & Wilson, 1988).

At the same time, expressive behaviors, unless they are inhibited, also inform interactants of one another's inclinations and response dispositions. They serve as important informational signals to social partners, inviting them to interact (joy, interest), to back off (shame/shyness), to go away (disgust), to stay away (contempt), to provide help (sadness, fear), and so forth.

Humans have at their disposal two avenues of emotion expression. Like other primates, they can express their emotions physically through

facial, vocal, and postural displays; however, they also have the capacity to verbalize their emotional states, and hence to further reveal themselves through the elaboration of their moods, feelings, likes and dislikes. Consistent with the developmental course of the emotion communication system over the life span, we review literature relevant to the nonverbal communication of emotion first, followed by the verbal expression of emotion, and conclude with emotion expression during the course of dementia, when the linguistic channel of expression is lost to the degenerative process.

Nonverbal Expression of Emotion

Emotional behavior is part of a prewired evolutionarily adapted set of behavioral propensities that are in evidence as early as the opening days of life (Izard, 1991). In the course of early development, children learn to modulate their expressive behavior in conformance with "display rules," which are culture-specific proscriptions about how, when, where, and in what form to express the various emotions. This conventionalization of emotional behavior undergoes a change during the adult years. As the work of Labouvie-Vief, DeVoe, and Bulka (1989) has shown, adolescents and young adults are more oriented toward normative proscriptions around emotion expression than are older adults. Middle-aged and older individuals are more likely to attend to inner subjectivity and to blend responsiveness to social convention with their own needs for emotional verisimilitude. Research by Malatesta and Kalnok (1984) also indicates that older adults feel less bound by inhibitory constraints of cultural display rules. In the latter study, there was a good correspondence between awareness of display rule proscriptions and the practice of inhibiting emotion expression for young and middle-aged individuals, but a low correspondence for older people.

The direct observation of expressive behavior supports the idea that older adults may be more expressive when emotionally aroused than younger individuals. Malatesta-Magai, Jonas, Shepard, and Culvert (1992) studied the facial expressions of younger and older individuals during an emotion-induction procedure in which participants relived and recounted emotionally charged episodes involving anger, fear, sadness, and interest. Older individuals were found to be more emotionally expressive than younger subjects in terms of the frequency of expressive behavior across a range of emotions: they expressed a higher rate of anger expressions in the anger-induction condition, a higher rate of sadness during the

sadness induction, greater fear under the fear-induction condition, and greater interest during the interest induction.

The facial expressive behavior of older adults may also be more expressive in another sense. Malatesta and Izard (1984) videotaped and coded the facial expressions of a group of young, middle-aged, and older women as they recounted emotional experiences. They found that although the facial expressions of the middle-aged and older women were more telegraphic than younger women (fewer component muscle movements in facial displays), their expressions were at the same time more complex, and consisted of more instances in which different emotions combined in one expression.

Although the above studies indicated that emotional expressivity is preserved, and perhaps even heightened, in later life, when objective facial-affect coding criteria are applied by skilled coders, there is some question about the communicative significance of facial expressions in the elderly in interpersonal contexts involving ordinary untrained individuals. It is a common observation that the musculature of the human face tends to lose some of its elasticity over the adult years, and with advanced age develops deep lines and furrows; such changes may interfere with the clarity of the affective signal. Malatesta, Fiore, and Messina (1987) had a group of adult untrained judges rate, from videotapes, the emotional intensity and quality of emotion expressions of young, middle-aged, and older individuals who were describing emotionally charged events. These naive decoders found the older faces somewhat more difficult to judge; moreover, the accuracy with which they judged the emotional event that subjects described (sad, fearful, happy, or angry) varied with age congruence between judges and the emotion expressors, suggesting a decoding advantage accruing through social contact with like-aged peers. Thus, older individuals may have greater facility in reading beyond the "noise" of facial wrinkling to discern the essential emotional messages of older social partners.

In summary then, in terms of developmental trends, there are several converging lines of evidence suggesting that there may be a gradual disinhibition in the expression of emotion with age, with older individuals feeling more at ease to openly express their emotions. Changes in facial musculature appear to obscure the meaning of affective signals in older people, but not appreciably so.

Verbal Expression of Emotion

Malatesta and Kalnok (1984) looked at the degree of elaboration of emotional experience by young, middle-aged, and older adults when recounting

events that involved a number of emotion-specific experiences. Respondents were asked to describe emotional events in several emotion categories, and these narrative episodes were then coded for frequency of emotion words corrected for verbosity. They found that there were no age differences with respect to the number of emotion words used to describe the events involving anger, disgust, anxiety, sadness, and excitement. However, the oldest group used fewer emotion words when recounting happy episodes.

Labouvie-Vief and colleagues (1989) performed a more qualitative analysis on similar kinds of emotion narratives collected from younger and older (middle-aged) adults and identified a developmental trend with respect to subjectivity and expression of emotion. They found that younger individuals rarely spoke of inner subjective feelings, tended to describe their experiences in terms of norms and conventions, spoke in terms of "oughts" and "shoulds," and controlled their emotions through such metacognitive strategies as forgetting, ignoring, or distracting the self. In contrast, older individuals were able to talk about their own subjective experience of emotion, were able to acknowledge complex feelings and endure the tension of conflict, and were less influenced by external group references and rules. Labouvie-Vief and colleagues also found that middle-aged versus younger subjects used a more vivid language of emotions and openly acknowledged their inner emotional experiences. Similarly, Lawton and Albert (1990), working with a particularly old group, found that these older persons had a distinct ease in acknowledging their emotions.

Despite this greater ease in articulating emotional feelings in older adults, Tomkins' thesis that individuals are motivated to minimize negative affect would lead one to expect that greater maturity might be associated with greater facility in avoiding emotionally negative situations, or in developing more effective strategies to cope with stressors. In this vein, Lawton (1989) has suggested that individuals actively create environments that optimize the mix of emotionally stimulating versus insulating features towards the goal of "affective optimization." Consistent with this thesis, Lawton, Kleban, Rajagopal, Dean, and Parmelee (1992) found that there is increasing self-regulatory capacity with respect to emotions in older individuals, with older people being higher in emotional control and emotional maturity through moderation. Older subjects were more likely to indicate greater affective proactivity, that is, to report that they chose activities so as to provide just the right amount of emotional stimulation. These findings do not necessarily contradict the studies noted above

indicating that older adults are less likely to hide their feelings and abide by social conventions regarding display rules. Indeed, it appears that the attempt to limit negative affective experience has more to do with avoidance of stressors than with restriction of affective communications once emotionally aroused.

In an examination of stressors and styles of coping in younger and older individuals, Folkman, Lazarus, Pimley, and Novacek (1987) found that relative to total coping efforts, older subjects used less confrontational coping styles than younger individuals and greater positive reappraisal, escape-avoidance, accept responsibility, and distancing. These particular patterns of coping appeared related to the fact that the older individuals experienced more stressors that were "unchangeable." Such strategies are probably quite adaptive under these circumstances. As Lazarus (1996) has pointed out, no coping strategy is inherently superior; maximum adaptation requires maximum flexibility and the utilization of a variety of strategies. Another study of coping, by Blanchard-Fields and Irion (1988), similarly found that older individuals relative to younger individuals, engaged in less blaming, expressed less hostility and showed greater altruism.

The Folkman et al. (1987) and Blanchard-Fields and Irion (1988) findings also seem to reflect on improved affect modulation and greater use of affective optimization in the sense of Lawton (Lawton, 1989; Lawton et al., 1992). In sum, older individuals appear to possess the ability to avoid the arousal or escalation of negative affect through affective proactivity; however, this does not mean that older individuals truncate their awareness of the emotional significance of events and material they encounter. Carstensen and Turk-Charles' (1994) study of affective recall in an incidental memory paradigm showed that older persons relative to younger persons recalled more affective information, suggesting that emotional information is more salient to the older person. Moreover, as the review above indicates, once emotional activation has occurred, older persons are more likely to acknowledge and articulate their feelings.

Superimposed on these developmental changes with respect to more complex subjectivity and expression, one can discern further specific changes at the level of different affects that relate to the larger context of roles and relationships. Malatesta and Culver (1984) coded material from a longitudinal study of women over a 19-year period from late adolescence to middle life. As women left college and entered the marital and childrearing years, and as their motivations shifted from achievement

to nurturance, certain emotions that had not been very salient for the cohort started to be articulated, including expressions of depression and anxiety, while anger affect correspondingly receded in prominence. In still later midlife, there was a reversal of this pattern, as anger and assertiveness increased and depression and anxiety abated, at least among those women who developed or resumed careers that they had abandoned earlier. Thus, the salience of certain moods and emotions were connected to the larger life contexts of these women's lives, with clear interpersonal links to children, husbands, and lovers in the context of roles and relationships. The kinds of emotions that surfaced and became the focus of description were very much linked to events surrounding these relationships.

What happens to emotional expressivity in advanced old age? Several studies have indicated that there is a narrowing of social networks in very late life. However, the work of Carstensen and colleagues (Carstensen, 1993a, 1993b; Lang & Carstensen, 1994, and Chapter 12, this volume) indicates that emotional communication is preserved, perhaps even in heightened form. According to Carstensen's socioemotional selectivity theory (1991; 1992), the narrowing of social networks is an adaptive strategy people use to regulate emotion, a strategy that is particularly important for the maintenance of well-being in later life because of aging effects that include reduced physical energy and increased physical fragility. Carstensen's own research (Carstensen, 1993b; Lang & Carstensen, 1994) strongly supports the theory; older people indicated that they restricted their social contact to those with whom they are most intimate.

All of the above studies involved self-report data, and as such tap the willingness of individuals to self-disclose emotional aspects of their lives, for the most part, anonymously, to research investigators. What about self-disclosure in situations more closely resembling real life? Although the following studies were structured for research purposes and were not field studies, they improve upon the foregoing studies in that they involved self-disclosure in naturalistic interactional contexts.

Coupland and colleagues (Coupland, Coupland, Giles, & Wiemann, 1988; Coupland, Coupland, Giles, Henwood, & Wiemann, 1988), videotaped younger (30–45 years) and elderly (70–87) women engaged in interaction with either a peer-aged individual or one from the other generation; all interactants were originally strangers to one another. The videotapes were subsequently transcribed and coded for sequences of painful self-disclosure. They found that painful self-disclosure was more characteristic of the elderly respondents. Elderly women spent 16.5% of their

speaking time in painful self-disclosure when interacting with a peer-aged partner, and 16% when interacting with a younger woman. In contrast, younger women spent 6% of their speaking time in painful self-disclosure with a peer-aged partner, and only 4% with an elderly partner.

Studies of emotion communication in long-term marriages have been conducted by Levenson and colleagues (Levenson, Carstensen & Gottman, 1994; Carstensen, Gottman, & Levenson, 1995). Two groups of married couples, one aged 40–50 years and the other 60–70, were asked to interact with one another in three exchanges. In one session, they were asked to have a conversation about events of the day. In a second, they were asked to discuss a problem area of continuing disagreement in their marriage, and in the third, a mutually agreed-upon pleasant topic. Each conversation lasted 15 minutes, during which time each partner's physiological activity was also recorded. A day or two later, spouses returned separately to view their recorded interactions and provide a continuous report of their subjective affective experience during each of the interactions using a rating dial that ranged from "extremely negative" to "extremely positive." Videotapes were scored using the Specific Affect Coding System.

Results indicated that older couples, compared to middle-aged couples, expressed lower levels of anger, disgust, belligerence, and whining, as well as higher levels of affection, during discussion of a marital problem; this finding held even after controlling for the severity of the problem discussed. In general, marital interaction in the older couples was more affectively positive and involved lower physiological arousal than was the case with the younger couples.

In summary, in both the verbal and nonverbal realms, the expression of emotion over the adult years does not show any substantive decline, at least in healthy older adults. On the contrary, the data indicate that as individuals mature they become increasingly capable of more complexly textured communication, of sustaining mixed feelings, of greater affective integrity, and emotional self-disclosure. Though older adults indicate that they have greater control and lowered reactivity with respect to emotional arousal (Lawton et al., 1992), this is accomplished via environmental and affective optimization (Lawton, 1989) rather than by denial of feeling. In addition, though social networks may be narrower in old age, interpersonal intimacy is preserved in those relationships that matter most. Moreover, interactions seem to be geared toward the preservation of positive affect and avoidance of or resolution of interpersonal conflict.

One might well ask if the ability to communicate emotion is preserved during dementia, when linguistic abilities are lost and when individuals are acutely dependent on others for the satisfaction of their needs.

Emotion Expression During the Course of Dementia

Lawton, Van Haisma, and Klapper (1996) studied emotion expression in older demented and nondemented adults using a behavioral coding system—the Philadelphia Geriatric Center Affect Rating Scale—and direct observation. Trained coders rated six affects (pleasure, interest, contentment, sadness, anxiety, and anger) based on 10 minutes' observation of residents' facial as well as vocal and bodily cues over a 4-week period of time.

In examining the relative frequencies and durations of emotion, they found that the 'hot' affects of anger, sadness, pleasure, and anxiety were relatively infrequent, while contentment and interest were observed during the majority of the behavior streams. All of the emotions were seen as present to some degree in the dementia patients; all but anger were present in the nondemented residents. Pleasure, interest, and contentment ratings were greater in cumulative duration among the nondemented versus demented residents, while anxiety was less. There was no difference between the two groups on sadness.

Magai, Cohen, Gomberg, Malatesta, and Culver (1996) also evaluated the emotional expressions of mid- to late-stage dementia patients (GDS stages 5–7) using a behavioral coding scheme and direct observation. The observations took place during a family visit, with facial expression coded on a second-to-second basis by research assistants trained in the Maximally Discriminative Facial Movement Coding System, MAX, of Izard (1979). Family members and nurses' aides also completed ratings of resident's emotional behaviors using a behavior rating scale. In the observation session, expressions of interest, anger, contempt, sadness, joy, disgust, and fear were coded, although the frequencies of disgust and fear were too infrequent for parametric analysis; the latter were almost exclusively observed in Stage 7 patients. Recognizable facial expressions of emotion were observed at each of the cognitive stages, including the most severely impaired, end-stage patients, although there were changes with advancing intellectual impairment. Only one emotion was found to be lower at the end stage of the disease than at earlier stages, namely joy. Family members

and aides concurred that joy diminished at the very last stage, as found in the interaction session, but aides and family members also reported, from their more extensive encounters, that interest declines as well. Neither caregivers nor family members reported a difference in the rate of fear or anger expression across the different stages of the disease, nor did the facial coding detect any change in anger expression (fear expressions were too infrequent in the limited sampling of the family visit for analysis).

Thus, the above study indicated that the ability to express affect, as observed in interpersonal contexts, whether in the context of a family visit or routine caregiving, remains intact during the course of dementia, even in the most deteriorated individuals. Moreover, other data from the study, such as the finding that sadness expressions of residents were typically restricted to family leave-taking, indicated that the emotion system is not only behaviorally intact in these patients, but functionally intact as well, and that emotion expressions are not just random discharges of facial activity but are related to the patients' wishes, concerns, and goals. Indeed, because of linguistic impairment, affect remains the only means of communicating wants, needs, likes, and dislikes, and is therefore vital to the quality of life in the remaining years of life in such patients.

Summary of Normative Trends in the Expression of Emotion

The picture of normative trends in the expression of emotion that emerges from our review indicates that people continue to be able to communicate their emotional states throughout the life span, even in late-stage dementia. Although expressive behavior may become somewhat more telegraphic in later life, and positive affects reduced in frequency/duration in the case of dementia patients, its functionality is preserved. And it appears to be reserved for those with whom we are most intimate, and on whom we depend for the fulfillment of our most basic needs.

INDIVIDUAL DIFFERENCES IN THE COMMUNICATION OF EMOTION

In this section we consider individual differences in expressive behavior with reference to personality traits and the interpersonal process.

Expressive Behaviors and Personality

Two studies have found that expressive patterns are linked to personality in adult subjects. Keltner (1996) has shown that particular patterns of

emotion expression (preferences to express different emotions) were correlated with scores on the five-factor model of personality in groups of young adults. Specifically, this investigator found that extraversion is associated with expressions related to social approach, neuroticism with negative facial expressions of emotion, agreeableness with expressions of sympathy, and conscientiousness with expressions of embarrassment.

Malatesta, Fione, and Messina (1987), working with older adults, also found distinct expressive biases, here linked to trait emotion. Participants were asked to fill out an emotion trait measure that reported on the frequency with which they expressed various emotions. They also were asked to encode five facial expressions. Other individuals, naive judges serving as decoders, were asked to ascertain the emotions that the encoders had been asked to communicate. The decoders had difficulty, owing to the fact that encoders' emotional dispositions leaked through and overrode the task demands. Despite their attempt to encode different emotion states, anger-prone adults were perceived to be expressing anger, sadness-prone adults sadness, contempt-prone adults contempt, and guilt-prone adults guilt.

The above findings have implications for the regulation of emotion in the context of close relationships. As Keltner (1996) has noted, facial expressions mediate the influence of an individual's personality upon the social environment through both their *informative* and *evocative* functions. For example, an individual who is anger-prone not only informs others that he or she is in an irritated frame of mind, and may well behave aggressively, but the anger affect itself tends to spread to the social partner through emotion contagion. Let us consider further how emotion expression, or its inhibition, may influence some of the more important social relationships in people's lives.

Individual Differences in Emotion Expression and Social Relationships

Individual differences in emotion expression in social relationships have been studied in two contexts: marital interaction and attachment relationships.

Individual Differences in Marital Interaction Patterns

Levensen, Carstensen, Gottman, and colleagues (Carstensen et al., 1995; Levensen et al., 1994) have examined individual differences in the context

of conversations between middle-aged and older long-married couples. The procedures of the study have already been described in an earlier section. Here we report on their findings with respect to differences in relationship satisfaction.

These investigators found that older unhappy couples were less likely than older happy or middle-aged happy and unhappy couples to engage in sequences in which one spouse's neutral affect was followed by the expression of negative affect by the other spouse; that is, the couples tended to avoid "negative start-up." The authors speculate that these couples had learned to achieve some control over the activation of negative affect. However, in the part of the session in which couples were to discuss an area of continuing conflict in the marriage, the exchanges of older unhappy couples, like those of younger unhappy couples, were characterized by the expression of high levels of negative emotion, negative affect reciprocity, female engagement, and male withdrawal.

Although it is obvious that certain differences in emotional expressiveness are linked to fundamental differences in temperament (Costa & McCrae, 1996), other sources of variance are related to social learning experiences. Indeed, there is a growing body of data indicating that styles of emotion regulation are closely linked to individual differences in attachment style. As such, we consider the attachment literature and what it has to contribute to our understanding of individual differences in affect regulation in adults.

Attachment Style and Affect Regulation in Youth and Adulthood

Attachment theory, as originally proposed by Bowlby (1969, 1973, 1980) is concerned in the most fundamental way with the communication of emotion between intimate partners. According to Bowlby, the attachment system is a biologically based, goal-corrected behavioral system oriented toward insuring both the physical survival and emotional well-being of young, dependent offspring. The young infant's propensity to signal states of distress is well matched by the adult caregivers' predisposition to respond with caregiving that is prompt, contingent, and effective at ameliorating distress. Both propensities are intrinsic to the survival of the infant, and all infants establish an attachment relationship early in life. However, while the formation of attachments between infants and their caregivers is universal, the quality of the bond and the style of emotional communication is shaped by the specific nature of the transactions characteristic of

each mother-infant dyad (Simpson, Rholes, & Nelligan, 1992). Ainsworth and colleagues (Ainsworth, Blehar, Waters, & Wall, 1978) have demonstrated that the manner in which a child's attachment needs are negotiated can take various forms, and that these relate to personality development. The majority of children form attachments to significant others that are characterized by trust and felt security, which leaves the child free to develop an autonomous and flexible sense of self. Two other less optimal outcomes have also been identified in the literature, and are associated with insensitive caregiving. One is the avoidant attachment style, in which the child tends to avoid rather than seek the caregiver when in a state of distress, manifesting a false independence. This attachment style has been linked with caregiving behavior that is insensitive, being overly stimulating or overwhelming and/or rejecting. The other major insecure attachment style in children is the ambivalent style, which is characterized by alternately clinging and rejecting behavior towards the caregiver, and is related to caregiving that is inconsistent and unpredictable (Cassidy & Berlin, 1994).

The avoidant and ambivalent attachment styles are also associated with different attentional strategies with respect to sensory-affective information and with different kinds of expressive behavior. The avoidant child tends to use a "deactivating" strategy, one that serves to truncate the experience of negative affect by routing it from consciousness; this emotion regulation style is also associated with the inhibition of expressive behavior. The ambivalent child, on the other hand, tends to be "hypervigilant" for sources of distress, augmenting them in consciousness, and engaging in heightened expressive behavior (Cassidy, 1994).

Research on the sequelae of early attachment relationships has underscored the enduring nature of the bond formed in infancy, as well as the continuity of attachment organizations over time. Stability of attachment style is said to be mediated by "internal working models" of the primary attachment relationship which then generalizes to other relationships. Not only do the majority of children retain their attachment styles as assessed during infancy into the 11th year of life (Elicker, Englund, & Sroufe, 1992), but there are robust associations between the various attachment styles and the quality of adaptation in a variety of social situations throughout these years. For instance, relative to their insecurely attached peers, securely attached infants and toddlers have been found to show more exploratory behavior (Ainsworth, Bell, & Stayton, 1971), to react with less fear, hostility, and avoidance in separation/reunion episodes (Ainsworth et

al., 1978), and to display more enthusiasm, positive affect, and better problem-solving ability (Matas, Arend, & Sroufe, 1978).

The work of adult attachment researchers indicates that adults can also be characterized as either secure, avoidant, or ambivalent in their intimate relationships and that they display the same patterns of attentional strategies and affect regulation styles seen in infants and children. For example, avoidant adults are characterized by a mistrust of others, strong reluctance to display attachment needs or feelings, to modulate negative affect by restricting awareness and acknowledgement of distress, and by adapting compulsive self-reliance. Ambivalent individuals, in contrast, experience others as unpredictable and themselves as helpless, have high conscious anxiety, and tend to be hypervigilant for occasions of distress and potential distress. Finally, securely attached adults appear to possess a realistic sense of self-efficacy, as well as trust in the benevolence of others. They tend to be characterized by generally positive affect as well as the ability to acknowledge, express, and manage negative affect constructively (Casidy, 1994; Magai & Mcfadden, 1995; Sperling & Berman, 1994)

Research has suggested that insecure attachment in adulthood fosters vulnerability to normative stresses, as it has been found to be reliably associated with various problems in emotional adjustment (Kobak & Shaver, 1987; Mikulincer, Florian, & Weller, 1993). For example, the avoidant attachment style has been associated with hostility, anxiety, brittleness (Kobak & Sceery, 1988), and fear of intimacy (Hazan & Shaver, 1987). The ambivalent style is associated with high rates of anxiety and personal distress (Kobak & Sceery, 1988), lowered levels of confidence and self-esteem (Feeney & Noller, 1990), relatively greater fears concerning separation from significant others, and of greater death anxiety (Mikulincer, Florian, & Tolmacz, 1990). Individuals who have secure attachment styles are seen by peers as cheerful and likeable (Kobak & Sceery, 1988), and are characterized by the relative absence of psychopathology (Borman & Cole, 1993).

A recently completed study has also provided some of the first data on facial expressions of emotion in adult subjects vis-à-vis attachment patterns (Magai, 1996). Adults ranging in age from the mid-20s to the mid-80s (mean age of 54 years) were assessed for attachment style, childhood experiences around conflict resolution, emotion traits, and internal working models of relationships; the latter involved assessing facial affect decoding biases and thematic biases in narrative material. The participants were also videotaped during an emotion-induction session,

in which they were asked to relate affectively charged events involving anger, sadness, fear, and interest. The expressive behavior was subsequently coded using Izard's Maximally Discriminative Facial Affect Coding System (1979). The data on expressive behavior, parental childrearing style, working models data, trait emotion, gender, and age were entered into hierarchical regression analyses with attachment style as the dependent variable. In this study, attachment style was assessed using Bartholomew's (Bartholomew & Horowitz, 1991) four-category model. This model discriminates two types of avoidant attachment in adults: a fearful avoidant style, characterized by desire for close relationships but avoidance due to fear of rejection, and a dismissing avoidance, involving a disinterest in or devaluation of close relationships. Additionally, in the Bartholomew system, the ambivalent style is referred to as "preoccupied" because of excessive ruminations about close relationships.

The multiple regressions indicated that attachment security was predicted by facial expressions of joy, the absence of love-withdrawal as a parental disciplinary strategy, a facial affect decoding bias favoring shame, a disinclination to route negative emotion from consciousness, a disinclination for depressive affect, and younger age. Fearful avoidance was predicted by facial expressions of shame, reports of parental use of love-withdrawal as a disciplinary style in childhood, attributions of sadness to ambiguous facial expressions, wish-fulfillment fantasies of approval from others, and trait anxiety. Preoccupation was predicted by facial expressions of disgust, wish-fulfillment fantasies of closeness and affiliation, trait anger, and female gender. Finally, dismissive attachment was predicted by mixed or ambivalent facial activity, the disinclination to see anger in faces, the routing of negative emotion from consciousness, inner conflict expressed in stories, the denial of anxiety, and older age.

These patterns are consistent with descriptions of the emotion traits and childrearing experiences of the different attachment styles as previously reported in the literature. The expressive behavior contributes an added dimension. Even though all participants underwent the same emotion-induction procedure, distinctive differences in expressive behaviors were in evidence, and the patterns were congruent with the rest of the affective profiles. The inner security of the secure attachment pattern seems reflected in predominance of joy expressions. As well, the low self-esteem and shyness that is said to characterize the fearful avoidant individual seems captured by the predominance of shame. Dismissives have been described as having a repressive coping style, with negative emotion routed from

consciousness and conflict buried at a deep and largely inaccessible level; thus the ambivalent or mixed emotion expressions that characterize their facial expressive behavior seem to validate the existence of inner conflict. In the case of the preoccupied individual, a lifetime of pursuit of close relationships and experiences with disillusion when attachment needs are frustrated seems well captured by facial expressions of disgust.

The fact that each attachment pattern was associated with a distinctive bias in expressive behavior is of more than passing interest, given Keltner's (1996) formulations concerning the impact of expressive biases in close relationships. As mentioned earlier, Keltner suggested that facial expressions mediate the influence of an individual's personality upon the social environment through both the informative and evocative functions. The conflict communicated by the dismissive and the disgust communicated by the preoccupied individual may serve to keep others at arm's length; while this may serve the goal of the dismissive, it is at odds with the preoccupied individual's desire for close connection. In the case of the shame signals emitted by the fearful avoidant individual, in addition to communicating low self-esteem, shame communicates a need for privacy, which again, may keep other social partners from making efforts to get close. The joy expressed by secure individuals will ensure that others are drawn to them, since emotion is contagious and everyone likes to feel the pleasure of positive affect.

The significant contribution of age in the regressions predicting dismissing and secure attachment was unanticipated. The data indicating greater security among younger individuals and greater dismissiveness among older individuals suggest a reduction of security with age. Alternatively, the results may reflect a cohort effect, as discussed in a later section.

In summary, in terms of emotion regulation and emotion expression, the relation between attachment style and emotion could broadly be summarized as follows: Secure individuals are characterized by a predisposition to express positive affect and to possess good modulatory skills when it comes to negative affect. Avoidant individuals, at least those that can be described as dismissively avoidant, tend to be hostile, to defend against negative affect, and to inhibit affect expression. Ambivalent individuals tend to be anxious, to have frustrated attachment aims, to be overalert to distress, and to be expressively disinhibited to an extreme degree. While such prototypes have the elegance of parsimony and coherence, they seem almost too limited to encompass the diversity of emotional profiles in the personalities that populate our everyday interpersonal world. Elsewhere

we have argued that the attachment and emotion systems are related but separable processes, and that more specific patterns of emotion expression and regulation may be obscured by the overly broad nature of the attachment classification system (Magai, 1996; Magai, in press; Magai & Hunziker, 1993). Still, these studies are a good starting point and emphasize that there are substantial individual differences in communicative patterns within close relationships during a large proportion of the adult years.

Attachments in Later Years

Although attachment theorists (Bretherton, 1985; Bowlby, 1979) maintain that attachment characterizes human beings from birth to death and that attachment behavior can be observed throughout the life span, especially when an individual is under stress, is frightened, or is sick, there has been less attention paid to attachment and its adaptational/emotional sequelae in later life than to earlier periods. However, important contributions have been made by Antonucci (1976, 1994), Troll (Troll, 1994; Troll & Smith, 1976), Carstensen (1991, 1993a, 1993b), and Cicirelli (1991).

This literature highlights the importance of continued attachment in later life, both for aging individuals and for their relationship partners, and has begun to explore developmental shifts in the manner in which the attachment needs of older adults are met. For example, Antonucci (1994) suggests that the increasing number of attachment relationships acquired by adults over time constitutes a "convoy" that accompanies each individual throughout life, offering the protection and security needed to confront life's challenges. The protective function of these attachment relationships was illustrated in a study by Antonucci and colleagues (Antonucci, Kahn, & Akiyama, 1989) in which elderly adults who spoke to supportive significant others about their symptoms were more likely to seek appropriate medical attention than those who did not confide in others about their health concerns. As mentioned earlier, the research of Carstensen and colleagues (Carstensen, 1993a, 1993b; Carstensen et al., 1994) indicates that while the emotional communication of older adults remains intact or is even heightened, the targets of this communication are narrowed purposively to include only those to whom the older adult is most closely attached. Further, there is evidence that this process of increasing selectivity, designed to conserve emotion resources and optimize the experience of positive affect while minimizing negative affect, begins in early adulthood, reaching a peak in advanced old age.

Research on attachment in late life is somewhat limited to date, and tends not to deal directly with the association of attachment styles and particular emotional patterns. However, there have been some interesting studies in recent years that have begun to explore various issues in this area. For instance, Andersson and Stevens (1993) examined the relation between reports of early parental care on various indices of psychological well-being in a cohort of elderly Swedish community-dwelling residents with a mean age of 69. They found that when parental care was recalled as warm and attentive (versus negligent and inconsistent), subjects had higher levels of self-esteem, attachment, social integration and feelings of self-worth, and lower levels of anxiety. Interestingly, Andersson and Stevens also found that the adverse impact of negative early experience (low parental responsiveness) on well-being in later life was stronger among those who lacked a current attachment figure in the form of an affectionate partner, and was especially strong in unattached older men. This finding suggests that current attachment relationships may partially mitigate the effects of earlier, undesirable attachment experiences.

Barnas, Pollina, and Cummings (1991), found that security of attachment to adult children was predicted by type and efficacy of coping with stress in a sample of elderly American women. Specifically, insecurely attached women reported using more coping responses overall than their secure counterparts, indicating that they had to do more in order to cope with stressful situations. In a study examining the relation between attachment styles and elderly women's ability to cope with age-related physical decline, Passman (1995) found that avoidantly attached women expressed more negative affect about the physical condition of their bodies, experienced more of a decline in self-worth related to their physical changes, and had significantly poorer morale overall than their securely attached counterparts.

In a novel attempt to use attachment theory to understand the belief among many demented elderly individuals that one or both of their parents are still alive, termed "parent-fixation," Miesen (1992) explored the relation between level of cognitive functioning and the expression of various forms of attachment behavior among demented residents in a psychogeriatric nursing home in the Netherlands. Subjects' level of cognitive functioning and degree of parent fixation were assessed, and observations of attachment behavior were made by staff on the ward at various times of day, including during family visits. In addition, a "Standard Visiting Procedure" was used, akin to Ainsworth's Strange Situation, in

which the demented person is alternately all alone in a room, with the researcher, and then with a family member. A particularly critical point in this procedure occurs when the family member suddenly announces he/she must leave and ends the visit, thus creating a potentially "threatening" moment which is assumed to be an activator of the attachment system. Individuals who were more cognitively intact exhibited less parent fixation and more overt, longer-lasting forms of attachment behavior towards present family members—for example, turning towards or calling after—while those who were functioning at a lower level displayed more parent fixation and fewer attachment behaviors of any other kind, except for touching a family member who arrived for a visit unexpectedly.

Miesen suggests that the invocation of deceased parents by patients with dementia represents an attempt to regulate the fear and uncertainty that accompanies loss of cognitive function; parent fixation is therefore an attachment behavior, an expression of the need for safety and security. In the early stages of dementia, she theorizes, parent fixation is not observed because other, more organized forms of attachment are still possible and because of the security provided by real, living attachment figures. As the illness progresses, however, the "strange situation" that is dementia becomes a more permanent condition; the now pervasive experience of feeling unsafe is increasingly managed internally, with parent fixation becoming the predominant form of attachment behavior as orientation to the outside world diminishes.

The incidence of parent fixation is unknown, although it is believed to be high among those afflicted with dementia. It is also unclear how this phenomenon may be influenced by the individual's premorbid quality of attachment style. Attachment theory would suggest that invoking the presence of parents, deceased or otherwise, would not be especially comforting for individuals who are avoidantly attached, although this remains to be explored. It would also be of interest to examine the relations among attachment styles, responsiveness to caregivers, and expressive behavior. There are as yet only very limited data. In an initial study, Magai (in press) found that premorbid attachment styles predicted emotional behavior of dementia residents, as reported by both aides and family members; specifically, they found that securely attached individuals expressed more positive affect than insecurely attached individuals.

In summary, in the literature on marital relationships and attachment relationships across the life span, it is apparent that there are large individual differences in the interpersonal communication of affect in close

relationships. Qualitative differences in the attachment patterns in older individuals—which are assumed to be formed largely during early development—are associated with differential patterns of behavior and feeling, including subjective well-being, coping patterns, morale, and self-esteem. It is also clear that even dementia patients show organized forms of attachment behavior in order to regulate the fear and uncertainty that accompanies cognitive decline, and that premorbid attachment patterns are associated with differential emotion expression in the context of caregiving. Although the research on marital interactions has not examined attachment patterns, this would seem to be an important and fruitful area for future research. Gottman (1993) has described a common maladaptive pattern of marital interaction that involves partners who have different styles of conflict resolution. One partner, commonly the female, expresses anger and the desire to talk about the conflict; the other partner, commonly male, withdraws from communication in a posture called “stonewalling.”

Although the studies of marital interaction reviewed earlier did not assess attachment patterns, it is possible that unhappy marriages in which one partner expresses distress and the other withdraws and refuses to communicate may represent a particular pairing of attachment styles—that of an avoidant individual paired with a preoccupied partner. Research on attachment styles in younger couples indicates that ambivalent/preoccupied and dismissive/avoidant pairings are not unusual; they are more common than ambivalent/ambivalent or avoidant/avoidant pairings (Collins & Read, 1990; Sencheck & Leonard, 1992). As indicated earlier, avoidant individuals are disinclined to engage negative affect; ambivalent individuals, on the other hand, tend to heighten the expression of negative affect.

Couples who have the pursuing/stonewalling marital interactive pattern described by Gottman (1993) are prone to early marital dissolution; though clearly some of these marriages survive. Thus, the high-conflict couples that Levenson and colleagues (Levenson, Carstensen, & Gottman, 1994; Carstensen, Gottman, & Levenson, 1995) have described in middle-aged and older couples, who engage in less negative start-up, may represent an adaptation that has permitted avoidant/preoccupied pairings to survive despite marital dissatisfaction. In younger couples, the pursuer/stonewalling pattern is predictive of marital dissolution; among older long-term couples it is predictive of impaired health in wives, though not in husbands (Carstensen, Graff, Levenson, & Gottman, 1996). The latter is somewhat puzzling. Perhaps it is the case that the older preoccupied wife has learned

to suppress her dissatisfactions in the service of conserving affective energy. Perversely, this may produce greater contentment in the avoidant male partner, while leaving the quality of marriage dysfunctional to an outside observer's view. If the suppression of dissatisfaction runs contrary to the preoccupied individual's true nature, as it would appear to, there may be a physiological penalty, which might help to explain the poorer health of wives in unhappy marriages. The research on affect inhibition generally shows that there are negative health consequences of suppressed affect (Pennebaker & Traue, 1993).

Exploring the relation between individual differences in marital interaction patterns and attachment patterns would seem to be an important area for future research, not only because inhibited emotion has negative health consequences, but also because attachment styles predict marital satisfaction and because marital partners typically serve as one another's caregivers during times of illness. To this end, we consider further the implications of attachment patterns in later life.

Implications of Differential Attachment Patterns in Close Relationships in Later Life

Studies examining the relation between attachment styles and various dimensions of young adult romantic relationships have already demonstrated that securely attached individuals experience their love relationships as happier, more trusting, and longer-lasting than do insecurely attached people (Hazan & Shaver, 1987); securely attached individuals have also been found to report more satisfaction as well as more positive and less negative affect in their relationships than the members of the other two insecurely attached groups (Simpson, 1990).

If similar patterns were found to obtain among older adults as well, certain groups of people might be at greater risk for a variety of physical and emotional problems. For instance, it could be that the relationships of insecurely attached people may not survive as readily as others into later life, leaving these individuals open to increased health problems and/or greater loneliness. Insecurely attached individuals (particularly anxious/dependent persons) may be at greater risk for pathological grief reactions following bereavement (Mikulincer & Florian, 1996). There are other potential implications as well. If, as Carstensen and colleagues suggest (Carstensen, 1992; Frederickson & Carstensen, 1990), emotional functioning improves over the life course due in part to the increase in experience-

based, emotional knowledge as people age, is this emotional wisdom equally likely to accrue to securely and insecurely attached individuals? It is possible that avoidant individuals, for example, because of their defensive need to deny or divert themselves from significant aspects of their emotional experiences, inadvertently narrow their opportunities for emotional learning over the ordinary course of their lives. As a result, they may not display the "normative" pattern of improved emotion regulation in later life observed in some of the research. However, it is also conceivable that the overall decrease in physiological arousal noted among older adults may be of particular benefit to ambivalently attached adults, whose higher levels of trait anxiety and vigilance for distress may be reduced over time. Due to the limited amount of empirical work to date on the concomitants of differential attachment patterns in later life, these questions remain unanswered. It is not even clear that the same distribution of attachment classifications obtains for samples of older adults as has been found among younger adults (Passman, 1995).

In terms of caregiving in close relationships, much of the work in this area has dealt with the caregiving behavior of adult children toward their infirm parents and the emotional impact of this exchange. Cicirelli (1989, 1991, 1993) has noted that adult children continue to make regular contact with their parents and report feelings of affectional closeness despite separation over time and distance. He has also noted that when parents become old and frail, it is their adult children who provide most of the help; this well-established pattern has been accounted for in attachment terms by the adult child's desire to protect and preserve the existence of their attachment figure (Cicirelli, 1989, 1991). Research has indicated that feelings of attachment on the part of adult children (i.e., affectional closeness and trust) are significantly related to the number of hours of weekly care provided to parents, as well as commitment to provide further help (Cicirelli, 1991). However, caregiving has costs as well, and subsequent research has attempted to identify variables that can predict why some caregivers experience more negative effects than others (Townsend & Franks, 1995).

In one such study, Cicirelli (1993) found that when adult child caregivers felt more strongly attached to their parent, they experienced less burden in caring for them; in contrast, when they provided care more out of filial obligation, their subjective sense of burden was greater. Similarly, Townsend and Franks (1995) found that reported emotional closeness between adult child caregivers and their impaired parents was significantly

associated with lower stress and depression and higher subjective feelings of efficacy in caregivers, while greater conflict in the relationship was associated with the opposite pattern. In general, negative ties were found to be more consistently and strongly predictive of well-being in caregivers than were positive ties. Williamson and Schulz (1990) studied both spousal and adult child caregivers of Alzheimer's patients and found that caregivers (regardless of type) who reported a close relationship with the patient prior to the onset of the illness felt less burdened than those whose relationship was not close.

In terms of emotion expression patterns, Whittick (1992) examined the coping patterns of dementia caregivers in Scotland utilizing the concept of "expressed emotion." This term is used in the psychiatric literature to index a pattern of interaction in which family members express criticism, hostility, and emotional overinvolvement towards an ill relative. Whittick found that the poorer the premorbid relationship between carer and patient, the greater the current level of hostility and criticism expressed by the carer toward their infirm relative. In turn, high expressed emotion was associated with greater depression and a smaller repertoire of coping strategies in the caregiver. Together, these studies suggest that differences in premorbid as well as current relationship quality have a significant impact on the emotional well-being of caregivers. More work needs to be done in order to gain a better understanding of the specific effects of particular attachment organizations and their associated emotion-regulation patterns on the caregiving exchange.

What about the effects of caregiver emotion communication on the well-being of the infirm older adult? Hinrichsen and Pollack (in press) examined whether the amount of expressed emotion (EE) shown by adult children and spouses was associated with the course of depression in an older adult population over a 1-year period. Fifty-four community-dwelling older adults admitted to an inpatient psychiatric service for major depression, and their children and spouses, were studied. Expressed emotion was measured via a 5-minute speech sample in which an open-ended monologue about the caregiver's relative was scored on one or more dimensions of criticism. Results indicated that expressed emotion was significantly related to patient outcome variables only when type of relationship was considered. Specifically, when the caregiver was an adult child, high EE predicted higher rates of relapse and lower rates of complete and sustained recovery from depression than low EE. Conversely, when a spouse was providing care, high EE was associated with lower rates of

relapse and higher rates of recovery than was low EE. These results suggest both that the meaning of a person's illness may vary for different caregivers, and that emotion communications may have quite different effects depending on the source of the message. A spouse's criticism may be more well tolerated than the criticism of children because, as the work in older marriages indicates, older couples tend to mix messages of negative affect with messages of affection, perhaps thereby softening the impact of criticism (Carstensen et al., 1996).

Finally, Fingerman (1995) examined intergenerational differences of perceptions of behaviors and feelings with regard to a specific conflict situation in older mothers and their adult daughters. Mothers and daughters were questioned together and then separately about the most recent disagreement or difference of opinion they had, and ratings were made about the degree of congruence in their perceptions of the event and feelings involved. Results indicated that mothers and daughters both reported using constructive approaches more than destructive or avoidant behaviors in resolving their conflicts, though mothers claimed to do so to a greater extent than daughters. Mothers reported engaging in constructive behavior more than daughters recognized, and daughters reported engaging in destructive and avoidant behaviors more than mothers recognized. In general, these older mothers tended to underestimate their daughters' negative behaviors and feelings in conflict situations, while daughters were more accurate. This deemphasis on the negative on the part of the older individual may reflect one means by which older individuals optimize their affective environments.

SUMMARY AND CONCLUDING COMMENTS

In terms of normative trends, our review of the literature on the expression of emotion over the life course yielded a fairly consistent picture suggesting that affective expressivity is not only preserved over the lifespan, but apparently undergoes some fine tuning as well. Older individuals, while showing a greater willingness to articulate their feelings when negative affect is aroused, also appear to exercise greater control of affective arousal by acting proactively to avoid conflict or the escalation of conflict. That is, they show greater affective control, greater avoidance of stressors, engage in less negative start-up with partners, and deemphasize the nega-

tive in interpersonal relations. These findings suggest that as people age, they become more, rather than less, capable of achieving the four regulatory goals articulated by Tomkins (1962, 1963) as noted in the introduction to this chapter.

Of course, we cannot be certain that this rather positive picture of graceful aging is entirely veridical, since there are as yet no relevant longitudinal data. It is necessary to consider cohort confounds in all of the research on emotion and aging, attachment, and marital conflict, as well as selective attrition effects, since virtually all have used cross-sectional methodologies.

Most of the older individuals in these studies were born in the opening decades of this century. Thus, they would have been reared during the era of Watsonian child-rearing precepts, which denigrated physical and emotional expressions of affection towards children (Magai & McFadden, 1995). This is much in contrast to the rearing advice of later child psychologists and pediatricians, who recommended open expression of affection and warmth. It is possible that the more constrained affectivity and affection of the parents of the earlier cohort of subjects biased the way in which attachment styles developed in this cohort. Thus, the impression of greater positive focus and lower negative affect in older versus younger individuals may be related to a greater degree of dismissive attachment among adults of this generation, as suggested in the attachment study by Magai (1996; in press) cited earlier in this review.

Indeed, a recently completed collaborative study between researchers at Long Island University, the University of Wisconsin, and the University of California would seem to support the thesis (Pinkham, 1996). In this study, autobiographies written by students at the University of Southern California over the course of several decades were coded for attachment style. Results replicated the finding that cohorts born in the earlier years of the century were more dismissive and less secure than later cohorts. In this case, age was controlled; that is, all cohorts were of roughly the same age when they wrote their autobiographies.

Since dismissive attachment is associated with the inclination to route negative affect from consciousness, the more positive affective profile offered by older individuals in their self-reports—greater emotional control, greater deemphasis on the negative, less negative start-up—may be based on a deactivating attentional strategy and psychological defense. It will thus be crucial to undertake longitudinal research on affect and aging

or make creative use of preexisting material, such as the California growth studies housed at the Institute of Human Development (University of California, Berkeley).

Our literature review also indicated that there are substantial interindividual differences in the expression of emotion, and in styles of emotion communication in close relationships. These differences are broadly linked to attachment style differences and define styles of affect enhancement and inhibition. Although the literature on attachment styles in later life is quite limited, the existing data indicate that individual differences in attachment style influence emotional well-being and basic morale in later life, attitudes towards caregiving, and even degree of positive affect during the course of dementia. As such, it is an important area for further research, and should be of particular significance to gerontologists who are interested in quality-of-life issues. What is uncertain at this point is whether attachment patterns are modifiable in adult development, and if so, to what extent and under what conditions. This will be an important area for future research, since attachment styles and patterns of emotion communication clearly have important ramifications for the health and emotional well-being of aging individuals.

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Does Stress-Emotion Cause Illness In Elderly People?*

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EMOTION TO DISEASE AND DISEASE TO EMOTION

Our chapter title raises three sets of questions. The first addresses the role of emotional stress as a factor in the onset and progression of physical illness. Questions in this area focus on the widely held belief that stressful life events cause illness. A central issue confronting this assumption is whether the linkage is direct (i.e., the physiological components of emotional distress creating disease), or indirect (i.e., emotional distress leading

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to behavioral and social changes that affect exposure and/or susceptibility to pathogens). Another set of questions is subsumed by the use of the phrase "emotional distress" rather than distress alone. This usage suggests that stress can be differentiated into specific emotions such as anger, fear, and depression, and that different emotions may precipitate different diseases (Malatesta-Magai, 1987). Common sense embedded in Western culture and medical writing provides a background for such differentiation: cardiovascular diseases such as stroke are attributed to the choleric, angry personality, and cancer to the phlegmatic, depressed personality (for a brief summary, see Contrada, Leventhal, & O'Leary, 1990). These linkages can lead to morbidity and mortality through both direct and indirect paths. The direct paths include both short-term or acute, psychological and physiological processes that may precipitate specific disease episodes such as cardiovascular events (Kamarck & Jennings, 1991), and long-term emotionally induced physiological changes that lead to chronic downregulation in various systems. The indirect paths include specific, disease-inducing and vulnerability-enhancing risk-taking behaviors such as use of illicit drugs, uncontrolled sexual behavior, noncompliance with medical treatments, inappropriate diet, and so forth. Figure 5.1 gives Cohen and Rodriguez' (1995) representation of these pathways.

The second set of questions focusses on the effects of disease on emotional distress; this too involves multiple paths, i.e., some direct and others indirect (see Figure 5.2). The indirect paths from disease to emotion are extremely diverse, including changes such as increases in depression, anxiety, and anger caused by changes in sleep and dietary patterns. These changes may result from the disruption of everyday activities, economic losses, and social isolation that can accompany chronic illness. Direct effects are also multipath. For example, we might suspect that pain could disrupt physical, mental, and social functioning. Others involve the physiological reactions accompanying disease which can have direct effects upon the physiological components of emotion. For example, the cytokines that integrate the collaborative activity of the cells of the immune system, e.g., interleukin 1 and 2, have direct effects on neural centers, suggesting that they may be involved in emotional reactions such as depression (Besodovsky, del Ray, Klusman, Furukawa, Monge-Arditi, & Kabiersch, 1991). Tracing the immune pathways from disease to emotion may provide important clues to the complementary pathways from emotion to disease and illuminate the adaptive value of emotional reactions induced by dis-

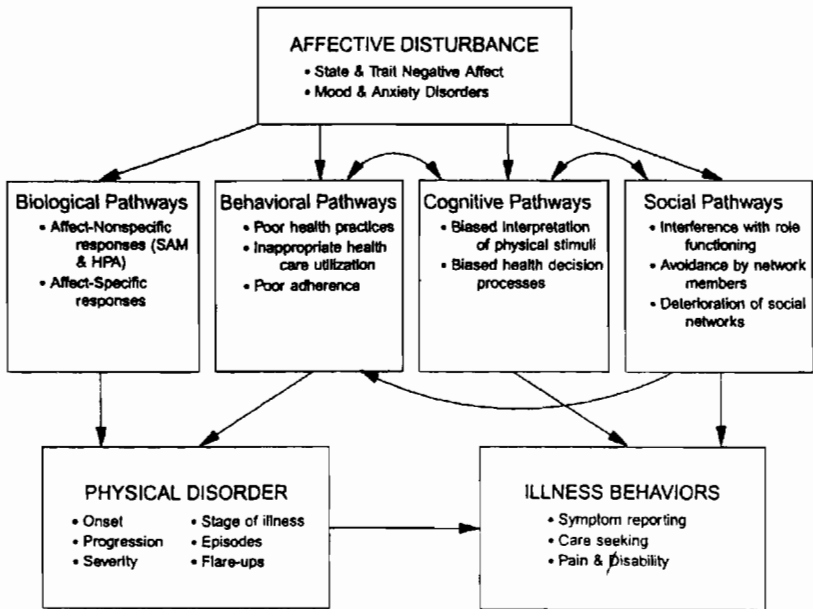


FIGURE 5.1 Pathways linking affective disturbances to physical disorders. The paths identified in the model move in only one direction from affective disturbance to physical disorder. The absence of alternative paths is not intended to imply that they do not exist.

From Cohen & Rodriguez, 1995, p. 376.

ease. While these bidirectional paths may not be identical, they are likely to overlap, and examining the pathways from both directions may alter our view as to how and why emotions and disease are connected.

The third set of questions concern the effects of age on the processes elaborated in response to the two prior issues. Though age per se should not be treated as an independent variable (Finch, 1990), age-related changes in an individual's social, psychological, and biological resources for managing life demands will affect both emotional responsiveness and susceptibility to illness. These changes can have both direct effects (e.g., physiological alterations in processes underlying emotion and/or illness), and indirect effects (e.g., changes in cognitive and/or overt behaviors affecting emo-

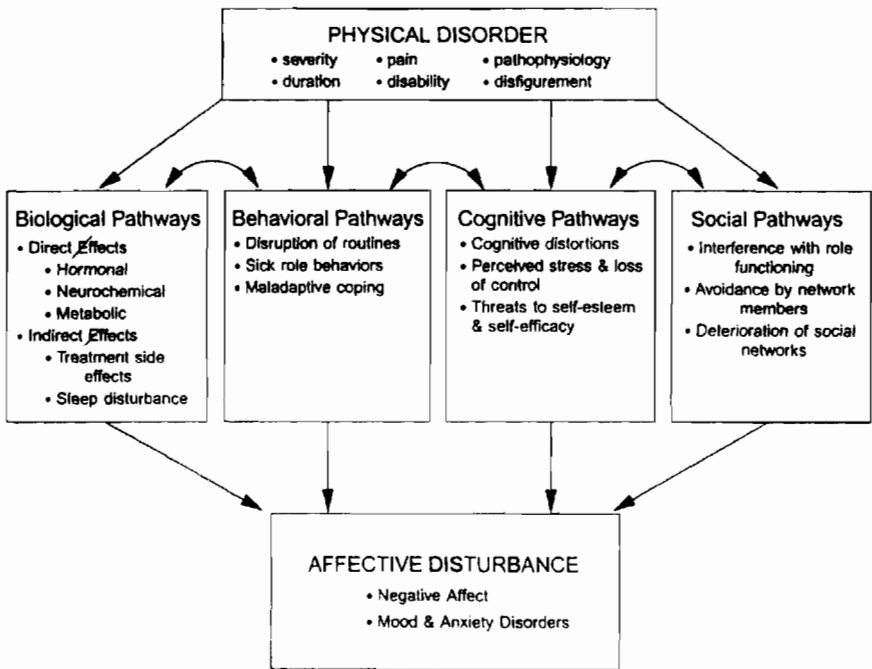


FIGURE 5.2 Pathways linking physical disorders to affective disturbances. The paths identified in the model move in only one direction from physical disorder to affective disturbance. The absence of alternative paths is not intended to imply that they do not exist.

tional and disease processes). It is unlikely that either the changes or their effects will be linearly related to age. For example, frailty appears to accelerate during the 9th decade of life, with individuals over 85 years of age becoming increasingly susceptible to disease-inducing pathogens in comparison to younger elderly (Burns & Goodwin, 1997). Knowledge of the precise nature of these changes and susceptibilities will be critical for developing interventions to enhance health and increase resistance to disease among the elderly.

Because behavioral scientists have been especially interested in delineating the psychophysiological steps comprising direct paths from stress to illness, our focus will be on direct pathways. We will first discuss some of the behavioral evidence suggesting that psychological factors,

and emotional distress in particular, can make a direct contribution to physical illness. We also discuss evidence regarding the direct effects of illness on emotion and discuss the effects of aging on both direct relationships. The proposition emerging from our review is that our evolutionary history requires that the direct effects from illness to emotional behaviors must be stronger than the direct effects from emotion to illness; the linkage is bidirectional and asymmetric.

Following the discussion of the behavioral evidence, we present a very brief overview of the physiological systems involved in the bidirectional linkage of illness to emotion. This review demonstrates that physiological pathways exist which may account for the findings of many behavioral studies. We also examine age-related changes in these systems that may be responsible for the appearance of different relationships between emotional distress and illness among older and younger persons. Because the physiological basis of the emotion-illness link is extremely complex, we adopted a functional view of the behavioral-biological system and assumed that emotions and the pattern of physiological and behavioral responses surrounding disease, which we call sickness, have adaptive value. When we looked at the evidence that we reviewed from this perspective, we formulated a series of eleven propositions that we believe make sense of much of the data; five of the eleven focus on the ways in which age moderates the illness-emotion link.

In the concluding section, we propose that many older persons adopt broadly based strategies that compensate for the aging-related biological changes taking place at lower levels of automatic functioning. Two such top-down strategies are identified: 1) risk avoidance and preservation of resources, and 2) exercise for resource maintenance. We suggest these strategies can be the basis for effective aging when properly executed, and/or the basis for ineffective and functionally self-limited aging when combined with powerful emotional needs. Effective aging may require combining a strategy of risk avoidance and conservation with a strategy of resource enhancement through active participation in daily life.

ARE THERE DIRECT CONNECTIONS BETWEEN EMOTIONS AND DISEASES?

Two types of evidence bolster the quest to identify direct connections between emotions and disease: descriptive studies of humans demonstra-

ting that personality and affective variables measured at an earlier point in time predict later mortality and morbidity, and animal studies detailing the impact of stress on the development of cardiovascular disease and cancers. For example, several longitudinal studies have reported a relationship to mortality of emotional maladjustment (assessed during childhood, adolescence, and/or early adulthood; e.g., Martin et al., 1995), and lifestyle factors during undergraduate (Paffenbarger, Hyde, Wing, Lee, Jung, Kampert, 1993), medical (Barefoot, Dahlstrom, & Williams, 1983), and law school (Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989). Because the psychosocial factors were assessed many years prior to the onset of morbidity and/or mortality, these studies appeared to avoid one of the major confounds plaguing predictions of this sort, i.e., the possibility that the predictor reflects preclinical disease. Although these studies bolster the search for psychosocial causes of mortality, they do not rule out other possibilities (e.g., that lifestyle factors associated with personality account for differences in outcomes, and that genetic and/or constitutional factors account for both illness outcomes and the personal and emotional factors predicting these outcomes). As a review of these studies will not advance our understanding of the illness-emotion relationship, we will turn instead to studies providing more detailed evidence for the direct pathway hypothesis.

Does Stress Effect Disease in Non-Human Species?

The huge body of research with nonhuman species, e.g., the rat and other mammals, provides the strongest evidence linking emotionally stressful circumstances to cardiovascular disease (Manuck, Marsland, Kaplan, & Williams, 1995) and cancer (Riley, Fitzmaurice, & Spackman, 1981; Sklar & Anisman, 1981). Four features of such studies stand out in contrast with the human literature. First, investigators exercise virtually complete control over the type, strength, and duration of exposure to the emotionally provocative stressors, and they can randomly assign animal subjects to experimental and control conditions. This level of control and intensity of exposure are nearly always absent in research with humans. Second, the studies make clear that interactions are the name of the game: stressors alone seldom produce major pathology. Stressful electrical shocks generate severe cardiovascular disease in dogs when combined with a high-salt diet (Anderson, 1986); rats develop ulceration of the stomach when making unsuccessful efforts to escape or avoid shocks that are unsignalled and/

or uncontrollable (Weiss, 1972); rats develop tumors when exposed both to cancer-inducing chemicals and the stress of being on a turntable (Riley et al., 1981). Many, though not all, of the factors involved in these interactions are also under experimental control.

Third, the outcomes of the above studies are complex. Stressors may reduce or increase resistance to pathogens depending upon the species, the disease, and the timing of the stressor with respect to contact with the pathogen and development of the pathological process. For example, resistance to development of tumors can be greater when stressors are applied prior to encounter with the pathogen, and resistance can be less when stressors are applied following pathogen exposure; and while stressors can promote the growth of cancer, stress alone appears insufficient to cause cancer (e.g., Riley et al., 1981). A fourth and final finding is the unexpected variation in the physiological processes apparently mediating disease outcomes. Thus, Ader, Felten, and Cohen (1990) point out that while cortisol-mediated immune suppression is assumed to be the main cause of illness progression and death, there is absolutely no evidence that cortisol elevation is involved in conditioned immune suppression, which is a powerful determinant of mortality. In sum, the animal data show that environmental stressors can increase mortality under conditions where there is a high level of experimental control over the stressor and its timing in relation to the introduction of the pathogen. The data also show that the timing can be varied so that the stressor enhances somatic defenses against the pathogen. The presence of a stressor alone is seldom sufficient for a disease outcome.

Is There Evidence for the Effects of Stress on Illness in Population Studies with Humans?

The complexity of interactions visible in the animal data make clear that it may be far more difficult to detect the effects of stress on illness in population studies with human subjects. Unlike research with animals or quasiexperimental studies with humans (reviewed at a later point), experimental control over the temporal sequence of encounters with the stressor and pathogen is lacking. In addition, even when these studies are longitudinal in design, and few are (Scheier & Bridges, 1995), they are still correlational and have difficulty ruling out both indirect paths (e.g., smoking, diet, exercise), and third factors; i.e., in most cases, both emotional distress and disease could be products of common genetic and

constitutional variables. In addition, the effects reported are generally small in size, and it is not difficult to find studies reporting null outcomes. These limitations aside, the data appear to fall into two groups: disease outcomes associated with emotional processes that are arousing, and disease outcomes associated with emotional processes that are anergic or deactivating.

Stress to Disease: Arousal Effects

Both short- and long-term effects on illness have been examined for arousing emotions such as fear and anger. The consensus with regard to long-term effects is that personality traits that predispose individuals to respond with activating emotions (e.g., hostility as a predisposition to anger), play a role in the genesis of cardiovascular disease (Adler & Matthews, 1994; Contrada et al., 1990; Mathews, 1988; Scheier & Bridges, 1995). Smith (1992) suggests that hostile individuals predisposed to respond with anger experience physiological costs because their motor systems are primed for combat over excessively long periods of time and because they incur social costs by irritating others and thereby undercutting their support networks. Demands of this type on the biological machinery, repeated over many years, can result in atherosclerotic changes which reduce the system's ability to respond to stress.

The hypothesis of a direct path from hostile emotion to cardiovascular risk is supported by studies linking assessments of hostility to measures of physiological reactivity such as elevated systolic blood pressure, elevations of epinephrine and norepinephrine during laboratory stresses (e.g., Lundberg, Hedman, Melin, & Frankenhauser, 1989) and elevated urinary cortisol (Pope & Smith, 1991). It is unclear, however, whether one can attribute disease outcomes to the processes involved in the acute stress responses observed in laboratory settings, as these latter effects may not be representative of the individual's blood pressure reactions elsewhere. In a meta analysis Suls, Wan, and Costa (1995) found that measures of hostility and anger were consistently related to blood pressure only in studies using random samples of subjects, and single (and therefore less reliable), resting measures (i.e., not laboratory stress induced) of blood pressure. These effects were small in size. Thus, while they concur with Smith's general conclusion that anger drives hypertension, and, therefore, cardiovascular disease, they raise important qualifications to the magnitude and reliability of the effect. In addition, many of the sustained physiological

effects necessary for disease may be mediated by behaviors that are risky to health and are associated with emotional reactivity (e.g., Knox, Jacobs, Chesney, Raczynski, & McCreath, 1996).

As we indicated at the beginning of this section, the findings are not entirely consistent for studies examining the relationship of psychological factors (i.e., hostile anger), to cardiovascular disease. Scheier and Bridges (1995) list four studies with negative effects. Recent data suggests it may be still more difficult to find relationships of psychological factors to coronary disease in lower socioeconomic groups. For example, no relationship was found between effort (hard work and determination: John Henryism) and blood pressure in the CARDIA study (McKetney & Ragland, 1996). Despite these ambiguities, the current data suggest that activating emotional states (i.e., hostility and anger) are likely to be significant predictors of cardiovascular morbidity and mortality over the long term (i.e., years).

The evidence is more persuasive regarding the toxic effects of intense stressors as triggers of life-threatening episodes of cardiovascular events and flares of chronic autoimmune disease. In their excellent and detailed review of the effects of stressors on coronary events, Kamarck and Jennings (1991) conclude that the evidence for the "oft cited relation between psychological stress and sudden cardiac death . . . in humans is more suggestive than definitive at this time" (p. 45). Their review makes clear that physiological pathways exist (e.g., coronary vasoconstriction, platelet aggregation, plaque rupture), which can lead to triggering events (e.g., ventricular tachycardial and fibrillation, bradyarrhythmias) and sudden death. It appears, however, that sudden-death outcomes are likely only in compromised systems, i.e., in individuals with underlying pathology (e.g., atherosclerosis and diagnosable heart disease; Mittleman et al., 1995). The role of emotional activation as a source of disease episodes in compromised systems can also be seen in studies of flares of rheumatoid arthritis (Zautra, Burleson, Matt, Roth, & Burrows, 1994) and the occurrence of asthmatic attacks (Dirks, Kinsman, Horton, Fross, & Jones, 1978). The extra output of an arousing emotion is life-threatening rather than useful in a somatic system that lacks the resources and flexibility to manage it.

Stressor to Disease: Anergic Effects

Whereas activating states have been implicated in the development of chronic hypertension disease and cardiovascular episodes, it has been

hypothesized that anergic emotions, e.g., depression and fatigue, are involved in the development of cancer (Contrada et al., 1990). The early work of Greer and Morris (1975) suggested that the acceptance of cancer and the absence of a "fighting spirit" was more common in women whose biopsies were cancerous, and in women experiencing disease recurrence (Greer, Morris, & Pettingale, 1979). Studies also suggested that the occurrence of cancer was related to a sense of anergy, a subjective pattern with a sense of hopelessness at its core (Antoni & Goodkin, 1988; Jensen, 1987; Schmale & Iker, 1969; Wirlshcing, Stierlin, Hoffman, Weber, & Wirsching, 1982). Although hopelessness is a frequent predictor of cancer, measures of emotional depression are seldom found to be related either to cancer occurrence (see review of studies in Contrada et al., 1990) or cancer recurrence (Buddeberg, Sieber, Wolf, Landolt-Ritter, Richter, & Steiner, 1996).

The data suggesting a link of feelings of hopelessness to cancer, supporting the hypothesis that activating emotions impact coronary disease and anergic emotions impact cancers, is inconsistent with the results of several studies. In a Finnish study of 2,428 men, a sense of hopelessness and depressive feeling was related to all-cause mortality and to both cancer and cardiovascular mortality (Everson et al., 1996). The relationship of depressed affect to coronary disease has also been noted by Anda et al. (1993). The most persuasive evidence for the relationship of depression to the recurrence of myocardial infarction and/or subsequent death is found in studies examining the effects of depression on individuals having a coronary episode (Fielding, 1991; Ladwig, Kieser, Konig, Breithardt, & Borggrefe, 1991; Ladwig, Roll, & Breithardt, Budde, & Borggrefe, 1994; Silverstone, 1990). For example, In a sample of 211 patients, Silverstone (1990) reported complications and/or mortality among 47% of those who were depressed subsequent to their initial attack versus 10% of those who were not depressed (the percentage depressed varied between 34% to 63% depending upon the criteria for depression).

A series of publications from the Montreal Heart Institute present a more detailed analysis of the depression-recurrence relationship. The basic finding in this study was an increase in mortality following myocardial infarction among those patients with a history of depression (Frasure-Smith, Lespérance, & Talajic, 1993). A differentiated view of the 12-month follow-up data from this sample of 222 persons showed that depression during hospitalization (measured by the Beck depression inventory) was a highly significant predictor of the recurrence of cardiac events for

36 persons hospitalized with acute coronary syndromes and 12 hospitalized with arrhythmic events (Frasure-Smith, Lespérance, & Talajic, 1995). In a later publication reporting results of an 18-month follow-up of these patients, Lespérance, Frasure-Smith, and Talijic (1996) report a higher death rate among patients who met DSM-III-R criteria for depression in hospital after their MI in comparison to those who were not so depressed (8 of 35 patients vs 13 of 187: 23% vs 7%). This effect was most pronounced, however, in the first 6 months following discharge and was less strong over time. While not reported upon at the 18-month analysis, both state anxiety and history of previous depression predicted recurrent events during the first year post-MI. Medical variables, with the exception of previous MI and prescription of ACE inhibitors at discharge, fared poorly in predicting recurrences, as did more stable psychosocial factors such as social support (perceived, living alone, etc.).

The high proportion of depressed patients reporting fatigue is an interesting feature of the Montreal study that may help to explain why depressive affect is related to recurrence of a cardiovascular event. Lespérance et al. comment that “fatigue was three times more common among patients depressed in the hospital than among the nondepressed . . . and . . . fatigue was not related to any measure of disease severity” (1996, p. 108). And because sleep and appetite problems were unrelated to the impact of the depression syndrome, “feelings of tiredness and lack of energy may be particularly important indicators of post-MI depression” (1996, p. 108). The investigators point to similarities of their results to findings by Appels and Otten (1992) showing that vital exhaustion is a strong predictor of cardiac death. Appels and Otten reported odds ratios of 3.0 to 9.0 between high levels of vital exhaustion and coronary attacks after correcting for factors such as age, blood pressure, smoking, and serum cholesterol. Analyses of the odds ratios over time show extremely high risk ratios during the few months following the assessment of vital exhaustion, e.g., between 8.0 and 10.0, with the ratios falling off sharply in 1 to 2 years. These data seriously question the hypothesis that depression (an emotional entity) is a “cause” of cardiac disease and suggest two alternative hypotheses: *Depression-fatigue and/or vital exhaustion indicate a lack of resources to fight disease progression and are a sign of vulnerability, or they may be indicators of very early stages of disease, e.g., coronary instability and failure to remove clotting, that results in vulnerability to both the onset and recurrence of coronary events* (Appels, Kop, Meesters, Markusse, Golombeck, & Falger, 1994). We will return to this issue.

Moderators of Stress-Illness Outcomes: Traits vs States, Disease, and Age

Stress does not have the same affects on disease outcomes for all persons. Scheier and Bridges (1995) identify three factors that may be moderators of the stress-illness relationship: whether the psychosocial predictor of disease is a trait or state measure, the stage of disease, and the age of the individuals studied. They argue that because emotional states such as anxiety and depression are temporary, they may predict flares and/or recurrence of disease episodes in an ill person, but not disease onset: stable, traitlike factors are presumed better predictors of disease onset. While it is possible to find evidence supportive of this hypothesis (e.g., social support and the comfort from religious beliefs were superior to a measure of depression in predicting death after cardiac surgery, Oxman, Freeman, & Manheimer, 1995), social support was not a predictor of mortality and/or recurrence in the 18-month follow-up report of Lespérance et al. (1996), and Huppert and Whittington (1995) found that recent feelings of emotional upset predicted 7-year postmeasurement mortality, while trait anxiety did not.

With respect to the second moderator, disease stage, Scheier and Bridges (1995) suggest that biological factors dominate disease progression during the later stages of illness screening; therefore, any effects of psychological factors are presumed to be more visible with regard to disease onset and disease progression. Data suggesting that mortality is postponed by holidays (e.g., Phillips & King, 1988; Phillips & Smith, 1990) is inconsistent with the assumption that psychological factors have no effects during end-stage illness, though the limited extent of the gain—no more than a few days—is consistent with the suggestion. When the gains are measured in days rather than significant days, the gain may seem paltry indeed.

With regard to age, Scheier and Bridges (1995) find that psychological factors have had a stronger impact on disease outcome for younger than for older persons. For example, in studies reporting a relationship of fighting spirit to cancer onset (Greer et al., 1979) or pessimistic outlook to cancer recurrence (Schulz, Bookwala, Knapp, Scheier, & Williamson, 1995), the effects are stronger for younger persons. Two additional studies cited in support of this hypothesis suggest an alternative hypothesis, i.e., that lifestyle factors may be responsible for the moderating effect of age. The finding that the components of hostility were stronger predictors of sudden death for younger than for older men in the multiple risk factor intervention trial (MRFIT) could be due to more frequent exposure of

younger persons to stressors sufficiently potent to induce stress reactions capable of producing cardiac episodes (Dembroski, MacDougall, Costa, & Gandits, 1989). In the second study, psychosocial factors seem more likely to be related to continued sun exposure and the occurrence of cutaneous melanoma in young than older persons (Temonshok et al., 1985). Scheier and Bridges' explanations for these age effects focus on two factors. The reasoning for the first, i.e., that biological factors may overshadow psychosocial factors in predicting mortality among older more than in younger persons, is the same as that advanced to account for the reduced predictive power of psychosocial factors for persons with advanced disease. The second is that investigators may have failed to assess the psychological factors that predict physical health outcomes in older persons. This latter factor seems especially plausible as a psychosocial factor not examined in the previously cited studies; people's self-assessments of health are robust predictors of mortality in over 25 studies (Idler, 1992; Idler & Benyamini, 1997). Physical, psychological, and social changes associated with age may orient people to different aspects of experience, resulting in a change in the psychosocial factors that predict health outcomes.

WHAT CAN BE DONE TO CLARIFY THE STRESS-ILLNESS LINK?

While we are persuaded of the plausibility of a direct, causal path from psychological factors to disease from the data we have reviewed, it is clear that the evidence is not yet conclusive. We have already listed three other possible interpretations of these findings: The first, that psychological factors (emotional traits such as anxiety and depression) have direct effects on *lifestyle* factors risky to health (e.g., smoking, specific dietary deficiencies, lack of physical activity), which are the immediate causes of disease. While many of the studies previously discussed partial out the effects of one such factor, e.g., smoking (Frasure-Smith et al., 1995), few control for all three. The second interpretation, that constitutional and/or genetic factors cause both the psychological factors and disease, is the *third factor* hypothesis. The strong form of this hypothesis, i.e., that emotional reactions and disease are parallel, non-causally linked outcomes of constitutional and/or genetic variables, seems less likely than a version suggesting that biological antecedents facilitate the linkage through direct

and/or indirect paths. And the last interpretation, the *indicator* hypothesis, suggests that emotional and personality factors predict health outcomes either because they assess the preclinical phases of disease or they are indicators of underlying vigor of the somatic system and its ability to defend against pathogens. This third alternative suggests the presence of low to moderately high correlations of emotional states and traits (e.g., depression), to disease in the absence of direct or indirect causal pathways (e.g., smoking). Given the presence of these alternatives, investigators have taken one of three routes in efforts to strengthen the hypothesis for direct effects: Use of quasiexperimental designs to test stress disease links; identification of the physiological pathways responsible for such direct effects; and investigation of the connections from disease to emotion. The last of these has been the least considered of the three.

Strengthening Causal Inferences: Quasiexperimental Approaches

Experimental studies randomizing individuals both to emotional stressors and disease pathogens would represent a major step toward eliminating explanations competing with direct pathway hypotheses. As both practical and ethical considerations preclude random assignment to chronic stressors, early investigations turned to quasiexperimental designs comparing, for example, physiological and illness outcomes subsequent to work loss due to plant closings (Kasl & Cobb, 1980) and illness indicators among air traffic controllers at sites differing in flight density (Cobb & Rose, 1973). In the latter study, the social support that the air traffic controllers provided one another reduced somewhat the strength of the association between work stress and disease.

The most recent and interesting examples of quasiexperimental trials have been conducted by Cohen and his colleagues (Cohen, Tyrrell, & Smith, 1991, 1993). Subjects in these studies are randomly assigned to exposure to placebo or one of several different respiratory viruses and data are obtained with regard to infection (viral replication) and illness (signs and symptoms). Both infection, i.e., viral shedding, observable mucous discharge, and symptoms of colds were more frequent and more intense after exposure to virus than to placebo, and for virally exposed participants who reported a substantial level of life stress (the nonrandom, quasiexperimental feature of the studies). A potentially important finding in the Cohen et al. (1993) study was the prediction of viral infection (evidence of viral replication) by two of the three measures of stress,

negative affects, and perceived stress, but not by prior life events. Sickness, i.e., symptoms and fever, after becoming infected was predicted, on the other hand, by life events, but not by negative affect and perceived stress. This findings appears to be reliable as it was also reported by Stone et al. (1992) and is consistent with data from a later study by Cohen et al. (1995) in which state affect was related to an objective sign of infection (mucus weight), but did not have a direct effect on symptom reporting. As symptoms such as fever are provoked by immune system responses, it is possible that the portion of "stress" independently attributable to life events is stimulative of immunological reactions.

As the participants in these studies are a highly select group of mostly young to middle-aged volunteers who were willing to be hospitalized for several days and exposed to viruses, one might question the relevance of the findings to samples of older persons. It is worth noting, therefore, that the results reported both by Cohen and colleagues and Stone and colleagues are congruent with a number of earlier correlational studies; those by Meyer & Haggerty (1962) and Clover, Abell, Becker, Crawford, & Ramsey (1989) are but two of many that can be cited. It is important to note, however, that none of these quasiexperimental studies provide evidence for selective effects of different negative affects: stress, whether anxious, depressive or feelings that one has failed to manage existent threats, predicts these illness indicators. In addition, while these data provide the most convincing demonstration to date that a measure of stress is an antecedent of resistance to viral pathogens, it is important to note that even when viral exposure is assured, the size of the stress effect is small. Still smaller effects can be expected in real-world samples of older persons where exposure is not controlled. This can be seen in longitudinal field studies of older respondents where repeated self-reports are obtained of both emotional distress and symptoms, the latter serving as an indicator of health status. Results from two such field studies from our laboratory, one where the mean age of participants was 62.1 years, the other 72.9 years, found that baseline measures of negative affect, depression, and anxiety predicted symptoms 6 months later, correcting for baseline symptom reports (Leventhal, Hansell, Diefenbach, Leventhal, & Glass, 1996). A state measure of depressive affect was a stronger predictor than a state measure of anxious affect in the first of the two studies, but both anxious and depressive affect, state and trait, predicted 6-month symptom levels in the second. Only 1% of variance was accounted for by these statistically significant effects. Similar associations of depressive

affect to symptoms were reported in earlier studies, for example, Aneshensel, Frerichs, and Huba (1984), accounting for virtually identical amounts of variance (1%) to that found by Leventhal et al. (1996). These data also suggest that one can detect the impact of depression on subsequent indicators of infectious illness for a 6-month period (Perez & Farrant, 1988), the effect disappearing over longer time frames.

In summary, there is evidence showing that psychological stress increases the probability of subsequent, acute disease as measured by viral shedding and symptom reports. The effects very likely reflect the interaction of emotional stress and pathogen exposure, the small size of the effects in the longitudinal studies reflecting the accidental nature of exposure. Second, the data suggest that stressors are most likely to affect indicators of sickness when the stress has been in place for several months. Third, while the data fail to support a differential affect hypothesis, i.e., anxiety and depression do not have disease-specific effects, there is some indication that anergic emotional reactions have stronger short-term than long-term effects. A final caveat is that none of these findings, the quasiexperimental or the correlational, rule out an indicator hypothesis, i.e., that stress as measured in these studies is an indicator of vulnerability to pathogens, but not a "cause" of disease.

Disease to Behavioral/Emotional Distress

The difficulty in demonstrating distress emotions as causal antecedents of illness contrasts with the ease with which one can see the effects of illness on behavior and emotion. When we are severely ill, the immune system's heavy demands on the body's resources shuts down the behavioral system; we shiver, become febrile, lose our appetites for food and water, curl up, and sleep (Hart, 1988). Hart's description of this pattern emphasizes its adaptive functions; fever inhibiting the replication of pathogens, shivering raising metabolism and body temperature, loss of appetite reducing risk of intake of substances rich in iron and necessary for viral replication, depressed mood and sleep conserving resources given the drain from elevated metabolism. To cite Hart, "Behavior associated with being sick can be viewed as representing an all-out effort to overcome the infectious disease, putting virtually all of the animal's resources into fending off the invading pathogens" (p. 133); i.e., a shift in resources away from behavior to the somatic defenses for the destruction of invading pathogens. The change is experienced both as illness and emotional dis-

tress, typically as depression (Aneshensel et al., 1984), though the total response pattern has both differences and similarities to that seen in psychologically induced depression, e.g., infant separation from mother (Hart, 1988). The effect from illness to depression is short-lived, and it appears to be stronger than the effect from depression to illness (Aneshensel et al., 1984).

Chronic illnesses also have direct effects on the behavioral and emotional systems and these longer-lasting, direct effects are burdens borne mainly in the later years of life. Parkinsonism presents a dramatic example: dopamine depletion and its associated physical disability results in as many as 40% of Parkinson patients manifesting comorbid depression (Cummings, 1992). Two features of this relationship merit attention. First, it is extremely difficult to determine the degree to which the high proportion of patients suffering from depressive affect is due to dopamine depletion per se versus the loss of mobility and the meaning of this loss. Cummings (1992) clearly attributes much of the emotional comorbidity to dopamine depletion itself. The second point worthy of notice is that the cognitive content of the depressive affect consists of depressed mood and feelings of hopelessness: self-recrimination and guilt are absent (Cummings, 1992), similar to the depression associated with coronary heart disease (CHD). It appears that depression induced by a neurotransmitter deficit and a cardiovascular event takes a somewhat different form than depression induced by life events.

Finally, age appears to moderate the impact of disease upon illness behaviors and their emotional components. Symptoms in older organisms appear to be blunted: fevers are moderated (Norman, Graham, & Yoshikawa, 1985) and at times nonexistent (Gleckman & Hilbert, 1982) and reports of pain may be blunted (Enck, 1991; Miller et al., 1990), although data on age-related reductions in pain perception is variable (Evans et al., 1992; Harkins, Price, & Martelli, 1986). And older persons report less intense emotional reactions to thoughts of contracting disease and to the reality of illness. The blunting seen in many elderly is a source of diagnostic difficulty in treating the elderly (Burns & Goodwin, 1997).

Because the impact of illness on behavior and mood is so potent and so clear, it may not seem to demand further discussion, but its significance does. Indeed, we propose that direct pathways among diseases and behavior are the legacy of the survival from pathogen attacks over successive generations of different species of living organisms. Our proposal that the links of behavior and emotion to disease are bidirectional needs to

be qualified: it is bidirectional but asymmetrical, the effects being more intense and well-defined in the direction from disease to behavior. This asymmetry offers a clue to an important, adaptive function of depressed affect.

Strengthening Causal Inferences by Defining Physiological Pathways

Defining the physiological pathways by which emotional stress leads to illness is the second and perhaps most important way in which investigators have tried to eliminate the uncertainty associated with epidemiological and clinical studies. An examination of the physiological paths connecting emotion to illness requires differentiation and specification of what we mean by emotion: what are the constituents and parameters of this construct, and how might it be related to disease? While many of the points that we will raise about the use of the term *emotion* can be raised about the use of the term *disease*, we will not attempt to spell them out in this chapter.

EMOTION: HOW IS IT TO BE DEFINED?

Emotions are complex responses reflecting the operation of an underlying, multifactorial psychobiological system: they are not indivisible entities or closed modules. Recognition that emotions are behavioral systems complicates the task of linking emotion to disease, as some components and/or parameters of emotion may be important for disease and others not. To understand the problems involved in defining pathways between emotion and illness, it is necessary to be clear about the following features of emotion.

1. Emotions Can Be Described in Three Different Languages

At least three languages can be used to describe and understand emotional reactions: cultural-sociological, psychological, and biological. Anger, for example, can be described in terms of the sociocultural context (e.g., hierarchical role relationships permitting its expression or use); the psychological meanings (e.g., revenge for attack on the self; availability of resources for counterattack) optimal for its elicitation (Scherer, 1984); subjective experiences accompanying it (Shaver, Schwartz, Kirson, &

O'Connor, 1987); and the biological responses comprising it (Panksepp, 1993). Investigators and laypersons tend to think these are different descriptions of the same entity; empirical data suggest otherwise. For example, physiological reactions are often assumed to be highly correlated with subjective feelings, when they are not (for comments on this theme, see Leventhal, 1984).

2. Multiple Levels and Multiple Components Exist in Each Language

Each language, e.g., psychological description of emotion, contains multiple levels for describing emotion, with multiple components at every level. For example, the psychological description of the cognitions involved in the information processing involved in the elicitation of anger will include a level of automatic factors such as a novelty detector, a primitive threat detector (object rapidly approaching), a pleasant-unpleasant detector, and a rapid appraisal of physical resources to respond with anger. As the individual matures, experience creates another level of abstract, directive, or "executive"-like cognitions. These are involved in decisions to express or inhibit the expression of anger as a function of the meaning of such a response with regard to one's self-image and the stability of the relationship to the other party (Johnson & Hirst, 1993; Leventhal & Scherer, 1987; Scherer, 1984). Multiple levels exist within the expressive-behavioral and physiological descriptions, and each level consists of multiple components. For example, the highest level of the physiological description will require description of the integration of neural activity across multiple brain loci, while the intermediate and lowest levels of description would focus on neurotransmitters and modulators active both in the brain, the peripheral nervous system, and at specific "end-organs" (e.g., adrenal glands, kidney, gut, lymphatic tissue, etc.).

An important consequence of this multicomponent physiology is that subjective emotional states as diverse as fear, joy, and effort may show similar response patterns on some physiological components (e.g., intense motor activity, heart rate acceleration, adrenergic activation) and differ on others. A serious challenge to investigators is to determine whether the disease outcome is "caused" by the emotion, a component of the emotion, or a behavioral factor that is associated with the emotion, e.g., overt motor activity, but is not an essential part of it (Contrada et al., 1990).

3. Emotions and Their Components Have Timelines

Emotions and illnesses have timelines: colds last for days, arthritis for years (Leventhal, Meyer, & Nerenz, 1980), angry feelings for seconds and/or minutes, depression for days and weeks. And the components of these reactions may last for different time frames, subjective feelings waxing and waning more rapidly than the physiological activation underlying them. Causal models require attention to the temporal overlap of the different levels of response of emotion and illness.

4. Levels and Components May Be Dissociated: The Search for Indicators

The tightness of the relationship among components across levels varies enormously. Physiological indicators may be highly correlated with subjective indicators of anger and fear for some persons at some points in time (e.g., self-statements of mood), and may be virtually independent of one another at other times: the differences in the duration of these responses virtually assure dissociation. This dissociation can lead to seemingly contradictory findings. For example, it has been hypothesized that cardiovascular disease is a product of anger and hostility detectable in vocal and expressive reactions in the type A interview (Mathews, 1988; Smith, 1992). It is also claimed that cardiovascular disease is a product of repressed anger, (i.e., toxic physiology in the absence of felt anger; Cottington, Matthews, Talbott, & Kuller, 1986; Shapiro & Miller, 1987) and unlabeled and/or not understood emotion (i.e., alexithymia), or the presence and awareness of the somatic symptoms of toxic physiology in the absence of emotion labeling (Kauhanen, Kaplan, Cohen, Salonen, & Salonen, 1994). That each of these contrasting sets of subjective and expressive indicators predicts coronary disease suggests that they may be linked to a similar set of underlying physiological components, the latter being responsible for the link to disease.

5. Emotions and Diseases Are Coping and Communicative Reactions

Emotional reactions did not evolve to create disease or to stimulate emotional coping. The various levels and components of emotional reactions emerged from evolutionary processes that integrated internal, homeostatic, and adaptive mechanisms of "emotion" physiology with the subjective

feelings and vocal, facial, and postural expressions of emotion useful for both interorganismic (Fridlund, 1991) and intraorganismic (Leventhal, 1984) communication in social animals. Knowing that you are angry and/or frightened, and letting others know it, is adaptive; it can shape one's own and the other's behavior to destroy or sustain hierarchical relationships and to create or avoid violent confrontation. Diseases emerge when this system is stressed so as to cause severe, acute deviations from homeostasis, or repeated deviations which reset or downregulate the system so that it fails to return to baseline levels.

AGE-RELATED CHANGES IN EMOTIONAL REACTIONS

Investigators have reported declines in the intensity of emotional reactions in the later years (Diener, Sandvik, & Larsen, 1985; Leventhal & Prohaska, 1986) and declines in the rate of progression of diseases (Kaesberg & Ershler, 1989). These declines parallel age-related changes in multiple spheres of life. Social transitions, such as children moving from home, retirement, and the narrowing of social relationships may separate the elderly from roles which involved frequent stressful encounters. Normal aging (senescence) is associated with declines in physical and physiological resources. For example, there are declines in muscle mass (Baumgartner, Stauber, McHugh, Koehler, & Gary, 1995) and reductions in pulmonary function (maximum VO_2 uptake) show steady decline after 20 years of age, declining 1% per year (Inbar, Oren, Scheinowitz, Rotstein, Dlin, & Casaburi, 1994; Lakatta, 1994; Morris, 1990). These declines are reflected in older persons' self-appraisals (e.g., they may feel they lack the strength and resources they had earlier in life), and lead them to decisions such as "Let someone else carry the (physical and/or emotional) load"; and "I've already done my share."

Aging is also associated with declines in fluid intelligence, though crystallized intelligence appears less susceptible to change (Baltes, 1993; Schaie & Willis, 1993). As crystallized intelligence reflects years of life experience, the elderly may exhibit more efficient (less resource-costly) forms of problem-solving and be less reliant on more primitive forms of coping, i.e., on emotional displays. And if action in the later years is dominated by well-practiced (habitual) forms of thinking and coping, significant dissociation may occur between behavior and the components of emotional responding, allowing for sustained autonomic reactivity and low levels of subjective emotion in response to stressors.

It is important to recognize, however, the enormous variability in the elderly population. Some “elite” elderly may continue with productive work during the eighth and ninth decades of life. The pulmonary and cardiovascular systems of elderly marathon runners are more competent than that of the average 20-year-old (Kujala, Viljanen, Taimela, & Vitta-salo, 1994), though inactivity results in more rapid decline and difficulty in recovery than in younger persons. Studies of learning in the rat, primate, and human consistently identify a subset of elderly animals (30 to 40% of the sample) who perform on par with their far more youthful compatriots (Rapp & Amaral, 1992), and the immune system of elite elderly appear as proficient as does the immune system of far younger persons (DeGreef, Van Staaiduinen, Van Doorninck, Van Rol, & Hijmans, 1992). Finally, the declines of senescence are often associated with different degrees of morbidity (senility) which deplete the organism’s resources, speed the rate of aging, and mute emotional and nonemotional behaviors.

CAN WE IDENTIFY PATHWAYS FOR DIRECT EFFECTS?

Do the physiological data show clear paths linking stress to illness in support of the epidemiological findings, and are these paths related to specific emotions, or will the paths support the division into activating and anergic effects, as suggested by our organization of the epidemiological data? Our questions are consistent with the suggestions of the researchers who have done much to define stress research. Selye (1973) suggested that some emotions may be toxic, i.e., stressful and disease-producing, while others may have positive and/or beneficial effects, and Mason (1975) advanced the hypothesis that different emotions may be toxic for different, specific diseases. Finally, can we identify how age affects these pathways?

SAM and HPAC: Paths to Disease?

Two paths are presumed to have toxic effects for disease; the sympathetic, adrenal medullary (SAM) path for cardiovascular conditions (corresponding to activating emotions), and the hypothalamic, pituitary, adrenal cortical (HPAC) path for diseases such as the cancers (corresponding to anergic emotional and immune response: Contrada et al., 1990; Frankenhauser, 1983; Henry, 1986; Henry & Stephens, 1977). The SAM system is activated by emotions such as fear and anger, resulting in the production of

norepinephrine within the central nervous system and epinephrine by the adrenal medulla; the latter is diffused throughout the body and has extensive effects on the cardiovascular system (e.g., constriction of peripheral vasculature, accelerated heart rate, etc.). The HPAC system, activated by depressed affects, sends peptide and steroid signals from the hypothalamus to the anterior pituitary gland which communicates with the adrenal cortex via the hormone ACTH. The adrenal cortex releases cortisol, which suppresses inflammation and immune function. Emotional reactions are potentially disease-producing and disease is potentially emotion-inducing, because they share these physiological systems.

The toxic effects of these emotions is presumed to be greater the stronger and longer-lasting the physiological reactions. As discussed earlier, Kamarck and Jennings (1991) provide qualified support for the role of intense negative emotion as a trigger of cardiac episodes and stroke. It has been more difficult, however, to demonstrate how the SAM responses accompanying emotional reactions can cause a chronic disease such as essential hypertension, the major precursor of stroke and hypertensive heart disease. Chronic activation of these negative emotions is possible when the environmental impact is sustained, for example, by years of continued exposure to work stress and when the toxic physiological component of the affect is dissociated from cognitive and subjective markers and expressive reactions that allow the individual to be aware of and communicate the presence of stress (Cottingham et al., 1986). Dissociation may also screen the affect from other persons, e.g., from medical practitioners, who as a consequence are unable to identify the presence of emotional upset and to intervene to ameliorate it (Roter & Ewart, 1992). In the absence of social intervention, the system may fail to return to a neutral (or positive) level, i.e., the neurophysiological "set-point" of the system may change, producing long-term effects on cardiovascular function and structure. Not surprisingly, a major class of anti-hypertensive agents, angiotension-converting enzyme (ACE) inhibitors, are designed to counter the toxic effects of sympathetic activation, which can be due to emotional activation, by their antagonistic action to adrenergic effects in both the central nervous system (CNS) in the periphery (e.g., lowering blood pressure by relaxing peripheral vasculature).

BEYOND SAM AND HPAC

While SAM and HPAC are reasonable as mnemonic devices, they create the illusion of two separate and distinct systems involved in internal

regulation. This is false on at least three counts. First, SAM and HPAC involve more components than those usually listed under each rubric. Second, the extent of interaction among the two is sufficient to suggest that the idea of their separation is an accident of the sequence of discovery and not a functional reality. Pert, Ruff, Weber, and Herkenham (1985) have suggested that the SAM, HPAC, immune and peptide systems form a single, interconnected system. Third, these systems have multiple functions, and one could easily regard their involvement in the emotion-disease link as secondary at best in relation to their varied, primary functions.

Complexity of Autonomic (SAM) and Endocrine (HPAC) Systems

The SAM system is but one of three components of the autonomic system, the parasympathetic and enteric being the other two (Dodd & Role, 1991). Sympathetic and parasympathetic effects tend to counter one another, though the latter are more localized. Because they are in balance, it is possible to misattribute a peripheral change, e.g., to ascribe an increase in heart rate and/or blood pressure to sympathetic drive when it is due to parasympathetic withdrawal. The HPAC system is extremely complex. Adrenocorticotrophic hormone (ACTH) released from the anterior pituitary in response to cortisol-releasing factor from the hypothalamus is a member of one of the three classes of hormones released from the anterior pituitary. It (ACTH) is only one of a group of hormones that is formed from the precursors alpha melanotropin and beta lipotropin. Though ACTH and each of the hormones in its group, of the other two groups (growth hormone & prolactin: thyroid-stimulating, luteinizing, and follicle-stimulating hormones), bears the name of that target organ whose physiological and behavioral functions first led to its discovery (e.g., l-thyroxin release from the thyroid), each has a wide range of effects. In sum, not only are SAM and HPAC intimately intertwined with one another, they are intertwined with the other pituitary hormones, and several of these hormones, including norepinephrine and cortisol, have bidirectional links to the immune system (Ader et al., 1990).

While these systems have multiple functions, their primary focus is the regulation of internal homeostasis in the face of changing, external demands: i.e., they are energy-regulating systems crucial for survival. For example, SAM, a catabolic system, produces rapid increases in metabolism and cardiac response during acute stress episodes involving fight or flight (Cannon, 1929). The parasympathetic system downregulates and fine-tunes cardiac response and energy expenditure during these episodes

(Landsberg & Young, 1991). The HPAC and glucocorticoids, such as cortisol, are there for the longer term. Cortisol, a steroid that is critical in transport across cell and nuclear membranes, plays a crucial role in energy mobilization which lasts for hours rather than moments (Landsberg & Young, 1991; Williams & Dluhy, 1991). As is the case for endocrine systems, its effects are widely felt and it interacts (feedback and feed-forward loops) with chemical messengers from the autonomic system, the immune system, and the central nervous system. The demands (stressors) that these systems are designed to meet range from environmental variation in temperature through intense muscular output for fight and/or flight, to the expressive and communicative behaviors associated with emotional reactions generated during these acute episodes.

The Immune System Is Stimulated by Endocrines and Neural Signals

Identifying pathways by which stress hormones and neural signals can affect immune function is critical for validating the stress-illness hypothesis, as the immune system is the main defense against disease once a pathogen has penetrated the body's first-line defenses (skin, nasal mucosa, etc.). The immune system consists of the several types of cells (e.g., various macrophage, natural killer cells (NK), t & b lymphocytes, and neutrophils), that recognize the difference between self and nonself and act to destroy intruders in the latter category. Each cell of the endogenous system can target a wide range of pathogens and diseased tissues (Nossal, 1993; Janeway, 1993). In addition to destroying pathogens, these generalized defense cells communicate with other immune cells by binding pieces of the invader (protein molecules in combination with complement) on their cell surfaces. If a T cell of the adaptive immune system recognizes this display, it sends a chemical signal alerting other cells to action (Janeway, 1993). Each T cell of the adaptive system "recalls" a prior encounter with a single pathogen, and the communicating substances (lymphokine) it releases, stimulates the proliferation or "cloning" of T and B cells (Burns & Goodwin, 1997). The B cells produce antibody to destroy the invading organisms as long as the invaders remain in the intercellular space. Nearly 100,000,000 different proteins can be recognized and marked for destruction by this system (Janeway, 1993).

A complex set of communications takes place among the immune and endocrine systems, and the mutual regulation created by these interactions plays an important role in the defense process. The sympathetic system

has direct effects on immune action via neural innervation of immune lymph glands and by neuropeptide stimulation of immune cells. The cells of the endogenous arm of the system have endocrine receptors on their surface, and their cellular and cytotoxic activity can be increased by acute sympathetic stimulation (Cacioppo et al., 1995; Murray et al., 1992). Cells of both the innate and adaptive arm also have receptors for cortisol [the longer-acting energy mobilizer in the endocrine system] which appears to suppress the activity of both arms of the system, diminishing the vigor of response of natural killer cells and T helper cells. This damping action is important in preventing excessive inflammation and injury to healthy tissue by an overreactive immune defense (Asnis, & Miller, 1989; Munck, Guyre, & Holbrook, 1984; Williams & Dluhy, 1991).

As indicated before, the adrenergic and cortisol effects on immune function are but one of many endocrine-immune interactions. Growth hormone provides another example; it has direct effects on immune end-organs (it can rejuvenate the thymus gland) and has a stimulating effect on white cells. As such effects are nearly always bidirectional, it is not surprising that a product of the immune system, interleukin 1, stimulates the secretion of growth hormone in humans (Kasting & Martin, 1982). These less well-known facilitory interactions are similar in structure to the inhibitory interactions discussed at length in treatises on HPAC and the immune system. Finally, in addition to the bidirectional communication among the autonomic, HPAC, and immune systems, there is bidirectional communication of the three systems with various peptides (55 different peptides had been identified by 1985; Pert et al., 1985).

It is clear that multiple paths exist for the interaction of the endocrine and nervous system with the body's immunological defenses. Ader et al. (1990) summarize the data describing these complex interactions in the following way:

Extensive results indicat[e] that hormones of the anterior pituitary and the adrenal gland are immunomodulatory; the lymphocytes and accessory cells receive neuroendocrine cues; and . . . products of the leukocyte components of the immune system can communicate with and modulate endocrine and nervous system responses. (p. 570)

And in a later publication, Ader and Cohen (1993) caution against assuming that endocrines such as cortisol are the sole mediators connecting psychological factors to immune function:

The available data, however, provide no support for stress-induced elevations in “stress hormones,” notably adrenocortical steroids, as the mediator of conditioned alterations in immune function. Indeed much of the data stand in direct contradiction to such a hypothesis. (p. 568)

Specific Immune Products Generate Symptoms, and Changes in Behavior and Mood

A central theme of our chapter is that the examination of bidirectional effects (i.e., from disease to behavior and emotion as well as from behavior to disease) would help to define the pathways connecting disease to the stress process. In accord with this theme, we reviewed data and suggested that the effects of illness on behavior and stress emotions are far more impressive and obvious than the effects of stress-emotions on illness. We would also argue that people have been aware of these effects from time immemorial. The knowledge that these behavioral and mood changes are caused by the immune system’s *response* to pathogens, rather than by the pathogens themselves, is more recent. The chemical messengers that immune cells produce to initiate the division and proliferation of the T and B cells needed to destroy pathogens also stimulate both the endocrine and central nervous systems. The effects on the nervous system are dramatic and powerful: interleukins change the set-point for temperature, i.e., they cause fever, produce shivering, fatigue, and depressed mood, and, in combination with the immune cells, cause inflammation and tissue damage (Hart, 1988). It is the immune system’s attack that makes us “sick,” it shuts down overt behavior, depresses our mood, and generates other psychological and social changes that facilitate recovery. The average bacteria and virus would be happier and more successful if it were possible to feed upon and kill us in silence. Immune cells also appear to be involved in the early, “silent” stage of development of chronic diseases; i.e., one form of white cell, the eosinophil, appear to be involved in the destruction of coronary artery intima surface and the formation of atherosclerotic plaque (Kojima et al., 1996).

Aging and Deficits of Inhibitory Action in Maintaining Homeostasis

To understand how age moderates the emotion-illness link, we must focus on the balancing act that is reflected in the interactions within and among the endocrine and immune systems, as well as on their interactions with the physical structure and physiological function of the body. For example,

with age-related changes in body composition, and declines in pulmonary function and the control of sympathetic, parasympathetic, and cortisol reactions (Baumgartner et al., 1995; Boutcher & Stocker, 1996; Cook et al., 1995), there is a reduction in how well these systems regulate energy expenditure: these include difficulties in adjusting to wide variations in temperature and in marshaling the resources for emotional and physical action and fighting pathogens (Finch & Landfield, 1985).

A factor that seems of special relevance to emotion, health, and aging is the age-related decline of inhibitory processes in both the autonomic and endocrine systems. The declines in inhibitory processes occur with little evidence of simultaneous decline in the activating components of these systems (Finch & Landfield, 1985; Pfeifer et al., 1983); these appear to be a part of normal aging (senescence) rather than a result of pathology. The effect within the autonomic system is the result of decline in the sensitivity of baroreceptors that initiate the parasympathetic reactions counterbalancing sympathetic activation (Pfeifer et al., 1983; Taffet, 1996). While highly speculative, it seems possible that the reduced effectiveness and slowing of sympathetic inhibition may result in a dissociation of sympathetic arousal from its eliciting environmental stimuli, a consequence of which may be a reduction in the reported intensity of emotion (Diener et al., 1985), and higher scores on measures of inability to identify emotions (Lane et al., 1996). The elderly may be faced, therefore, with an increase in the duration of potentially toxic autonomic arousal and the experience of somatic distress that lacks both a clear cause and an emotion label. Such reactions may be less easily regulated by oneself and others.

A similar decline appears to occur in inhibition of cortisol production. Reductions both in receptor sites and death of hippocampal neurons disrupts the feedback loop that reduces hypothalamic cortisol-releasing factor. The result is failure to close down anterior pituitary output of ACTH, the hormone-stimulating cortisol discharge from the adrenal cortex (Sapolsky, Krey, & McEwen, 1986), and the maintenance of high systemic levels of cortisol and the continuation of catabolic processes that further deplete muscle protein and suppress immune function. The result may be a window of opportunity for pathogens.

CAN WE FORMULATE GENERALIZATIONS REGARDING SYSTEM FUNCTIONS?

Our overview of the physiological mechanisms connecting stress-emotion and illness has stressed three points:

1. The "systems" (autonomic; endocrine; immune) are extremely complex;
2. Multiple, bidirectional communication and mutual regulation exists among the elements both within and between the systems; and
3. Age reduces the inhibitory feedback and sensitivity to modulators in several areas.

What can we conclude from this complexity? How does the complexity change our view of the emotion-illness link? We could attempt to address these questions by engaging in an increasingly detailed analysis of system function, or we could "take a step back" from the stress-illness issue, and by focussing on the major functions of these systems formulate a few simple generalizations regarding the interaction among the systems that might provide a new perspective on the effects of stress upon illness and its modulation by age. The principles are as follows:

Homeostasis, Energy Utilization, and Survival

The single proposition that seems to best describe the central function of both the autonomic and endocrine systems is that:

P1) These systems maintain internal homeostasis and assure the availability of resources (glucose, etc., for energy) for adaptation to a changing, external environment to insure the organism's survival.

From this perspective, emotions and the instrumental behaviors tightly linked to them (running, hitting, regurgitating, laughing), are automatic reactions for adapting to environmental demands. The shape and duration of these behavioral reactions make demands upon the physiological machinery, and this system adjusts and repatterns its output to provide the needed energetic resources while maintaining internal stability. This leads us to the suggestion that:

P2) It is primarily the homeostatic, energy-utilizing component of emotion which is involved in disease. The physical and physiological demands may differ for different emotions and their associated behaviors. The pattern of these demands creates the possibilities for disease over short and long time spans and it leads to links between specific diseases and specific emotions.

This second proposition concurs with Selye's (1973) proposal that the physiological responses to stressors are protective and adaptive as well as disease-producing, and suggests the possibility raised later on by Mason (1975), that different types of stress may have a degree of specificity with respect to disease causation. We believe, however, that the number of patterned, physiological reactions responsible for specific distress-disease links is less than what one would predict from a differential emotion theory. We also suggest that the illness-inducing physiological reactions produced by a stressor are as likely to be a consequence of the instrumental behaviors accompanying the emotion as of the emotion itself (Weiss, 1972).

As with emotions, the defense against pathogens and disease is an energy-demanding biobehavioral reaction. Thus:

P3) The defenses against disease draw upon somatic (energy) resources, the pattern and amount of these demands reflecting the nature of the pathogen and the component of the defense system called upon to annihilate it.

Allocation of Resources

As all somatic systems, behavioral, emotional, endocrinological, and immunological, draw upon the body's energy store, the apportionment of resources is a major problem for the biological system. The system must "answer" questions such as the following: "How much of the body's energetic resource should go to problem-solving (e.g., running from William James' bear or competing with an opponent), to emotional expression (e.g., anger, fear, etc.), and/or to disease control?" "What is the best timing for resource distribution?" "Is survival enhanced if the physiology underlying the biobehavioral system deploys resources to the most energy-costly component of disease defenses (e.g., T cell clonal expansion?) when resources are needed for the cognitive and behavioral responses to succeed competitively?" "Does the expression of anger provide a competitive advantage and minimize long-term energy expenditure, or does it strengthen external attacks that deplete limited resources?" We believe the following proposition addresses these issues:

P4) Resources are deployed among the systems in accord with the organism's immediate, adaptive needs. Thus, the physiological machinery (auto-

nostic; endocrine; and immune) is responsive to top-down (behavioral and cognitive) as well as bottom-up demands.

The effects of sympathetic arousal generally appear to confer a survival advantage by funnelling energy into systems attuned to managing immediate, external threats, e.g., fight or flight. The direction of somatic resources toward the cognitive and motor processes needed for survival in a competitive jungle, and the deflection of resources away from secondary defense systems that are not immediately needed (e.g., immune response), creates a potential window of vulnerability to disease. We assume, therefore, that survival will be (and was) enhanced by appropriate adjustments within the immune system:

P5) To close the window of vulnerability to external pathogens, endocrine-immune interactions will inhibit those immune defenses that are energy-costly, and enhance those that are energy-inexpensive. Within systems adjustments of this sort will be bidirectional, i.e., they will occur in the behavioral system when the role of immune defenses are primary.

Laboratory studies of the effects of short-term stressors on endocrine and immune function yield a picture consistent with our propositions. For example, Cacioppo et al. (1995) found an increase in NK cell lysis (more effective immune response) and a decrease in CD4 response (less effective T helper cell response) in response to short-term laboratory stress. Similar data were reported by investigators at UCLA (Naliboff et al., 1991). This simultaneous enhancement (NK cell) and suppression of adaptive (T cell) function seems less puzzling when viewed in terms of our propositions. First, adaptive defense, T and B cell cloning, is costly, i.e., it draws upon somatic energy (Proposition 3). As the activity of the adaptive arm is extremely energy-demanding, survival is enhanced by its suppression during active threat management: energy at that moment is needed for cognitive and muscular action (Propositions 4 and 5). Sympathetic activity does more than conserve energy by suppressing adaptive immunity; by raising blood pressure, it is bringing existent NK cells and macrophages into circulation (Herbert et al., 1994; Naliboff et al., 1991) which increases the possibility of early identification and destruction of pathogens, doing so at minimal cost by suppressing adaptive immune activity. Thus, adaptation is optimized by enhancing the availability and activity of already available defenses while suppressing the T helper subset, whose response

would make heavy demands on somatic energy stores. The innate system can bring the more costly, energy-demanding adaptive system into play, if needed.

As suggested earlier, there is a bidirectional connection of the immune system with behavioral and emotional mechanisms (Besodovsky et al., 1991). When exogenous pathogens overcome the primary lines of defense, i.e., penetrate the skin, mucosal defenses, and are detected by but evade the innate system, clonal expansion of the T cell system and B cell production of antibodies begin in earnest. Cytokines secreted by immune cells stimulate clonal expansion, raise body temperature to slow viral replication, cause inflammation, fatigue, etc., and tell us, often with great force, that we are sick. The vigor of the cytokine response may vary with the stimulus (Burns & Goodwin, 1997). The specific features of the response reflect the particulars of the pathogen and the immune defense; the "generic" aspect of the reaction, defined by Selye (1956) as the stress response. It is no accident that stress was first identified as a component rather than a cause of illness.

Age as a Moderator of Resources

The final set of propositions contains suggestions referring to two sets of closely connected issues:

1. How do reductions in the quantity of resources and regulation of resource distribution affect the stress illness link?
2. How do age and illness impact resources, resource utilization, and the stress-illness link? (Meites, 1990).

It would be important to know whether the effects of age on the stress-illness link is mediated by age or disease-related changes in the availability and distribution of resources (Mangiacapra & Florini, 1990), or by other factors. Our suggestions on this issue are as follows:

P6) Age (senescence) and chronic illness (senility) result in an overall decline in the size of the resource pool, and in particular, in the availability of resources (reductions in muscle mass-protein pool) for longer-term (cortisol-converted) energy utilization.

P7) Senescence and senility are associated with reduced inhibitory control over the systems activating resource utilization, resulting in an increase in the time needed to replenish resources.

Evidence was cited in this area regarding age-related changes in body composition (Baumgartner et al., 1995) and autonomic balance, i.e., greater reduction of inhibitory, parasympathetic than of activating sympathetic activity (Schwartz, Gibb, & Tran, 1991), and failure to inhibit cortisol output due to decline in cortisol-sensitive neurons in limbic and hypothalamic brain areas (Sapolsky et al., 1986). The endocrine effects point to an age-related failure in the automatic processes for shutting down activated systems. Elderly persons who permit themselves to become affectively aroused risk resource depletion.

P8) The compromised (senescent and senile) organism is more susceptible to periods of resource depletion and to attack by pathogens.

Propositions 6, 7, and 8 suggest that survival and effective aging may be partially dependent upon higher-order changes in a person's self-maintenance strategies that compensate for deficiencies in the automatic control system.

P9) As individuals age, they adopt higher-order strategies to compensate for declines in the quantity and distribution of system resources that are products of aging and disease. Two types of self-regulation, resource-conservation strategies have been identified: (1) Risk avoidance and preservation of resources (Leventhal, Leventhal, Schaefer, & Easterling, 1993; Leventhal & Crouch, in press), and (2) Exercise for resource maintenance.

P10) Successful aging, i.e., long-term survival and vigor, is a product of the interaction or fit of specific self-regulation strategies to specific environmental demands (Baltes & Baltes, 1990; Carstensen, 1992; Fredrickson & Carstensen, 1990).

Subjective Indicators of System Status

In an earlier section, we concurred with Scheier and Bridges' (1995) suggestion that investigators may have failed to assess the psychological factors that predict physical health outcomes in older persons. We placed less weight on the hypothesis that biological factors overshadowed psychological and personality factors as predictors of health outcomes among older persons. To support our preference, we pointed to the more than 25 studies showing that older persons' self-assessments of health are robust predictors of mortality (Idler, 1992; Idler & Benyamini, 1997).

The predictive power of factors that directly assess judgments of health status is congruent with Proposition 9 (P9) that the social, physiological, and physical changes associated with aging generate higher-order self-regulation strategies (Fredrickson & Carstensen, 1990; Leventhal & Crouch, in press). The desire to sustain life, either by conserving resources or by exercise to enhance vigor, orients individuals toward the preservation of function and judging their health on the basis of their ability to recall recent and prospective events, their ability to walk, dress, shop, do household chores, etc., rather than judging on the basis of traitlike statements of optimism, or items measuring neuroticism and negative affect. The consequence is a change in the psychosocial factors that predict health outcomes.

Emotion theories make clear that subjective measures of affect are responsive to a wide range of stimuli (Leventhal, 1984; Leventhal & Scherer, 1987). The result is that measures of affect are sensitive to multiple events and nonspecific. Measures of depression are sensitive to psychological loss such as death of a spouse (Brown & Harris, 1978), and to physical illnesses such as CHD (Lespérance et al., 1996) and Parkinson's disease (Cummings, 1992). Our multilevel systems view suggests that these "depressions" may be similar in one component, e.g., mood, and differ in predictable ways in others. For example, the "depressions" reported by both Lespérance et al. (1996) and Cummings (1992) lack self-critical and self-blame cognitions. This should not surprise us, given that these patients are assessed in a medical setting while in treatment for a serious illness; hence depressed mood is more likely to be blamed on the disease than on themselves. Thus, mood-state indicators such as depression, fatigue, and/or vital exhaustion can be induced by psychological factors, deficiencies in somatic processes that indicate a state of vulnerability should a pathogen strike, presymptomatic disease processes (e.g., coronary instability and failure to dissolve clots that predispose to CHD), and by active disease. The objective of measurement, therefore, is not merely the identification of an affect, i.e., the presence of clinical depression or anxiety, but the identification of a sufficiently complete array of affect components at any level (subjective, cognitive, or physiological) to allow us to identify its source, likely duration, consequences, and response to intervention.

In her thorough review of the depression immune literature, Weisse (1992) provides a clear statement of the current "causal" view of the stress-illness link which contrasts with that which we have proposed.

She states that "Severity of depressive symptoms have been related to dysphoric mood. Therefore, immune alterations may be more a function of the severity of depressive symptomatology than of a specific situation or event" (p. 483). The causal logic implicit in Weisse's statement is disturbing, as it assumes that depression is a direct cause of immune dysfunction rather than an expression of one of three alternative states: a state of anergy and vulnerability to pathogens, a prodromal disease process, or a state of active disease process. The degree to which a depression measure reflects any one of these three alternatives, rather than a psychologically activated state antecedent to immune dysfunction and disease, detracts from depression's role as a "cause" of disease, even when there is a clear relationship between the intensity of a depressive state and a medical indicator of disease. The following proposition summarizes our position:

P11) Anergy, i.e., fatigue, sadness, and a sense of hopelessness, reflects the exhaustion of system reserves. It can be a product of multiple causes and have multiple, different correlates. Thus, anergy can be a cause of illness or a noncausal predictor of illness elicited by an advanced disease process, an early disease process, or depletion of resources resulting in vulnerability to encountered pathogens.

CONCLUSIONS AND DIRECTION FOR FUTURE RESEARCH

Does our emphasis on the illness-stress relationship, rather than its obverse, suggest new directions for research? How will these directions change when we consider the effects of age on the size of the individual's resource system, dysfunctions in the automatic regulation of endocrines, and the adoption of global self-regulatory strategies to compensate for the aforementioned deficits? And what other changes in direction will occur as we consider the selection of measures of emotion and/or psychological status in light of our view of emotion systems?

We will mention but two of the many issues that can be raised by these three questions. The first concerns the identification of the direct and indirect effects of disease on emotional reactions. Research in this area would identify the contributions of the physiological effects of disease, the psychological representation of the disease, and personality and social variables on emotion and behavior. These studies would make use of a differentiated view of emotion. For example, the physiological changes

involved in diseases such as Parkinson's, rheumatoid arthritis, cancer, and cardiovascular disease can have profound impact on emotion and behavior. The approach we are suggesting would require, however, that we specify and examine the specific components of emotion that we expect to be impacted by these physiological changes; will dopamine depletion in Parkinson's disease affect mood and cognitive factors, and which cognitive factors will be most vulnerable? Are the mood and cognitive changes direct consequences of dopamine depletion, or are they moderated and/or mediated by beliefs about Parkinson's (e.g., that it is progressive and chronic, in contrast to nonprogressive and acute), and higher-order strategies for self-regulation (e.g., the need to conserve and avoid depletion vs. the need to exercise and replenish). Cognitions respecting the disease (illness representations: See Skelton & Croyle, 1991) and the self (Leventhal & Crouch, in press) will operate in conjunction with the physical and physiological changes of disease to shape the individual's emotional reaction.

The second concerns the joint effects of disease and emotional distress on adaptation to illness. In contrast to the studies which examine the relationship of depression to recovery from cardiovascular disease which ask, "How does the presence of a comorbid state of depression affect survival from CHD and/or recurrence of CHD?," we would address questions such as: "How do survivors live with coronary disease? Do they go about their daily business as before? Do they return to pre-illness life tasks with a different approach, and if so, what is the difference? Do they reconstruct themselves and become different people?" Most of the studies examining adaptation to chronic and life-threatening illness focus on the impact of illness on negative emotional state and factors such as coping styles (Keefe, Brown, Wallston, & Caldwell, 1989; Miller, Markides, Chiriboga, & Ray, 1995) and personal outlook that mediate and/or moderate affective outcomes. While Zautra and colleagues (Zautra et al., 1995) have broadened the search to include the examination of the impact of disease on negative and positive emotional states, few studies directly address questions respecting the impact of disease on constructions of the self and involvement in life tasks.

The direction we are suggesting takes a step forward by asking whether and how specific adjustments to the self are affected by the combination of three sets of factors:

1. Illness and the individual's beliefs about it (the illness representation):

2. The emotional reactions associated with these beliefs (fear, anger, depression); and
3. Global, age-related self-regulation strategies (risk avoidance and preservation of resources and exercise for resource maintenance).

For example, a coronary episode and concurrent and subsequent angina in combination with fear elicited by the representation of CHD as a threat of “sudden death” can lead to reframing the self as a coronary cripple and sharp reductions in activities in multiple domains (e.g., failure to engage in rehabilitation, avoidance of sexual contacts, disengagement from all physical and social activities viewed as “stressful,” etc.). This restructuring of the self in response to painful angina and fear would seem most likely for aging individuals who have adopted a global strategy based upon the avoidance of risk and the need to conserve and avoid resource depletion. Individuals whose global strategies emphasize the need to exercise and replenish resources would carefully monitor pain, avoid “excessively” stressful physical and/or social episodes, and gradually increase both exercise and exposure to life challenges with the expectation of improving function. It would be essential, of course, to incorporate factors in studies designed to address these issues that would link new results to the existent literature (e.g., specific coping strategies, moderators such as personality dispositions and social support).

Though it is still too early to tell how reversing the stress-illness question will change our view of the pathways connecting emotional and disease processes, we are reasonably certain that the change will result in substantial additions to knowledge. Research on the effects of immune function on endocrine function and behavior, e.g., the impact of cytokines on endocrines and behavior, supports the value of our viewpoint. The long-term goal, however, is to identify and map in detail each of the pathways connecting emotions and illness.

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CHAPTER 6

Emotion and Control: A Life-Span Perspective*

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Emotions and affect are a pervasive element of everyday life. The experience, expression, and perception of mood and emotion are central features of human existence. Not surprisingly, the centrality and ubiquity of emotional phenomena have secured their status as topics of intense discussion and frequent debate among philosophers, scientists, and historians for at least two millennia. For the past century, the study of emotions has become a central focus for theory development and empirical investigation among social and behavioral scientists.

More than a decade ago, we noted that despite the current widespread interest in the study of emotions, this topic was rarely addressed from a life-span developmental perspective (Schulz, 1982, 1985). Major textbooks on

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adult development and aging devoted little space to this topic, and major theories of emotions had little to say about emotionality through middle and old age. Although considerable progress has been made on multiple fronts in the last decade, including work on age-related differences in the expression/communication and perception of emotions (Labouvie-Vief, DeVoe, & Bulka, 1989; Levenson, Carstensen, Friesen, & Ekman, 1991; Lubin, Rinck, & Collins, 1986; Malatesta, Fiore, & Messina, 1987; Malatesta, Izard, Culver, & Nicolich, 1987; Malatesta-Magai, Jonas, Shepard, & Culver, 1992; Moreno, Borod, Welkowitz, & Alpert, 1990, 1993); individual differences in the experience of emotions (Aldwin, Levenson, Spiro, & Bosse, 1989; Larsen, Diener, & Cropanzano, 1987; Rotor & Ewart, 1992); and the measurement of emotion (Lawton, Kleban, Dean, Rajagopal, & Parmelee, 1992; Schulz, O'Brien, & Tompkins, 1995), relatively few researchers have ventured into the difficult terrain of articulating and testing ideas that view affect in a life-course context. Some notable exceptions to this conclusion are the theoretical and empirical work of Carstensen (1992, 1993), Labouvie-Vief et al., (1989), Lawton, Kleban, Dean, et al. (1992), and Lawton, Kleban, Rajagopal, et al. (1992).

The purpose of this paper is to extend the discourse on emotions and affect by squarely placing these constructs in a life-course developmental perspective. The fundamental question we are interested in addressing is what purpose do emotions serve; what role do they play in the development of the human organism?

Our approach to addressing these questions is guided by three factors. First, we use our recently articulated life-span theory of control as context for discussing the role of emotions in development across the life span (J. Heckhausen & Schulz, 1993, 1995; Schulz & J. Heckhausen, 1996). To date, the emphasis in our theory of life-span development has been on cognition, motivation, and behavior. Affective or emotional phenomena have been intentionally omitted from our earlier papers, even though we strongly believe they play a critical role in life-span development. Second, we rely on empirical research published primarily in the last decade to help elucidate our theoretical position. And third, our perspective on emotions and affect and our ability to integrate this topic into our own theoretical framework is strongly influenced by the work of Nico Frijda and a compelling paper he published in the *American Psychologist* entitled "The Laws of Emotion" (1988).

Our paper is divided into four parts. We begin by describing our life-span theory of development. Next, we focus on the role of affect and

emotions in human development, and this is followed by a discussion of empirical research relevant to our theory. We conclude with recommendations for a future research agenda that is derived from our theoretical perspective.

LIFE-SPAN THEORY OF CONTROL

A theory of the life course must first acknowledge the broad biological and social forces that fundamentally shape the development of the organism (Elder, in press; J. Heckhausen, in press; J. Heckhausen & Schulz, 1995). These forces are typically viewed as constraints and can be briefly summarized in four propositions (Schulz & J. Heckhausen, 1996).

The first proposition is that life is finite. Whatever is to be achieved or experienced in life has to be done in a finite period of time, typically less than 80 years. Second, biological development follows a sequential pattern. Although there is considerable interindividual variability in biological development, the overall biological resources across the life span resemble an inverted U-function. Third, societies impose age-graded sociostructural constraints on development. Life-span psychologists and life course sociologists emphasize that all societies can be characterized as having age-graded systems which constrain and provide a scaffold for life course patterns (Baltes, 1991; Hagestad, 1990; Hagestad & Neugarten, 1985; J. Heckhausen, 1990; Heckhausen, in press). These patterns provide predictability and structure at both individual and societal levels. And fourth, genetic potential is a limiting factor on functional development. Although the potential behavioral repertoire of humans is vast, the capacity to achieve extraordinary levels of functioning in a given domain may be constrained by the genetic makeup of an individual.

A second general requirement of a theory of life-span development is that it must provide means for regulating development in ways that help maximize an individual's potential. This is achieved through four types of mechanisms (Schulz & J. Heckhausen, 1996; J. Heckhausen, in press). First, there must be *diversity* in the opportunity to sample different performance domains. Second, there has to be *selectivity* in pursuing and allocating resources to developmental paths that are consistent with genetic and sociocultural opportunities. Third, the individual must *compensate* for and cope with failure encountered as different action goals are pursued and with declines associated with late life development. And fourth, the indi-

vidual must *manage tradeoffs* across domains and sequential life phases and recognize that the allocation of resources to one domain may compromise the opportunity to develop others.

The life-span theory of control proposes the construct of control as the central theme for characterizing human development from infancy to old age (J. Heckhausen & Schulz, 1995; Schulz & J. Heckhausen, 1996). The underlying assumption of this position is that humans desire to produce behavior-event contingencies and thus exert primary control over the environment around them throughout their life span. We further distinguish between primary control and secondary control. Primary control targets the external world and attempts to achieve effects in the immediate environment external to the individual, whereas secondary control targets the self and attempts to achieve changes directly within the individual. Both primary and secondary control may involve cognition and action, although primary control is almost always characterized in terms of behavior engaging the external world, while secondary control is predominantly characterized in terms of cognitive processes localized within the individual.

We emphasize the functional primacy of primary over secondary control. Because primary control is directed outward, it enables individuals to explore and shape their environment to fit their particular needs and optimize their developmental potential. Without engaging the external world, the developmental potential of the organism cannot be realized. As a result, it is both preferred and has greater adaptive value to the individual.

Extensive empirical research suggests that striving for primary control is inherently part of the motivational systems of mammals. The developmental origin of activities directed at controlling external events and acquiring generalized expectations about control can be traced to the very beginning of life. Even neonates are able to detect behavior-event contingencies (Janos & Papousek, 1977) and most mammals prefer behavior-event contingencies to event-event contingencies even in the absence of consummatory behavior (Singh, 1970). The striving for primary control assures development within specific domains as well as the sampling of diverse domains over time (cf. White, 1959). Primary control striving provides the foundation for diversity and selectivity throughout the life course.

The development of primary and secondary control over the life course is illustrated in Figure 6.1.

Early development is characterized by an increased ability to exert primary control over the environment. The action-outcome experiences

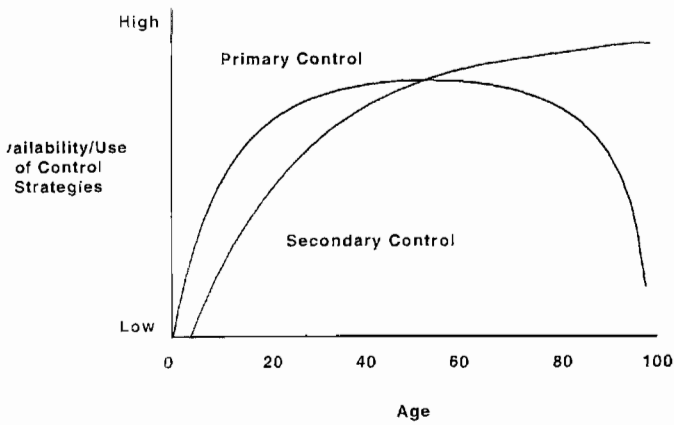


FIGURE 6.1 Availability and use of primary and secondary control over the life course.

of the child provide the basis for the development of self-competence, including generalized and exaggerated expectancies of control and perceptions of self-efficacy. Children between the ages of three and four are able to experience appropriate emotional reactions to failure (Geppert & H. Heckhausen, 1990; H. Heckhausen, 1984) and therefore require compensating mechanisms to counteract this threat to their motivational resources. During childhood and adolescence a broad range of secondary control strategies develop, including changing aspiration levels, denial, egotistic attributions, and reinterpretation of action goals (see review in J. Heckhausen & Schulz, 1995). Perceptions of control are highly exaggerated early in life (Weisz, 1983), showing little correspondence to actual primary or secondary control. This delusional sense of control is adaptive in that it provides the motivation to engage the environment at a time when the organism is rapidly developing.

Early adulthood is characterized by increasing levels of primary and secondary control as well as increased selectivity with respect to the domain specificity of control. Selectivity continues to increase throughout adulthood, while diversity gradually decreases. Because of the limited capacity of the individual and external constraints, the increased selectivity at older ages has to be compensated for with decreased diversity. This

tradeoff between diversity and selectivity is a hallmark of development in late middle and old age. During late middle age and old age, the strategy of choice leans more toward the elaboration and increased use of secondary control strategies. Increasing age-related biological and social challenges to primary control put a premium on secondary control strategies as means for maintaining motivational resources for primary control. As the ratio of gains to losses in primary control becomes less and less favorable, the individual increasingly resorts to secondary control processes.

Throughout the life course, primary and secondary control work together to optimize development of the organism through selection processes and compensation for failure. As shown in Figure 6.2, motivation for primary control is a central driving force in our model. It provides both the impetus for and regulation of the individual's interactions with the environment. Primary control across the life span is optimized by processes of goal selection. Selection processes regulate the choice of action goals so that diversity is maintained and positive and negative trade

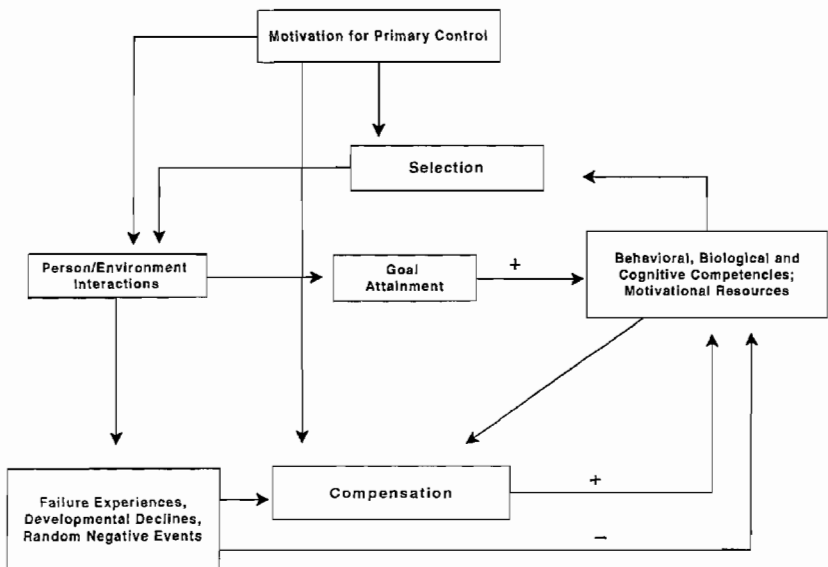


FIGURE 6.2 The role of primary control in a life-span model of development.

offs between domains and life stages are taken into account. Moreover, selection processes manage the allocation of motivational and behavioral resources to goals that have been selected.

Our model indicates that person/environment interactions are motivated by the motivation for primary control, and are guided by selection processes. A given interaction will result in either positive outcomes, such as goal attainment, or negative outcomes, such as failure. Goal attainment leads to the maintenance or enhancement of competencies and motivational resources. Three types of potential failure experiences are identified in our model: normative developmental failure experiences encountered when individuals attempt to enlarge their competencies; developmental declines characteristic of late life; and non-normative negative events. These failure experiences have the potential of undermining competencies and motivational resources and therefore require some form of compensation. Compensation mechanisms serve to maintain, enhance, and remediate competencies and motivational resources. Both compensation and selection processes are motivated by desires for primary control and can be characterized in terms of primary and secondary control processes.

The Role of Emotions

Implicit in the discussion that follows is our view that emotional development cannot be viewed as distinct from other developmental factors. Our view of emotions emphasizes its relation to behavioral, cognitive, and physiological as well as subjective phenomena. Thus a life-span view of emotion has to attend to all of these aspects of development, each of which may have its own developmental trajectory and contextual opportunities or constraints.

Although there are many different approaches one might take to the discussion of emotions throughout the life course, our emphasis here will be on the functional significance of emotion to the development of the organism. Thus, the important question we address is, what role do emotions play in the development and maintenance of primary control over the life course? Our focus on this question is not meant to imply that the sole function of emotions is to serve primary control ends, but rather to help us frame our discussion in a life-course context. We acknowledge that emotions serve multiple functions, including communication, attachment, and social referencing (Oatley & Jenkins, 1992).

A fundamental proposition of our theory is that humans desire to produce behavior-event contingencies and thus exert primary control over the environment around them throughout their life span. Thus, a major goal of development is to promote and maintain primary control. The discussion presented below is aimed at showing how the emotional system is ideally suited to serve as a motivational resource for and mediator of primary control striving.

Emotional Experience as Ends and Means

According to our view, emotions cannot be ends in themselves, although they may serve as proximal goals in specific situations. Another way of expressing this concept is that feeling good is not a major goal of human development, it is to maximize primary control. Thus, our view of the experience of emotions emphasizes the role of emotions as facilitators or mediators of primary control. This view is consistent with Nico Frijda's (1988) evolutionary perspective reflected in his statement that "the human mind [is not] made for happiness but instantiating the blind biological laws of survival" (p. 354).

In making this claim, we do not intend to dismiss the common everyday experience of intentionally engaging in desirable activities in order to "feel good." Although the short-term or proximal goal of pursuing behavioral options such as going out for a good meal, watching a good movie, or perhaps going shopping is to make oneself feel better, we would contend that, at least in some cases, the goal of feeling good serves another more distal purpose, and that is to recharge the motivational resources of the individual so that other control-related goals might be pursued in the long term. A system whose primary goal was to maximize feeling good would be an evolutionary failure because its host would be very short-lived.

Positive and Negative Affect as Feedback and Regulatory Systems

A theory of development requires a regulatory system that responds appropriately to successes and failures. Research suggests that the capacity to respond affectively to behavior-event contingencies is already in place at birth. For example, Rosenstein and Oster (1988) showed that 2-hour-old babies exhibited facial expressions showing pleasure when presented with sweet fluids and displeasure when given salty and bitter ones. These facial expressions are viewed as indexes of positive and negative emotions that are innately organized in relation to the goals of obtaining sweet and

avoiding bitter substances. Such data are consistent with our life-span theory of control, which states that the organism from infancy on is programmed to detect and respond to contingency experiences. Thus, positive affective responses are observed even in neonates (e.g., smiling, cooing) when they experience behavior-event contingencies (Papousek, 1967; Watson, 1966).

Throughout the life course, mastery of behavior-event contingencies or achievements is associated with positive affect such as happiness, pride, pleasure, and joy (Csikszentmihalyi, 1975; Oatley & Jenkins, 1992), while losses or failures tend to elicit negative affect, such as sadness, shame, or anger (H. Heckhausen, 1984).

Positive affect resulting from contingency experiences serves both as a reinforcer for existing levels of primary control and a motivator for further primary control striving. Negative affect can serve the important role of increasing control striving when failure experiences are encountered. This would be the case, for example, when individuals fail to attain goals, and then increase their efforts to gain the desired primary control.

Negative affect can also have dysfunctional consequences when it undermines the motivation for primary control. Repeated failures at achieving important goals can undermine an individual's motivation to pursue them. In the long run, this would limit the primary control potential of the individual. In order to attenuate or buffer the impact of failure and loss experiences and their attendant negative affect, the individual has available a large repertoire of secondary control strategies. These strategies are invoked when opportunities for direct action are constrained, and they vary in direct proportion to the intensity of negative affect instigated by the loss experience. For example, poor performance on an important test may result in more practice or harder work to prepare for future similar challenges, and/or it may result in making external attributions for poor performance (e.g., "I didn't get enough sleep the night before the test"). Together, these responses to failure help to protect existing levels of primary control and assure future primary control striving. In an analogous way, secondary control strategies can serve to enhance the impact of positive affect and promote primary control striving. Thus, the pleasurable feelings resulting from achieving success on a particular task may result in heightened self-attributions about one's ability and encourage setting new goals that motivate primary control striving.

In some circumstances, losses or failures can be so overwhelming that neither primary nor secondary control mechanisms are able to overcome

them. When this happens, the primary control potential of the individual is compromised, and we would expect negative affect to be both intense and long-lasting. This might be the case, for example, when a permanent physical disability fundamentally undermines the primary control of an individual and all attempts to cognitively or physically compensate for this loss are unsuccessful. Situations such as these are frequently associated with the presence of clinical depression in late life (Alexopoulos et al., 1996; Schulz, J. Heckhausen, & O'Brien, 1994). This example is consistent with other findings showing that severe losses and threats occurring in conjunction with vulnerability factors, such as lack of social support, can cause psychiatric syndromes such as depression (Brown & Harris, 1989; Oatley & Bolton, 1985).

It is also possible to imagine positive affect so strong and persistent that motivation for further action is undermined, as might the case, for example, with addictions to mood-altering drugs such as heroin. However, like Frijda, we believe that mechanisms have evolved to protect humans from the dangers of positive affect serving as the ultimate goal of human existence. Positive emotions are contingent on change and disappear with time, whereas negative emotions persist as long as the instigating conditions are present: "One gets used to the events that, earlier, delighted and caused joy; one does not get used to continuous harassment or humiliation. Fear can go on forever; hopes have limited duration" (Frijda, 1988, 353–354). The link between change and positive affect is consistent with our idea of the primacy of primary control. It assures that individuals continue striving beyond already attained levels of primary control, and the only way to achieve this is through action on the external environment. From an evolutionary perspective, an asymmetric affective system that requires continuous change for maintaining positive affect and heightened responsiveness to adverse conditions is likely to promote survival by way of maximizing primary control.

Emotional Intensity and Specificity of Response

We have already noted that the affective system is asymmetric with respect to the duration of affect once instigated. Thus, positive affect dissipates spontaneously and relatively quickly unless reinvigorated, while negative affect persists unless acted upon. Emotional experiences also vary in intensity and in direct proportion to the magnitude of threat to or loss of primary control (Frijda, 1988). Thus, threats to higher-order domains of

primary control, such as survival or physical functioning, elicit stronger emotional responses than threats to lower-order domains such as specific cognitive or physical skills or abilities (Schulz & J. Heckhausen, 1996). The greater the loss or threatened loss, the greater the emotional response, and hence the greater the action readiness to respond. A rich repertoire of response options to loss are available to the individual, and they serve the dual purpose of maintaining or promoting the primary control of the individual and downregulating the negative affect generated by the loss.

Figure 6.3 illustrates how four types of adaptive control strategies which can be elicited in response to positive and negative affect. Both primary and secondary control strategies are available response options to threats, losses, and failures. Specific emotions are associated with specific response tendencies. For example, an emotion such as intense fear elicited by threat is more likely to result in a response involving selective action on the environment (i.e., selective primary control), whereas an emotion such as sadness elicited by loss or failure is likely to result in a secondary control response targeting internal representations of the eliciting event and its likely consequences (i.e., compensatory secondary control). Compensatory secondary control strategies include disengagement from prior goals, engagement with new alternative goals, self-protective patterns of causal attribution, and strategic inter- and intra-

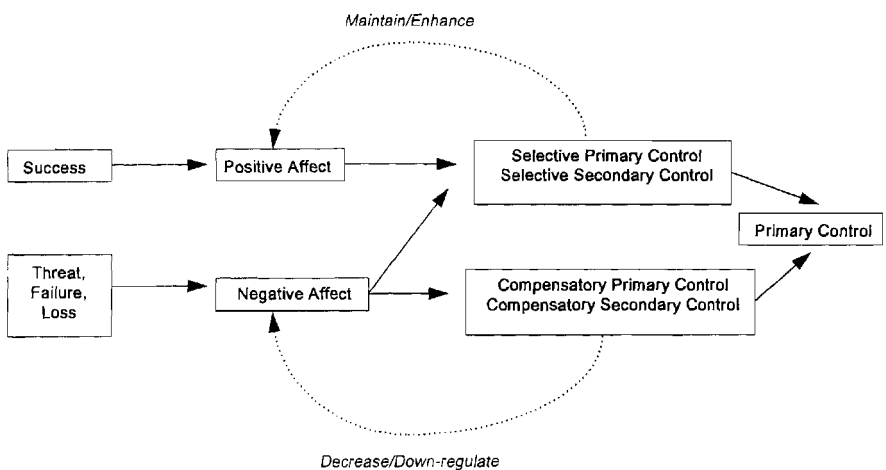


FIGURE 6.3 The role of emotions in the life-span model of control.

individual social comparisons. Negative affect generated by a loss may also elicit compensatory primary control responses, such as seeking assistance from others or using assistive devices, such as wheelchairs or hearing aids.

Positive affect frequently leads to enhanced goal striving (selective primary control), but may also elicit selective secondary control, such as targeting internal representations relevant to goal pursuit. This might involve enhancing the value ascribed to a chosen goal, the perceived personal control of goal attainment, or the anticipated positive effects of goal attainment.

In sum, both positive and negative affect serve to instigate selective or compensatory control striving in order to protect or enhance existing levels of primary control. Selective and compensatory control processes play the additional role of modulating the emotional experience itself, downregulating negative affect and maintaining positive affect for as long as possible. The specific control-related response option instigated by an experienced emotion is a function of both the type of emotion and its intensity.

Emotional Development

We earlier characterized life span development in terms of primary and secondary control processes. Primary control follows an inverted U-shaped pattern as a function of age, accelerating during infancy and throughout adolescence and then declining in late life. Secondary control processes have a slightly later onset, also increase with age, and continue to increase into middle and old age. Together these processes help to optimize development throughout the life course. In this paper we have further argued that emotional processes play a key role in the primary control striving of the individual throughout the life course. Emotions signal the status of primary control efforts and, together with secondary control processes, help modulate primary control striving. Two questions emerge from an integrated model of emotions and control. First, what do we know about the emotional experience of individuals from a life-course perspective, and second, how does this inform our theoretical thinking about the role of emotions in control-related processes? An important follow-up question is, what do we need to know in order to better understand the role of emotions over the life course? These issues are addressed next.

The capacity for emotional response already exists at birth. Emotions at very young ages are relatively undifferentiated, representing basic emotions such as being happy, sad, angry, and afraid. By the age of 2, children are able to use terms denoting emotion, and are able to make causal statements involving emotions by the age of 3. With increasing age, children develop subcategories of emotions and more complex conceptions of emotions. Ultimately, children are not only able to characterize their own emotional states in terms of highly differentiated categories, but they are also able to infer mental states of people around them (Smiley & Huttenlocher, 1989). Given the strong link between the development of primary control and intellectual development, we would expect strong reciprocal relations between intellectual and emotional development, and this is indeed the case (Case, Hayward, Lewis, & Hurst, 1988). Attaining a measure of control over emotional states once instigated, developing self-related emotions such as pride, shame, and guilt, and using emotions as mechanisms for developing and regulating goal achievement are important milestones in development. They are essential requisites for the successful development of the organism and for maximizing the primary control potential of the individual.

Once we leave childhood and adolescence, empirical research on emotional development becomes scarce. The lack of research on emotionality in adulthood may reflect an assumption that things stay pretty much the same from early adulthood on. Our early work (Schulz, 1985) challenged this assumption, and a number of published studies in the last decade provide important insights about emotional development over the life course. Much of this literature is reviewed in other chapters in this volume (e.g., Caccioppo, Chapter 2; Magai & Passman, Chapter 4). This literature suggests that there is considerable continuity in emotional responsiveness from childhood through adulthood (Oatley & Jenkins, 1992) and that there are important individual differences in emotional responsiveness and/or the ability to regulate emotional responses once they occur (Larsen et al., 1987). As we would expect, emotional responsiveness is linked to the primary control striving of the individual (Aldwin et al., 1989; Caspi, Elder, & Herbener, 1990).

Research that derives from an explicit life-span perspective of development and focuses on emotions is still relatively rare. One important exception to this general conclusion is the work of Carstensen (1992, 1993, in press). Carstensen proposes two broad superordinate classes of social motives that follow different developmental trajectories. An information-

seeking motive seeks to acquire knowledge about the self and the social world. A second class of social motives derives from a need for emotional gratification, and includes motives such as the desire to feel good, derive emotional meaning from life, establish intimacy, and verify the self. These motives are at their peak both early and late in life, whereas information-seeking is dominant during adolescence and young adulthood. Carstensen has further articulated a socioemotional selectivity theory, which postulates that in late life, social interaction is increasingly likely to be motivated by attempts to regulate emotion and increasingly less likely to be motivated by information-seeking goals. This in turn affects the type of social partners chosen by older people, as well as the types of social interaction they engage in. An impressive array of evidence is presented to support this proposition, including the fact that social contacts decline with age; older persons are more likely to prefer familiar over unfamiliar social partners, and are more likely to think about social partners in affective terms. This pattern of results converges with findings reported by Lawton, Kleban, Rajagopal, Dean (1992) in their work on dimensions of affective experience among younger, middle-aged, and older adults.

Based in part on the theoretical propositions of Schulz (1985), Lawton, Kleban, Rajagopal, et al. (1992) pose a number of hypotheses concerning the experience and regulation of emotion over the adult life course. Although in some respects exploratory, this study yields several consistent patterns of results. One pattern of cross-sectional age differences suggests that self-regulation increases with age. Thus, older respondents are more likely to agree with statements such as "Part of maturing is being able to arrange your life so there are fewer highs and fewer lows"; and "I can continue to do the same things year after year and enjoy them as much or more than I used to."

A second pattern of results suggests that affective responsiveness becomes moderated with age. This is reflected in the higher rates of endorsement among older respondents when compared to younger respondents of statements such as "Both pleasure and worries become fewer as I grow older," "Moments of extreme despair or unhappiness become much less frequent as you grow older," and "My feelings are likely to become more moderate as I grow older."

This pattern of results is consistent with our life-span theory of control. In old age, losses become predominant, and novel positive experiences become less and less likely. Because of increased losses and decreased probability of novel positive experiences, an adaptive regulatory system

would selectively downregulate negative affect and enhance positive affect. The secondary control strategies we have identified are ideally suited to achieve these goals, resulting in the overall modulation of affect in old age. In contrast, during early development, where the emphasis is not on protecting primary control but rather increasing it, we would expect a highly labile and reactive emotions system. During early phases of life, the density of novel positive or success experiences is much higher; as a result, an emotions systems that is highly reactive to these experiences has the potential of maximizing motivational resources that enhance primary control striving.

CONCLUSION AND FUTURE DIRECTIONS

Our goal has been to address the broad question: What role do emotions play in the development of the human organism? The implicit assumption in this question is that emotions have evolutionary significance, and therefore play a critical role in the survival and development of the organism. We argue that by themselves emotions are essential, but not sufficient, mechanisms for regulating development, and that a higher order motivational system is needed to understand the role of emotions in human behavior and development. Thus, we examine the role of emotions in the context of a life-span theory of control. This theory posits a motivation for primary control as a major driving force in both survival and development. In this model, emotions serve as the fuel of a regulatory system whose major goal is to maximize the primary control potential of the organism. Both positive and negative affect generated through interactions with the environment have the potential of energizing the organism toward further primary control striving. Secondary control processes serve the function of protecting and enhancing primary control and are closely linked to emotions. An emotional response can instigate a secondary control process which in turn promotes the motivational resources needed for primary control striving. Thus, the emotions system serves as a signal and as a motivational resource in shaping human behavior. However, the functional value of emotions to the optimal development of the organism is achieved through a wide range of secondary control processes that regulate and channel emotional experiences.

The evolutionary significance of primary control striving and emotions is a major theme of this chapter. We have articulated a theoretical model

that emphasizes primary control striving throughout the life course, not just during the years during which procreation is common in our species. This view stands in sharp contrast to a number of alternative theoretical positions such as the models proposed in this volume by Carstensen, Gross, and Jung (Chapter 12) and Labouvie-Vief (Chapter 7) as well as those of earlier personality theorists such as Jung, Erikson, Gould, and Loevenger (Cavanaugh, 1990; Schulz & Ewen, 1993). The major difference between our perspective and theirs is that these theorists advocate alternative motivational systems such as achieving a sense of integrity, becoming more inward, or emotional gratification as primary themes of development during adulthood. Thus, they would generally agree with the idea of primary control striving during the early years; but for them, this is supplanted by something else that places less emphasis on control striving during middle and late adulthood.

Evolutionary processes favor attributes that maximize survival through young adulthood, when most reproduction occurs. From an evolutionary perspective, a motivational system that has primary control striving at its core has obvious advantages for procreation, but the reason for the maintenance of primary control striving throughout life may be less clear. Postreproductive age was not exposed to selective pressures of evolution because late-onset characteristics were not relevant for inclusive fitness (except, perhaps, for grandparenthood which is a relatively recent phenomenon). However, it is unlikely that abilities and preferences favored early in life can be easily overridden in late life as a result of cultural forces or ontogenetic adaptation. Older adults must work with the same phylogenetically determined preference structures that younger persons do. To the extent that such preferences are nonadaptive in old age, there is a negative trade-off between the functional ability to pursue the developmental tasks of young adulthood and the requirements of old age. It is for these reasons that compensatory processes become critical in old age. Our theoretical perspective emphasizes that these compensatory mechanisms, some of which are evolutionarily selected to maximize development during the first few decades of life, are available and useful during the second half of life. Thus, our view of the evolutionary basis of development is quite parsimonious. It posits one primary motivational system which operates throughout life, two control-related processes that serve primary control striving, and an affective system that is closely integrated with all three of these components.

It will be apparent to the reader of this volume that emotions as an area of scientific discourse is theory-rich but relatively data-poor. We have a gusher of theories and a trickle of empirical findings. This chapter adds to this imbalance, but also suggests new types of empirical questions that might be pursued. For example, our assessment of the literature suggests that there are important individual differences in people's ability to modulate their emotional responsiveness. By viewing modulation mechanisms in terms of secondary control processes, we may be better able to identify functional and dysfunctional methods for regulating emotions. An important advantage of our theoretical perspective is that it offers a relatively clear criterion for functionality, i.e., the extent to which the primary control potential of the individual is maintained or enhanced.

Another implication of our theory is that interference with secondary control processes will affect the duration and intensity of emotional experience. Although secondary control processes can be both automatic and volitional, it should be possible to prevent individuals from engaging secondary control strategies in response to an emotional experience. This should cause positive emotions to dissipate more quickly and negative emotions to persist longer.

Evidence already exists that the utilization of secondary control processes varies over the life course, and there is suggestive evidence that their use varies in regard to emotion regulation (Band & Weisz, 1988; Compas, 1987). These are interesting findings and should be pursued further, particularly with respect to how these regulatory mechanisms affect primary control striving at different stages of development. An important requisite to the development of research in this area is the development of more refined measurement strategies for primary and secondary control. Although the number of existing control-related measurement instruments is vast (Haidt & Rodin, 1995), it is important to note that these scales exclusively focus on perceived control. The measurement of optimization in primary and secondary control striving requires a very different strategy from existing instruments. Both general and domain-specific measurement instruments for primary and secondary control strategies currently in use can be obtained from the authors.

The role of emotions in development and aging is a vast unexplored territory with the potential of yielding important new discoveries. Further research in this area may take us well beyond the psychology of aging or even a psychology of the human species.

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Cognitive-Emotional Integration in Adulthood*

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In this chapter, I report on a research program on cognitive and emotional development throughout the adult life span. This research project began some years ago with the question whether accounts of cognitive changes in adulthood and later life should be reconnected with models of developmental processes in early life (Labouvie-Vief, 1980, 1982). Thus I began to look for a theoretical account that described the total of the life span as a series of continuing reorganizations, with specific linkages between earlier and later periods of life. In that process, I inevitably was confronted with the relationship between cognition and emotional experience.

The salience of emotion in adult cognition derives, I believe, from the unique structure and function of cognition in late life. To be sure, emotions are important at all stages of the life span. Yet the increasing complexity of the mature person, paired perhaps with the deep awareness of the impermanence and mortality of the self (Brandstädter, 1993; Carstensen,

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1992), raises the understanding of the emotional dimensions of life to a qualitatively different level. Youth-centered theories of development have focused primarily on cognition's role in adjusting to an outer, culturally given reality. This outer focus goes along with the primary function of cognition in youth: it is predominantly reproductive, acquisitive, and focused on an outwardly defined reality or on "primary control" (Heckhausen & Schulz, 1995; Jung, 1933; Labouvie-Vief, 1994; Schaie, 1967). In contrast, cognition in mature and later adulthood undergoes what Neugarten (1968) described as an "inward turn" and Neumann (1973) as "centroversion": an increased introspectiveness and concern with the subjective conditions of life. In my own recent book *Psyche and Eros* (Labouvie-Vief, 1994), I suggested that as a consequence, in later life, the cognitive system increasingly comes to embrace the emotional conditions of life, at least ideally so.

My own work over the years has been animated by a deep conviction that such a view of qualitative reorganizations has profound implications for how one views adaptive processes in ways that extend our current focus on the maintenance of positive mood. As a result, I have slowly moved into rather uncharted terrain, circumambulating a core structure that I only grasped in its most abstract features at the outset (see Labouvie-Vief, 1980, 1981, 1982), and I have gradually filled into that abstract outline more concrete detail. This evolving interplay of theoretical hunches and empirical research is the focus of this chapter.

The chapter is structured into four sections. The first section outlines the current theoretical framework of my research program. The second section summarizing empirical attempts at delineating a series of qualitative levels of cognitive-emotional regulation. In the third section, I report on attempts to validate and explicate those levels by relating them to other variables and constructs. Finally, I focus on a number of implications and limitations that derive from the current formulation of my view of cognitive-emotional reorganizations across the life span.

THEORETICAL FRAMEWORK

Emotions have only recently begun to emancipate themselves from a somewhat devalued position in academic psychology. This emancipation has been accompanied by a wide-ranging critique of the cognitivism and objectivism prevalent in past theories of behavior. These theories provided

a standard of the mature person that was based on classical models of reason, with their emphasis on conscious-rational processes of integration. Instead of the prevalent cognitivism inherent in these theories, what began to emerge is a view of maturity in which rationality is but one component (e.g., Baltes & Staudinger, 1993; Commons, Richards, & Armon, 1984; Labouvie-Vief, 1994). That component must be integrated into a broader self-structure which itself is characterized by multiplicity, contextual (cultural, historical, and interpersonal) situatedness, and the crucial importance of biological-emotional forms of regulation (Epstein, 1991; Labouvie-Vief, 1994; Mayer & Salovey, 1995; Noam, 1988).

Reason and Emotion in Freud and Piaget

Although the emphasis on the scientific study of emotions is relatively new, propositions about how cognition and emotion interface were integral to traditional grand theories of development, and foremost to the psychoanalytic movement launched by Freud and the cognitive developmentalism fathered by Piaget. Both started from the assumption that human behavior, including advanced forms of rationality, ultimately is to be placed in the context of core biological systems, including the emotional one. Yet far from being reductionistic, both theories opted for some form of interactionism, in which emotions and reason could transform each other over the course of development.

For Sigmund Freud (1911/1957), development was based on the tension between two modes of being and of defining reality—primary process, in which an inner world of desires and wishes prevails, and secondary process, which mediates the demands of the outer world. The tension between the rational and the organismic was also a basis of Piaget's theory. In his theory Piaget, too, emphasized a duality of two types of processes: figurative thinking that ties cognition to a broad organismic base, and operative thinking that performs abstract operations on these organismic structures (e.g., Inhelder & Piaget, 1975).

In both theories, during the course of development the rational system increasingly comes to inform the emotional system. Nevertheless, neither theorist carried the notion of a genuine balance between reason and emotion to its logical conclusion. Freud's theory, for example, remained less aimed at a harmonious balance between inner and outer reality and more at a fairly complete victory of the secondary process over the primary process principle (see S. Freud, 1911/1957). Secondary process, with its related ego functions, was assumed to strive to find out what is objectively

true; what holds in the outer world. Indeed, it is called the “reality principle,” in contrast to the primary process “pleasure principle.” As a result, the primary process system remained problematically and dangerously opposed to the cognitive functions, and Freud’s later work was permeated by a sense of despair at the resulting fatal opposition.

Piaget’s theory in many ways took a more optimistic view. For him, the power of the two systems to interact and coevolve was an important aspect of development. Thus, in the process of development, emotions were not simply covered over by a controlling ego or cognitive monitor; rather, development gave rise to new emotions, related in part to the different realities created by the growing mind. Thus with advances in development, the child creates symbolic and ideal realities, and these new realities bring with them feelings related to morality, intentionality, as well as personal and collective ideals (Piaget, 1981). Indeed, much recent work has focused on how children, as a result, come to construct complex affective-emotional systems that parallel in many ways the core cognitive stages outlined by Piaget (e.g. Case, 1991; Fischer, 1980; Harter & Monsour, 1992; Selman, 1980).

Nevertheless, Piaget’s theory, too, maintained a profoundly rationalist bias. His writings show that he tends to equate development with a loss of organismic and imaginative relatedness, emphasizing instead the rise of objective, abstract structures of relating to the world. Play and fantasy, love and hate, procreation and death, the feelings so crucial in psychodynamic works are curiously absent in his theory, and the more so as development advances. Thus, rather than adults struggling with issues of sexuality, love, and faith, we are left with visions of budding scientists exploring the world with objective detachment (Labouvie-Vief, 1994; Riegel, 1973).

In my own work over the years, I have attempted to work to construct an adult-focused account of development that relies on both Piagetian and psychodynamic perspectives (see Labouvie-Vief, 1994). In essence, my strategy has been both deconstructive and reconstructive. The deconstructive part consisted in pointing out some limits of both approaches; however, the intent in doing so was primarily reconstructive, since I hoped to eventually be able to construct a more integrative account of development.

Limits of Traditional Views

As far as the psychoanalytic approach and later formulations such as object-relations and self-theoretical approaches are concerned (see

Greenberg & Mitchell, 1983), a core strength is to point out that processes of increasing cognitive and ego mediation are not only the result of cognitive maturation. Rather, they are inherently tied to the interpersonal world. That world is mediated through processes of identification with core important others, especially the parents. More recently, attachment theorists have provided considerable evidence to show that these early identificatory processes are of paramount importance in building foundations for later emotional regulation processes by providing general schemata or working models on which later emotional-relational experiences are built (e.g., Hazan & Shaver, 1994; Main & Hesse, 1990).

Such a view of the growth of cognitive-emotional capacities immediately stresses the importance of the integration of the two systems. The adaptive role of cognition must be judged not just by purely formal cognitive criteria, such as how elaborated and complex a representation is. Rather, what matters is how well the individual brings cognitive processes to bear on regulating affect in interpersonal settings of attachment, sexuality, and so on. The degree to which such integration is accomplished, in fact, is a criterion that defines when cognitions create defensive distortions, on the one hand, and when they create adaptive modes of self-environment organization, on the other (e.g., A. Freud, 1965; Vaillant, 1993).

However, in traditional psychodynamic models, the processes of identification so central to cognition-affect interfaces are not developed for the total span of life. Rather, they remain rather concrete and linked to the parents. This no doubt reflects the conviction that the parents provide the core structures on which the self is built. Yet as Freud's disciple Jung (1933) was the first to point out, this leaves the superego and related ego structures unduly tied to early developmental processes and the immediate settings of the family, while identification processes based on more general cultural and transcultural processes are not elaborated. For Jung, adulthood brings the major task of reexamining and transcending early parental identifications. Through such reexamination, the individual can begin to transform ego and superego into structures that are less locally bound. Instead, they come to extend to broad patterns of symbols, stories, and emotions that undergird the human condition more generally (see also Jaques, 1965; Labouvie-Vief, 1994; Levinson, Darrow, Klein, Levinson, & McKee, 1978). Indeed as Erikson (1984), too, suggested, processes of identification need to be traced through gradually widening circles, from parents and peers to the larger community and cultures, and, finally, to the human condition at large.

In his recent book, *The Wisdom of the Ego*, Valliant (1993) also proposed that processes of identification can be arranged on a developmental continuum ranging from less to more complex. Earlier forms of identification are built on relatively immature forms of introjection and imitation—relatively inflexible, wholesale adoptions of parental ideals and characters. However, as individuals mature, identification can shift to more complex forms, ones that are closely conceptually associated with the defenses of anticipation and sublimation: Now, the process is more flexible, reversible, neutralized, differentiated, choice-determined, and abstract.

Turning to the Piagetian approach, its strength lies in being able to give a more precise account of the cognitive operations inherent in the regulation of affect. Thus, the emergence of reflective and metacognitive capacities, the ability to coordinate contrasting affects and to organize them over time, the evolution of more abstract standards of “right” and “good” that come to regulate emotions—these cognitive operations all can be studied as specific cognitive skills that derive from, and are coherent with, a cognitive-developmental perspective (see e.g., Case, 1991; Fischer, 1980; Harter & Monsour, 1992; Labouvie-Vief, Hakim-Larson, DeVoe, & Schoeberlein, 1989).

However, a traditional weakness of the cognitive-developmental approach has been its neutrality vis-à-vis the interpersonal world (see Labouvie-Vief, 1996). Thus, attempts to extend Piaget into adulthood proper have tended to focus on how individuals come to coordinate the abstract and formal world with one of interpersonal processes and emotions. Significantly, this work was in a profound way influenced by Kohlberg (1969), who was the first of the cognitive developmentalists to relate cognitive operations to the interpersonal world. In extending cognitive developmentalism to the domains of values, self, and identificatory processes, Kohlberg—similar to Erikson—used the core concept of a widening circle of social relations. However, in Kohlberg’s theory, this widening circle took on a more cognitive cast as levels of perspective-taking. These levels were derived from George Herbert Mead’s generalization from a dyadic, two-person perspective to a more abstract “third-person” perspective (Mead, 1973). Kohlberg further generalized these two levels to define increasingly wider relational perspectives within which the individual defines self and values. At first limited to direct concrete dyadic exchanges, they extend, at more complex levels, to systems of familiar people, then to somewhat more abstract institutions, then to potentialities and finally, to a view of transcendent aspects and universals of human life.

Loevinger (1976, 1993), somewhat similarly, outlined a model that emphasizes this widening circle of regulatory structures. At early stages of development, impulse life is directly subordinated to the need for protection by powerful others. In adolescence, however, it becomes subordinated to more generalized social norms, which in turn give way, in the mature individual, to a language of self-regulation in which the conflicts between impulse and norm, self and society, inner and outer are explored and reintegrated within more abstract standards. Cognitive complexity thus replaces a youthful language of self-regulation preoccupied with physical, mental, or emotional control, good-bad dichotomies, and little or no tolerance for intrapersonal and interpersonal conflict (see also Armon, 1984; Kegan, 1982). All of the subsequent work on adult processes of self and emotion from a cognitive perspective was, in fact, profoundly influenced by these two theoreticians.

My own theory is indebted profoundly to Kohlberg and Loevinger, but has been aimed at explicating some of the self and emotional processes implicit within these theories (see Labouvie-Vief, 1993). Specifically, in my work and that of my collaborators (e.g., Labouvie-Vief, Chiodo, Goguen, Diehl, & Orwoll, 1995; Labouvie-Vief et al., 1994), we have attempted to distinguish among several affect-relevant criteria that themselves can form developmental orders. One is *affective complexity* and refers to emotional differentiation/integration, or the degree to which the individual is able to differentiate, organize, and integrate opposite emotions when talking about self and other. At the low end, this dimension involves global and polarized, static emotions while at the high end, emotions are expressed in terms of complex contrasts, reciprocal mind-body processes, and historical/biographical transformations.

A second dimension is the *inter-personal perspective* that organizes the understanding of self and other. Here, the assumption is that self and other are defined by an implicit model of a shared reality, and that this shared reality or perspective changes during the course of development. Following Kohlberg (Colby, Kohlberg, Gibbs, & Lieberman, 1983; Kohlberg, 1984), we assume that this perspective evolves through distinct levels from simple dyadic processes to ones that are framed within a general framework of distinct individuals shaped by their own histories, yet linked by reciprocal emotional influences. Inherent in this dimension is a further one of *self-other differentiation*. Here, we are concerned with whether the other is experienced as an individual distinct from the self, as one that is not only valued and described because of a particular

affective bond, but one whose unique individuality is appreciated. Descriptions range from those in which self and other are fused into a single global evaluation to others that involve complex differentiation of self and other, with greater awareness of the coexistence of multiple perspectives.

Two further dimensions are those of *reflectivity*, and *ideals*. Reflectivity refers to the degree to which the individual appears to be aware that selves are complex agents that can be characterized not only by actions, physical characteristics, and global emotions, but also by inner, abstract, mental processes, such as processes of thinking, wishing, goal-setting, and so forth. Persons at the lower levels of these dimensions show no such awareness of reflectivity, but at higher levels we see awareness that selves operate on many different levels, involving not only conscious decision processes, but also less conscious dynamics. *Ideals*, finally, concern the degree to which the individual is able to define those goals, norms, and standards that make him or her either a person with "good" qualities, worthy of idealization and admiration, or one with unacceptable qualities. On what criteria are such evaluations based? At the lowest level, the individual evaluates self and other merely in terms of salient emotional bonds or physical characteristics. But with increasing development, self and other are described more and more in terms of ideals and goals that reflect complex processes of evaluating and goal-setting.

These various dimensions are carried through five levels. At the lowest level (0), the individual operates within a *concrete/pre-systemic* orientation, in which descriptions are concrete, physicalistic and behavior-based, conveying global, affectively toned and self-referencing evaluations. At level 1 (*interpersonal/proto-systemic*), descriptions are less self-focused and rely on norms and standards derived from the individual's immediate interpersonal sphere. At level 2 (*institutional/intra-systemic*), more individualized descriptions include internalized goals and values. However, there is little in the way of questioning prevailing conventions or understanding complex psychological motives and histories. More norm-questioning, psychologically sophisticated and contextualized descriptions appear in the next, *contextual/inter-systemic*, level. At the fourth, *dynamic/inter-subjective*, level, a view of the self and other as dynamic, historical, and complex individuals is further elaborated. Table 7.1 gives a general overview of these levels, while Table 7.2 carries the five criteria previously discussed through the five levels.

A brief commentary is in order about my use of the notion of levels here. Although these levels were derived from theories of life span changes

TABLE 7.1 Overview of Self and Other Descriptions

	LEVEL	DESCRIPTION
0	Concrete/ Pre-Systemic	At this level descriptions of self and other are fused; the other is not understood as a separate self, but described in terms of his or her impact on the self (e.g., "he is nice; stupid; mean . . ."). Self and other are described in terms of concrete physical characteristics (e.g., "she is big") and such features as age, demographics, or simple relational status. Psychological descriptions are relatively global, idealized, and embedded (e.g., "she is the nicest mom in the universe").
1	Interpersonal/ Proto-Systemic	At this level language is more abstract and refers to more enduring behavioral dispositions. These are, however, relatively global, static, and conventional. Self and other are described in terms of social interactions and interpersonal belonging (e.g., "he is considerate, a bully . . ."). A sense of distinct individuality is lacking.
2	Institutional/ Intra-Systemic	At this level a sense of a more distinct individual emerges, a self or other that has a set of internalized self-chosen goals that may extend to the immediate social group. Typological and characterological descriptions are frequent. Goals and activities of self and other are not contextualized, evaluated, or put into psychological or historical perspective. They are institutional, achievement oriented, and quite conventional (e.g., "she is family oriented, active in her community, and involved in her children's activities . . .").
3	Contextual/ Inter-Systemic	Self and other are viewed in terms of process and contrast over time. Conventional goals and values are examined and questioned, and an awareness of a complex, psychologically motivated individual emerges. An introspective perspective is evident, with examination of psychological and unconscious dynamics. (e.g., "she has endured many hardships and gained much strength from them").
4	Dynamic/Inter- Subjective	Self and other are described in terms of complex motivations and internal psychological processes. Descriptions have a dynamic and process-oriented quality, emphasizing the emergence of a complex individual over time. Interests and activities are described on a complex psychological level and in terms of complex reciprocity between self and other (e.g., "as my father slows down as he ages, my mother becomes more active and autonomous").

TABLE 7.2 Criteria for Levels of Emotional Development

Level	Affective Complexity	Interpersonal Perspective	Self-Other Differentiation	Reflectivity	Ideals
0 Concrete/ Pre-Systemic	Emotions tend to be global and polarized	Adopts a concrete dyadic perspective in which states of self and other are not clearly distinguished.	A fusion between descriptions of the other and the affective bond that exists between self and other.	Shows no awareness of reflectivity.	Evaluates self and other merely in terms of salient emotional bonds or physical characteristics.
1 Interpersonal/ Proto-Systemic	Simple intra-person contrasts are acknowledged, but there is little tolerance, so that the respondent feels a need to resolve contradictions in favor of one or the other emotion.	Moves to a truly interpersonal perspective. The individual can understand norms, rules, and standards from a perspective, though still linked to a group that is personally experienced.	The other is defined somewhat more abstractly, from an idealizing but quite conventional perspective.	The beginning conception that individuals have a degree of interiority and abstractive ability.	Inner processes reflect the concrete interpersonal context of group conventions.
2 Institutional/ Intra-Systemic	Better able to acknowledge multivalenced emotions without preemptively resolving them.	Adopt a social system of societal perspective in which self and other are seen more abstractly, from the vantage point of more impersonal and institutional goals.	Introduces the other with increasing differentiation from the self and with greater awareness of the coexistence of multiple perspectives.	A deeper sense that individuals have their own distinct characteristics and thoughts emerges, but there still is little acknowledgment of genuine complexity and the pervasiveness of conflict.	A distinct sense of an individual agent with his or her own intentionality emerges.

TABLE 7.2 (*Continued*)

Level	Affective Complexity	Interpersonal Perspective	Self-Other Differentiation	Reflectivity	Ideals
3 Contextual/ Inter-Systemic	Deeper tolerance for contradictory affects emerges.	Able to judge self and other by considering not only social realities, but also the potentialities inherent in human nature and its development.	Introduces the other with increasing differentiation from the self and with great awareness of the coexistence of multiple perspectives.	Some acknowledgment of the conflicts between self and other, self and convention, and the historicity of human biography.	A sense emerges of individual's questioning and evaluating goals rather than merely "having" them.
4 Dynamic/ Inter-Subjective	Brings an awareness of selves and others as truly complex beings, combining if not reconciling in themselves many opposing affects in sometimes tragic fashion.	A perspective emerges that Kegan (1982) calls interindividual, i.e., the conception of self and other now is relatively stripped of conventional roles and prescriptions and becomes truly transactional.	Introduces the other with increasing differentiation from the self and with greater awareness of the coexistence of multiple perspectives.	Conception emerges of self and other as entities that are complex, that change over time and across situations, and that relate to one another at multiple levels of awareness.	This dimension is carried further into a dynamic understanding of the contextual relativity and historical evolution of an individual's goals.

in cognitive-emotional capacities, there is no assumption that they are necessarily related to age. Rather, I assume that they form a hierarchy of cognitive emotional competencies, an assumption that is born out by the validation research I report in the next section. Further, I do not necessarily assume that these levels extend to any domain of cognitive-emotional capacities; whether or not they do is a strictly empirical question. Indeed, there are good theoretical grounds for suggesting that the resulting levels provide a relatively loose structure, with differing functional significance for different domains.

LEVELS OF COGNITIVE-EMOTIONAL DEVELOPMENT

Processing Information

In my own research program over the years, I began to examine the types of changes described in the previous section by looking at how individuals of different ages process information, for example, when reading texts or stories (see Labouvie-Vief, 1994; Labouvie-Vief & Hakim-Larson, 1989). This work follows up on the notion discussed earlier that middle and later adulthood brings a turn inward. It expands on that view by adding that such an inward turn implies specific cognitive consequences. These can be described as a shift in naïve epistemological assumptions about what is “true” or “real.” Previously defined by literal, outer, and static criteria, many adults evolve new criteria that are more psychological and historical. As the individual realizes that information is not independent of an interpreter—a self who reads and who infuses self into a text—the individual turns more to the landscape of human motivations and intentions that determines how statements are generated and interpreted.

This shift from a more text-dependent mode to one that is more interpretive and subjective was shown in a series of studies on individuals’ rendition and interpretation of narratives (Adams, 1986; Adams, Labouvie-Vief, Hobart, & Dorozs, 1990; Jepson & Labouvie-Vief, 1992). That research suggests that adolescents and college students reading text primarily attend to the structure of actions and events depicted in the text. However, for mature and older adults, the primary interest is not in this literal action-event structure, but rather in what it reveals about underlying aspects of the human condition. To that extent, the mature adults’ interest in text becomes more abstract and symbolic: A narrative does not refer

to the concrete here and now of protagonists and their actions, but rather is taken as indicative of human actions in general (see also Jepson & Labouvie-Vief, 1992).

On the basis of the above and similar evidence, I suggest that adulthood may bring a the ripening of a symbolic style of processing (see Labouvie-Vief, 1994, 1996). Much as artists often abandon interest in realism and focus on the bare outlines of expression and symbolic content, so individuals are primarily interested in examining their experience in terms of broad, universal patterns of human motivation (e.g., Clark, 1972; Munsterberg, 1983). This idea was, in fact, proposed by Jung (1933) who suggested that in later life our experience turns from the personal towards the archetypal and universal. It also supports models of religious development (e.g., Fowler, 1981) that claim that most individuals give up a literal approach to religion in favor of one that focuses on universal spiritual laws that transcend particular denominations. Indeed, I have begun to extend my earlier research on story recall and understanding to the uses individuals make of stories and symbols that have a specifically religious nature.

This early work led me to speculate that older adults may become experts at dealing with emotionally relevant information. However, in a series of studies it has become obvious that such symbolic thinking by no means continues linearly into late adulthood. In fact, studies in my lab consistently find that this type of thinking appears to peak around middle adulthood, approximately in the 40-to-55 age range.

Even so, later adulthood may bring a more general bias for emotion-based responses, as noted by Blanchard-Fields (1994) and Carstensen (1992; Carstensen & Turk-Charles, 1994). In our own research, too, we noted that the psychologizing approach appeared to occur with high frequency in older individuals. However, it did so in styles that differed in complexity and elaboration. Some adults would give summaries that involved complex back-and-forth references between the text base and some psychological process they thought the text symbolized; in fact, in Adams' (1986) study, such responses peaked in middle-aged adults. Other responses were rather global and undifferentiated, affectively laden responses such as "The trouble is that nobody believes in God anymore," and it was these responses that were most frequent in the older group.

The observation that emotion-based language sometimes is rather global and undifferentiated suggests that even though older adults may use a more emotion-based language, this emotional language may not necessar-

ily imply the ability to reason about emotions in complex and coordinated ways. Thus, other mechanisms than emotional understanding may play a role. For example, Brandstädter (e.g., Brandstädter & Greve, 1994) and Carstensen, Gross, and Jung (Chapter 12, this volume) both suggest that awareness of time and mortality are major factors by which an increasing acceptance of emotions is ushered in, even though this awareness may be stimulated by events, such as illness, that are not related to age. However, although such realization may effect a switch in the preferred processing system (as implied by Carstensen's work), such a simple switch must be distinguished from the kinds of processes of cognitive-affective integration with which I am concerned. Further, it is also possible that certain cognitive restrictions, particularly in the domain of fluid intelligence, may limit some older individuals' ability to modulate complex affects (see Labouvie-Vief & Diehl, 1996; Labouvie-Vief, Chiodo, et al., 1995; Labouvie-Vief, Diehl, Coyle, & Chiodo, 1995). Thus, conceivably, an increase in emotion-based language might reflect *less* complex emotion regulation strategies.

Understanding of Emotions and Self

More recently, we have turned to the study of emotions (Labouvie-Vief, DeVoe, & Bulka, 1989). As individuals reevaluate and reinterpret aspects of reality, their understanding of the nature and causes of emotions changes, as well. Early in life, individuals need to define their emotional lives in accord with external criteria; they begin to master a set of rules that permit them to regulate behavior in accordance with cultural dictates. In contrast to this outward movement, adulthood may bring a compensatory movement inward. A focus on inner dynamics, on private experience, and on rich organismic experience and emotive content now comes to the fore—a process Gutmann (1987) refers to as the “greening” of the mature individual.

We examined this process in a sample of 72 individuals ranging in age from 10 to 77. Individuals were asked about their experience of four prototypical emotional states, and the resulting responses coded within a four-level scheme (a precursor to the current scheme). The results of this research are depicted in Figure 7.1.

In general, from adolescence to middle adulthood, younger or less mature individuals used a conventional language of emotions based on formal and technical processes. Distant, static terms were used as descrip-

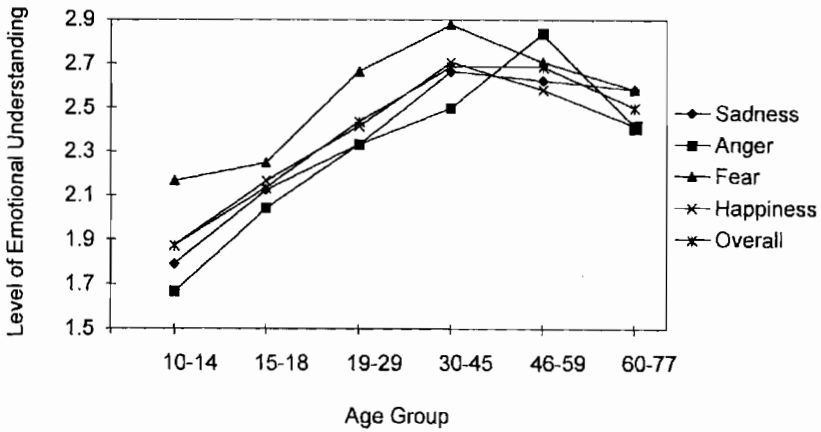


FIGURE 7.1 Levels of emotional understanding for six age groups.

From "Speaking About Feelings: Conceptions of Emotions Across the Life Span," by G. Labouvie-Vief, M. DeVoe, & D. Bulka, 1989, *Psychology and Aging*, 4, p. 432. Copyright © 1989 American Psychological Association.

tors. In addition, feelings were described in terms of how one *should* feel; external rules and standards of conduct, rather than the felt experience, characterized individuals' expression of emotions. In contrast, our mature adults—those around middle adulthood—gave evidence of a significantly reorganized emotional language. Feelings were described in terms of a vivid felt process (e.g., "My heart felt like bursting," or "I felt a rush of energy"). Their language was inner and personal, rather than outer and technical. Metaphors became dynamic, dealing not with static states, but with process and transformation. At the same time, individuals began to differentiate an inner realm of emotional experience from an outer realm of convention. The conflict between these realms was acknowledged, and the individual was concerned with accepting impulses and thoughts that previously seemed too overwhelming to accept.

This progression in how individuals describe their emotions was paralleled by the control strategies mentioned. The young or less mature individuals often controlled emotions through active mental strategies such as forgetting, ignoring, and redirecting one's thoughts. The primary end of

emotion control appeared to be repression of emotional tension and freedom from emotional conflict. The individual also looked to others to affirm the self's feelings.

Such repressive forms of control contrasted with the language of the mature adult who was open to acknowledging periods of intense inner conflict and rumination. Aware that emotions have a lawful regularity of their own that may oppose our concepts about them, older and/or more mature adults had evolved means of control that allowed a fuller acknowledgment of their emotional experience. For example, realizing that "You can't paper your emotions over," individuals often made an effort to examine their felt experience, rather than inhibiting it under a layer of "shoulds" and "oughts." Emotions were accepted as motivating energy to assist the self in either acting upon or accepting the prevailing situation. Others were no longer blamed for the self's emotional state, but were viewed as part of a more complex system of interaction and communication.

What is notable about this research is that, though there were some slight variations by emotion, the general pattern suggested peaks in the middle portion of adulthood. In contrast, the 60+ age group scored somewhat lower. However, when using ego level as a parameter against which to plot levels of emotional representation, relationships generally were linear; this was true for the negative emotions, suggesting perhaps that happy emotions are less cognitively demanding.

Representations of Self and Others

Since the emotion work was ultimately motivated by an emerging theory of self-related changes in adulthood, we more recently turned to an examination of self-related representations proper. In line with the emerging view that the self is inherently a relational construct, we initially focused on different relational contexts in which self and others are described: self, parents, friends, and liked and unlike others. Since pilot work (see Murphey, Labouvie-Vief, Orwoll, & Chiodo, 1992) suggested that these targets were highly interrelated, in subsequent research we focused on self and parents only. That choice of targets was partly motivated by parsimony, and partly by the theoretical significance of parental representations discussed earlier—i.e., the salient role of parent representations to the core self. These targets were assessed in a sample of 400 individuals ranging in age from 10 to 80+; however, due to the intensive nature of

the coding involved, we selected a subsample of 168 individuals from this larger sample (Labouvie-Vief, Chiodo, et al., 1995; Labouvie-Vief, Diehl, et al., 1995).

As shown in Figure 7.2, the results revealed a pattern quite similar to the emotion study. Younger or less mature individuals frame self and others in terms of a conventional perspective. In that perspective, self and others can be described in terms of an organized, codified, and abstract set of role expectations. Such role expectations are important for smoothly functioning institutions, such as family, work, and community. Conventional individuals see others from a static perspective—a perspective that becomes transformed in older and/or more mature adults. At that more developed level, the institutional values become susceptible to doubt and criticism; for example, such values can be “carried too far.” Instead, a dynamic perspective evolves in which descriptions of self and others convey in vivid language the unique and evolving experience of individuals within the context of their particular life histories. Lives now are

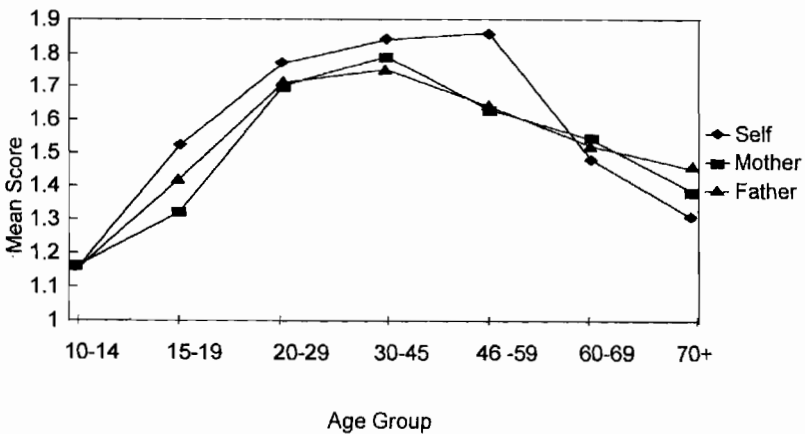


FIGURE 7.2 Mean scores for representation of self, mother, and father across age groups.

From “Representations of Self and Parents Across the Life Span, by G. Labouvie-Vief, M. Diehl, L. M. Chiodo, & N. Coyle, 1995, *Journal of Adult Development*, 2, p. 214.

understood in the context of multiple frames—cultural, social, and psychological, for example. There is keen insight into the psychological dynamics that are at the root of human diversity, yet an understanding that such diversity appears to be regulated by a common human heritage.

Just as the self becomes viewed more from the perspective of historical patterns and general emotional transformation, so too do the parents. Younger individuals and those over the age of 60 primarily describe their parents in the interpersonal context of their roles as providers of emotional and financial support to the self, or, to a lesser extent, in the institutional context of their societal position. Few youthful individuals represent their parents as more autonomous individuals in their own right. In contrast, around midlife, there is a peak of responses that are appreciative of the unique individuality of parents; participants describe their parents not just as carriers of parental and other social roles, but show an awareness of the conditions that shaped the parents and made them become the persons they are or were.

These results are consistent with views which suggest that a restructuring of representations of one's parents is part and parcel of the reorganizations in self often associated with middle adulthood (e.g., Jaques, 1965; Jung, 1933; Kohut, 1977; Labouvie-Vief, 1994; Levinson, 1990; Levinson et al., 1978). Overall, however, it is also notable that relatively few individuals display the higher levels of parent-representations, as shown in Figure 7.3. Specifically, Figure 7.3 indicates that the lowest levels are related to age in a U-shaped function, with a low in the 46-to-59 age group. In contrast, levels that could be said to involve a contextual-intersystemic or higher perspective (i.e., since our coding system was extremely stringent, a score of 2.00 or higher) show an inverted-U function with a high point in the 46-to-59 age group as well. Scores that are even higher, i.e., those exceeding 2.25, are only found in the 20-to-69 age range, with a high in the 30-to-45 age group. This finding that higher levels of representation are quite rare in the population, and that they tend to be concentrated in the middle-age period, is also replicated by many other studies (see Labouvie-Vief, Chiodo, et al., 1995).

INTERFACES OF LEVELS TO OTHER CONSTRUCTS

A major component over the years of my research on cognition-emotion interfaces has been validation, attempting to provide evidence of how

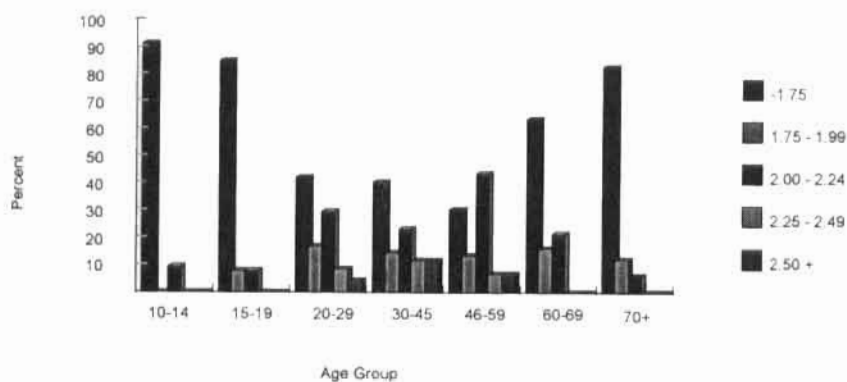


FIGURE 7.3 Distribution of self-representation scores by age group.

From "Representations of Self Across the Life Span," by G. Labouvie-Vief, L. M. Chiodo, L. A. Goguen, M. Diehl, & L. Orwell, 1995, *Psychology and Aging*, 10, p. 409. Copyright © 1995 by American Psychological Association.

cognitive-emotional levels are related to external variables. Such attempt at validation appeared especially important since only few individuals appear to score at the higher levels. Thus one question that has occupied me over the years is: "Why should individuals develop more complex representations of self and emotions, i.e., what, if any, are the advantages of doing so?" Developmentalists often assume that the answer is self-evident—that, of course, it is better to display a more complex level of development. We have translated this question into a strategy asking what such levels predict—what other variables they are related to.

Coping Processes

One set of variables we have examined is processes of coping or self-environment organization. Since my theory is specifically informed by assumptions about the cognitive mediation of self-regulation strategies, strategies of coping are a particularly relevant set of correlates. In the emotion study above, we indeed found such relationships. Working with the Defense Mechanisms Inventory and the Lazarus Ways of Coping Scale (Folkman & Lazarus, 1980), we predicted the set of coping variables from a combination of emotion representation, ego level, verbal ability,

and gender. Two significant variates were found (see Table 7.3). The first—and explaining most of the variance—was one related to gender; the second reflected a developmental dimension marked by age, emotional understanding, verbal ability, and ego level. Individuals scoring high on this second variate were more likely to use strategies of reinterpreting and of turning against self (affect balance) and were less likely to use escape-avoidance, aggressive acting out, projection, and distancing as strategies of managing affect. Thus, the data suggested that indeed, together with gender, a single cognitive-developmental dimension underlies variance in coping/defense processes.

More recently, we expanded these findings with the larger sample of the self-representation study (Diehl, Coyle, & Labouvie-Vief, 1996). Specifically, findings indicate that the use of more mature coping and

TABLE 7.3 Emotional Understanding: Correlations of Variables with Canonical Variates

Variable	Variate 1: Gender	Variate 2: Developmental Complexity
Developmental complexity–sex set		
Age group	.22	.88
Emotional understanding	.22	.79
Verbal ability	.59	.69
Ego level	.18	.53
Sex	–.69	.32
Coping–defense set		
Seeking social support	–.74	.20
Escape—avoidance	–.48	–.40
Accepting responsibility	–.41	–.31
Reversal	–.07	.63
Turning against others	.08	–.55
Projection	.24	–.52
Turning against self	–.32	.48
Distancing	–.32	–.42
Principalization	.03	.22
Planful problem-solving	.04	.16
Positive reappraisal	–.32	–.09
Self-controlling	–.05	–.02
Confrontive coping	–.34	.02

Source: Labouvie-Vief, G., DeVoe, M., & Bulka, D. (1989). Speaking about feelings: Conceptions of emotion across the life span. *Psychology and Aging, 4*, 425–437.

defense strategies increased across age groups; but more significantly, and in keeping with a number of other studies on aging and coping (see Aldwin, 1994), the use of immature strategies declined. Younger adults were more likely than older adults to use defense strategies that were outwardly aggressive or involved distorting and defensive psychological processes such as projection, turning against object, displacement, regression, and rationalization. In turn, older adults reported a greater inclination than younger individuals to use suppression, indicating their tendency to react to conflict situations by cognitively reinterpreting situations, relying on principles and truisms, and withholding inappropriate feelings and thoughts until a more appropriate setting is available. On the surface, these results suggest that in the domain of coping and defense, older adults reveal the most mature picture. However, there is some suggestion in some of the variables that this pattern may abate, or even reverse, with the very oldest groups (see Figure 7.4).

This conclusion is strengthened by the results of a canonical (see Table 7.4) correlation analysis relating the independent variables of age, ego level, verbal ability, and sex and the dependent variable set of coping and defense scales. Three components accounted for the covariation between dependent and independent variable sets. Of those, the first variate was related to gender and indicated that most of the variance (about 60%) in the variable set was accounted for by gender. The second and third variates appeared to indicate a growth-related dimension (with positive loadings on age, verbal ability, and ego level) and a decline-related dimension (with positive loadings on age but negative loadings on verbal ability and ego level).

Apart from underscoring the importance of gender in the study of coping, these results carry implications for how we conceptualize the relationship between cognitive and social-emotional development. In keeping with views that suggest that emotion regulation may represent one facet of intelligence (e.g., Labouvie-Vief, Hakim-Larson, & Hobart, 1987; Labouvie-Vief et al., 1989; Mayer & Salovey, 1995) our study suggests that these two domains, though not necessarily identical, have strong interrelationships. Thus those who are culturally more advantaged and of higher cognitive complexity also show more integrated coping, at least as judged by self-reports. However, some of our ongoing analyses suggest that for defensive coping, additional variance is accounted for by variables indicating dissatisfaction with the family of origin. Thus, if individuals feel a sense of vulnerability vis-à-vis their family of origin,

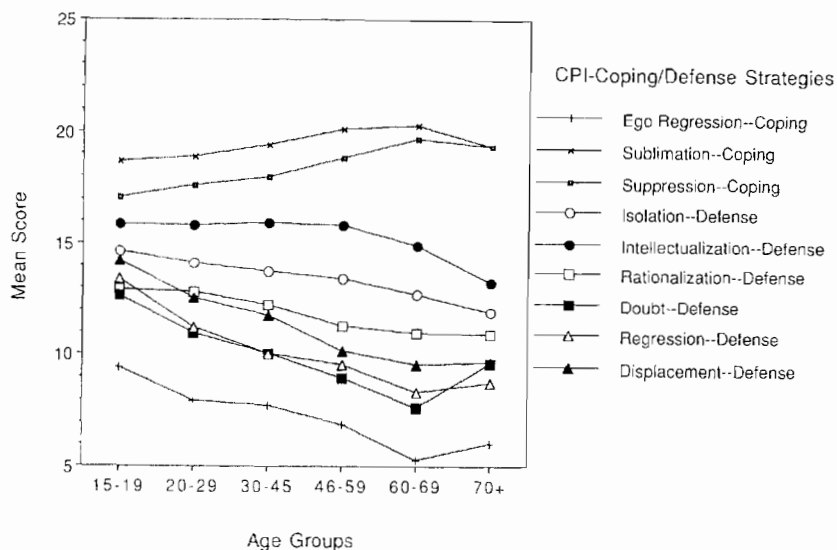


FIGURE 7.4 Mean scores on CPI-based coping and defense strategy scales.

From "Age and Sex Differences in Strategies of Coping and Defense Across the Life Span," by M. Diehl, N. Coyle, & G. Labouvie-Vief, 1996, *Psychology and Aging*, 11, p. 133. Copyright © 1996 by American Psychological Association.

then the two pathways may become somewhat disconnected (see Fischer & Ayoub, 1994; Labouvie-Vief, 1982, 1993; Noam, 1988).

One model of development that implies such a partial disconnection is that of Erikson (1984) who suggests, in effect, that positive development is based on the joining of two developmental lines. One of these lines is based on such capacities as independence, initiative, and autonomy. The second line, in turn, is rooted in the vicissitudes of human relatedness, particularly the capacity for trust that is established in the first stage of life. In Erikson's theory, vulnerability in the second domain is not so much a matter of limiting the *level* of development that can be attained; rather, it affects the *scope* of the integration that is ultimately possible at any developmental level. Thus, an adult with a developmental history predisposing him or her to vulnerability in the domain of basic trust still

TABLE 7.4 Coping and Defense: Correlations of Variables with Canonical Variates

Set/Measure/Variable	Variate 1 Gender	Variate 2 Positive Adaptation	Variate 3 Negative Adaptation
Developmental-Sex Set			
Age	-.02	.86	.51
Ego level	.17	.56	-.34
Verbal ability	.18	.81	-.46
Sex	.99	-.06	.13
Coping-Defense Set			
DMI Defense Scales			
Turning against object	-.07	-.52	-.44
Projection	-.02	-.40	-.35
Reversal	-.13	.52	.41
Turning against self	.27	.05	.34
CPI Coping Scales			
Objectivity	-.06	.51	-.55
Intellectuality	.14	.26	-.59
Logical analysis	.14	.38	-.48
Tolerance of ambiguity	.43	.31	-.46
Empathy	.74	.06	-.05
Ego regression	-.02	-.32	-.47
Concentration	-.09	.17	-.30
Sublimation	.33	.42	-.24
Substitution	-.29	.27	-.36
Suppression	.26	.58	.04
CPI Defense Scales			
Isolation	-.08	-.38	-.20
Intellectualization	-.19	.05	-.63
Rationalization	.16	-.53	.10
Doubt	.28	-.44	.07
Projection	-.30	-.32	.23
Regression	-.07	-.64	-.09
Denial	-.27	.06	.31
Displacement	-.03	-.69	.09
Reaction formation	-.83	.06	.16
Repression	-.08	-.32	.71

Source: Diehl, M., Coyle, N., & Labouvie-Vief, G. (1996). Age and sex differences in strategies of coping and defense across the life span. *Psychology and Aging, 11*, 127-139.

may have available a sector of complex and level-appropriate functioning, such as concerns with generativity; however, he or she may also manifest less mature and fragmented sectors, especially in situations that activate dynamics of failing trust.

When examining correlations between levels of self-representation and other variables, one intriguing finding emerged. Even though overall, the relationship between self-representation measures and cognitive and emotional-personality indicators is substantial, it differs profoundly when broken down by age (we divided the sample into a younger and an older half) or gender. These correlations are presented in Table 7.5. As this table suggests, for the younger individuals, self- and parent representation measures are primarily related to ego-level variables. However, for the older individuals, additional variables come to be significant predictors. On one hand, variables related to both fluid and crystallized intelligence predict higher levels of self- and parent representations. On the other, variables related to coping strategies also predict significant variance. A similar pattern also holds for a gender breakdown, although the role on cognition in this case is not as pronounced.

The fact that correlation patterns differ by age group could suggest several mechanisms. One possibility is that the role of cognitive and emotion/personality variables differs because of the core formative factors of these roles at different life stages. As Labouvie-Vief, Chiodo, et al. (1995) and Labouvie-Vief, Diehl, et al. (1995) suggest, the factors associated with positive cognitive-emotional development differ for different points of the life span. Early development is often believed to be strongly constrained by organismic maturation, including the maturation of the cognitive apparatus; in contrast, later life development has been associated more strongly with variations and limits imposed by culture. Moreover, early development is specifically institutionalized through cultural practices such as education, while later life development is usually associated with a distancing and critical transformation of institutional thinking. Thus, whether as a function of historical change or of age-graded expectations, it is likely that factors of individual life history and of collective social practices may serve as inhibitors of high levels of late-life development.

A second possible interpretation is that the organization of affect carries different significance for emotional and intellectual functioning in early and late life. As Showers (e.g., Showers, 1992; Showers & Kling, 1996) recently has shown, in younger (i.e., college-aged) adults, high levels of well-being actually are related to the ability to polarize affect and segregate

TABLE 7.5 Zero-Order Correlations with Self-and-Parent Representations for Younger and Older Adults

Variable	Younger Adults (<i>n</i> = 69)			Older Adults (<i>n</i> = 61)			z-Scores		
	Self	Mother	Father	Self	Mother	Father	Self	Mother	Father
Ego level	.34 ^b	.34 ^b	.33 ^b	.38 ^b	.41 ^c	.18	—	—	—
Crystallized intelligence	.25 ^a	.19	.21	.39 ^b	.43 ^b	.19	—	—	—
Fluid intelligence	.02	-.10	-.08	.49 ^c	.30 ^a	.39 ^b	-2.87 ^b	-2.28 ^a	-2.72 ^b
Controlled coping	-.05	-.01	-.12	.30 ^a	.49 ^c	.28 ^a	-2.00 ^a	-3.03 ^b	-2.27 ^a
Expressive coping	.06	.09	.21	.29 ^a	.39 ^b	.14	—	—	—
Structured defense	-.07	-.14	-.02	.07	-.04	.08	—	—	—
Primitive defense	.09	-.18	-.02	-.34 ^b	-.52 ^c	-.27 ^a	2.47 ^b	2.19 ^a	—
Summed coping	.11	.11	.02	.33 ^a	.36 ^b	.26 ^a	—	—	—
Summed defense	.04	-.09	.03	-.34 ^b	-.41 ^b	-.17	2.19 ^a	1.92 ^a	—

^a*p* < .05.^b*p* < .01.^c*p* < .001.

positive from negative affect. In turn, individuals who integrate affect actually may experience lower self-concept and higher depression levels. Thus, the ability to integrate affect, an important component measured by our method, actually may not enhance well-being in younger adults. Indeed, since our age differences in coping strategies suggest that younger individuals in general endorse less mature strategies, these results may point to a life-stage related limit on emotional integration. However, in older adults, integration of affect appears to carry a different functional significance, since it predicts variables of positive coping and well-being.

IMPLICATIONS AND LIMITATIONS

In sum, what are the implications of my research on emotion-affect integration over the adult life span? In general, we have provided consistent evidence that affective integration may continue well into adulthood, and that these processes of integration may, in large part, be a correlate of more general cognitive changes with which they form a tandem progression. Although thus far these patterns are based on cross-sectional evidence, if taken in concert with the information we already have about developmental changes in psychometric intelligence (e.g., Schaie, 1995), these results suggest that parallel to these general changes occur developmental transformations in how individuals view self, reality, and emotions. We also are finding that such reorganizations are linked to reorganizations in representations of the self, and that they have profound linkages with individuals' maturity of coping processes.

These results thus bear implications for models of cognition-emotion relationships. Although to some extent, core emotional systems can function independently of cognitive ones, the view here presented suggests that with advances in cognitive development individuals are able to form more and more powerful linkages between the two systems. Thus cognition does not simply control emotion, but both informs it and is informed by it. Through such a process of mutual exchange, affects that otherwise would be experienced as too disruptive or too frightening can be understood as simply one facet of the human condition. As Vaillant (1993) suggests, in this way the function of advanced cognition is "to bear affect"—to provide a structure that can contain it, explain it, perhaps even embrace it. Indeed, a function often associated with advanced forms of wisdom and spiritual leadership is exactly this ability to maintain an

attitude of serenity vis-à-vis the most extreme forms of affect, from horror and suffering to mystic ecstasy (Miller & Cook-Greuther, 1990).

The current results also are in accord with many models of development through adulthood, that claim that middle and later adulthood usher in a deepened ability to mediate aspects of the outer and the inner worlds (see Jaques, 1965; Jung, 1933; Labouvie-Vief, 1994; Levinson et al., 1978; Vaillant, 1993). However, our results also suggest that such reorganizations are only very loosely age-related. Although our middle-aged adults have consistently shown the highest average levels, the distribution of scores by age group show that many younger adults also demonstrate high levels. Indeed, a factor much more important than age is that of cognitive complexity—a combination of crystallized intelligence, ego level, and reflective intelligence. Nevertheless, our research also suggests that age, over and beyond these factors, contributes additional variance. Of course, since the results are cross-sectional in nature, it remains to be determined to what extent the findings reported here are truly related to age, and to what extent they may be a function of cohort changes.

A consistent finding of this research has been that older individuals, in contrast to those of middle adulthood, achieve lower levels of self-and emotional representation. One possible interpretation of this finding is that lower scores on reflective cognition or higher scores on immature defense in the older group(s) reflect genuine regressive phenomena. For example, our data (Labouvie-Vief, Chiodo, et al., 1995; Labouvie-Vief, Diehl, et al., 1995) suggest that lower reflective cognition scores in the older portion of the sample are also related to lower scores on fluid intelligence. Since fluid abilities are thought to be an indicator of the mechanics of cognition (Baltes, 1987), this is a possible indication that a decrease in intellectual and/or biological resources may affect the coping strategies of the older groups.

An alternative interpretation, however, is that lower reflective cognition scores in the older groups do not give a valid assessment of the cognitive-emotional skills of the older individuals in the sample. Many current theories of cognitive-developmental changes in later life possibly tap midlife phenomena more validly than those related to later life. These models tend to emphasize personal growth and introspection, self-enhancement and autonomy, critique of conventional-social goals, and redefining the self within a fairly long anticipated remaining life span. Instead, later life may focus on new issues not as well captured in our measurement approach. These new issues have been described as redefining values in

the face of limited resources and time, rescaling goals that are no longer within reach, and in general transforming the meaning of personal and social losses (Aldwin, 1994; Brandstädter & Greve, 1994; Carstensen, 1992; Cross & Markus, 1991; Ryff, 1989, 1991; Staudinger, Marsiske, & Baltes, 1995). Thus, more complex reasoning may be evident if individuals are explicitly questioned about these critical late-life domains, rather than in more midlife relevant areas of self-definition. If so, a specific next step in need of more attention is to focus on theories and methods that are more explicitly focused on the nature of the self in advanced age.

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The Role of Emotion in Social Cognition Across the Adult Life Span

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There is a rich history of research on cognitive processes, thinking, and decision making. However, from time immemorial society and philosophers have been interested in the curious and intricate relationship between how we feel and how we think. Yet the nature of this relationship has only received attention in the scientific literature within the last 10 years or so. This is not surprising given that, in the past, cognition was largely seen as of primary importance, and cognitive processes were viewed as logically distinct from emotional processes. Today, cognitive psychologists openly question whether emotion can be separated from cognition, either theoretically or empirically, and have instead stressed the relationship between emotion and cognition in the laboratory and in everyday life (Bower, 1991; Clore, Schwarz, & Conway, 1994; Forgas, 1991, 1995). Rather than argue about issues such as whether conditioned emotional responses can be formed without cognition, or whether emotions require prior cognitive appraisal, researchers have focused on the interactions between emotional states and cognitive processes.

Following a similar path, there has been a considerable amount of research on whether adult development changes the fundamental nature

of cognition and the extent to which age-related changes in cognition influence the effective functioning of the individual. However, there is relatively less research on the role of emotion in cognitive functioning in adulthood and aging. The paucity of research on adult development of cognition and emotion relationships, again, reflects the fact that much of the theoretical interest and empirical work on this general topic has only recently evolved. Thus, there has been a limited opportunity for mainstream work on cognition and emotion to influence the gerontological literature.

In the past, when emotion/cognition relationships were examined in the gerontological literature, they focused on the extent to which empirically observed age differences in cognitive tasks reflect confounded age differences in arousal or affect, as opposed to being a function of age changes in basic cognitive processes (see Botwinick, 1984; Kausler, 1990). That is, they addressed the question of whether age differences in performance-inhibiting emotional states (e.g., test anxiety) account for age differences in task performance. The classic studies by Eisdorfer and colleagues (see Eisdorfer, 1968) argued, for example, that age differences in paired associate learning could be an artifact of "overarousal" of older persons in test situations.

The gerontological literature reflects the historical fact that the primary questions about cognition/emotion relationships and aging were being asked by psychologists interested in understanding age changes in basic cognitive processes. Emotion and affect tended to be treated as a completely separate domain of psychological constructs relevant to aging (Schulz, 1985). From the point of view of gerontologists interested in cognitive processes, emotional constructs were really little more than nuisance factors representing possible confounding influences on studies designed to measure age changes in cognition.

Instead of viewing emotion as a separate domain of research or a "nuisance" variable in cognitive research, the perspective adopted here, and in more current research in the area, is that cognition and emotion are reciprocally related in a complex manner that varies widely across individuals and situations. Emotional states influence cognitive processes (i.e., memory, decision-making, social judgments, learning) but cognitions also influence emotions (i.e., mood induction, cognitive appraisal, causal attributions).

The present chapter focuses on a review of the literature on emotion/cognition relationships as they relate to adult developmental changes in

social cognition. A review of my current program of research follows that examines emotion and cognition in everyday reasoning (i.e., problem-solving and causal attributions) across the latter half of the life span. However, before this domain of research is explored, let us examine the general role of emotion in cognitive functioning.

A SOCIAL COGNITION PERSPECTIVE ON AFFECT AND COGNITION

Social cognitive research, in general, has centered largely on (a) the content and structure of social knowledge, (i.e., one's understanding of social reality) and the cognitive processes involved in accessing such social information (Fiske, 1993); (b) the functional importance of social representations (and other variables) for actual behaviors in context (Fitness & Strongman, 1991); and (c) how and to what end individuals access and use information under particular kinds of social situational demands (i.e., sociocultural, affective, and motivational influences) (Fiske & Neuberg, 1990; Gilbert & Malone, 1995). Given the emphasis on cognition within a social context, it is no wonder that social cognition researchers claim that the role of emotion is never more important than in the context of individuals' processing and performing everyday social judgments (Bower, 1991; Clore & Parrott, 1991; Forgas, 1995).

Social information processing is a highly selective and interpretive process. Information selected by the social perceiver is not just given, but selected from complex and socially ambiguous stimuli, such as other individuals or interpersonal events (Forgas, 1991). In addition, social and interpersonal situations are laden with emotional triggers which influence the availability of knowledge structures used in processing the information (Forgas, 1995). There are multiple ways in which researchers have examined the role emotional experience plays in how an individual makes social judgments and engages in particular behaviors. These include emotion as (a) an informational source guiding social judgments, (b) an outcome of cognitive appraisal, or (c) as a trigger for invoking the use of particular cognitive, problem-solving, or regulatory strategies.

Emotion as Information

Current work in social cognition has examined the interactive role of affect and cognition in the way individuals perceive and cognitively repre-

sent events, scripts, and interpersonal knowledge (Berkowitz, 1993; Bower, 1991; Forgas, 1991). For example, the emotional state of the individual, as well as the affective response to the evaluations of an event, are integrated into the representation of the event in memory. Bower and his colleagues postulate a network theory that incorporates reciprocal influences of cognition and emotion by positing a semantic network model. When an emotion node is activated it spreads to the memory structure to which it is connected. In other words, when an emotion is experienced, information associated with it is primed and more likely to be recalled. The affect-memory activation involves two-way linkages in the network. In fact, conceptualizations of the cognition-emotion interaction have been expanded to include bidirectionality of influence in a number of cognitive theories on the cognitive representation of emotion (e.g., Bower, 1991; Mandler, 1984; Ortony, Clore, & Collins, 1988).

Affect plays a key role in cognitive representations of relationship scripts and social episodes. For example, there is evidence demonstrating that we perceive and interpret social events in terms of our feelings about them, as well as organize implicit knowledge in terms of affective dimensions (Forgas, 1991). In other words, individuals hold a number of implicit, cognitive representations of a range of relationship prototypes and past social episodes that are organized in terms of similarity of emotions aroused by them (Pervin, 1976).

Affective states have also been examined as a source of information about social stimuli that, in turn, influence perception and judgment (e.g., Schwarz & Clore, 1996). Rather than elaboratively processing features of the target stimuli and inferring their implications, individuals consult their affective reaction to the target to inform their social judgment. For example, individuals report being in a better mood and more satisfied with their life on sunny than on rainy days (Schwarz & Clore, 1996). The question is under what conditions do individuals rely on "how they feel" to guide their social judgments? For example, Schwarz and Clore (1996) demonstrated that the impact of such an affective-related response is eliminated when the informational value of the affective reaction for the judgment is questioned or examined. In this case, individuals examine the notion that the weather may be affecting their response. Thus, feelings as a source of information or as a short-cut to making evaluative judgments increase with greater complexity of the judgment task, increased time pressure, and decreasing relevance of the situation (Schwarz & Clore, 1996).

Cognitive Appraisal and Emotion

The way we appraise a situation in terms of its adaptive significance (e.g., sensing relevance to one's goals or constraints and/or opportunities present in the environment) is related to the type of emotions one experiences (Smith, Haynes, Lazarus, & Pope, 1993). In other words, emotions are evoked as a result of an evaluation of the adaptive significance of one's circumstances for personal well-being (e.g., Roseman, 1984; Smith et al., 1993). In fact, studies have demonstrated that it is this type of appraisal that directly results in emotion (Smith et al., 1993; Weiner & Graham, 1989). Thus, Smith et al. (1993) note that the key to the cognitive appraisal-emotion relationship is to establish the relevance for well-being in terms of consistency with one's goals reflecting benefits or harms, an appraisal of one's resources to achieve a goal, the extent to which extenuating circumstances justify a causal agent's role in producing a negative outcome, or what the event implies for the future.

In addition, current research shows that emotions are associated with distinctive patterns of cognitive appraisal (Folkman & Lazarus, 1988; Manstead & Tetlock, 1989; Smith & Ellsworth, 1985). Smith and Ellsworth (1985) found that there were characteristic patterns of appraisal along six dimensions (pleasantness, anticipated effort, certainty, attentional activity, self-other responsibility/control, and situational control) associated with different emotions (e.g., shame, pity, guilt, fear, frustration). For example, fear was found to be associated with maximal uncertainty about the situation, strong attributions of situational control, and appraisals of other-responsibility/control. Other researchers have extended these findings by including other dimensions of appraisal such as unexpectedness, benefit, and inconsistency with behavioral standards (Manstead & Tetlock, 1989).

Emotions as a Trigger for Cognitive Strategies

Positive and negative emotions have been shown to activate different cognitive strategies (Fiedler, 1991; Schwarz & Bless, 1991). For example, individuals are motivated to control negative mood states, and thus consciously focus on potentially rewarding information (Forgas, Bower, & Moylon, 1990). Other research demonstrates that strong and specified motivational pressures for a particular judgment outcome result in an increasingly selective, guided information search (e.g., Berkowitz, 1993). Such motivational goals include mood repair or maintenance, self-evalua-

tive maintenance, ego enhancement, achievement motivation, or affiliative motivation (Forgas, 1995). Thus, it appears that emotions as a function of appraisal qualities (described above) motivate particular types of social judgments and behavioral strategies.

Conclusions

The three areas of mainstream social cognition research reviewed above provide important information that informs and interfaces with research on emotion-cognition relationships from an adult developmental and aging perspective. First, this type of research recognizes the importance of social situations as adaptive contexts and moderators of cognitive functioning. Similarly, life span developmentalists view cognition in terms of age-related change in adaptive capacity. This change in functioning occurs as a function of selective adaptation, whether it be adapting to biological changes, goal-related changes, or the social context (Baltes, Lindenberger, & Staudinger, in press).

Second, the social cognition approach broadens the scope of inquiry regarding cognitive functioning to include concepts such as motivation and emotion, which are integral components of many models of social cognition. Such models provide a starting point for understanding the impact of such factors when they are considered along with concepts and problems from the field of aging. Developmental researchers also take this perspective and suggest that successful or adaptive cognitive functioning involves cognitive, affective, and physical characteristics that interact or are embedded in cultural values, attitudes, and sociocultural institutions (Labouvie-Vief, 1992; Sebbi & Papini, 1989).

Third, social cognition theories and models have identified cognitive and affective mechanisms underlying social judgments and other social cognitive processes (e.g., affect-priming vs. elaborative processing) that could be explored from an adult developmental perspective. For example, can factors that account for variability across contexts and individuals in young adults (e.g., complexity of the judgment task) account for age-related variability?

THE ROLE OF EMOTION IN SOCIAL COGNITION AND AGING

Given the importance of emotion in processing social information, in general, what are the implications for this interface when an adult develop-

mental perspective is taken? Two basic questions can be asked. Does adult development change the fundamental nature of emotion/cognition relationships as depicted in the mainstream social cognition literature, and if so, in what ways? To date, the majority of research examining this relationship has been documented primarily in college-aged young adults. To what extent do age-related changes in cognition and emotion influence the effective functioning of the individual? This question is important even if it is the case that developmental processes in adulthood have no impact on the fundamental structure of emotion, cognition, and their reciprocal influences on each other. Irrespective of developmental changes in the nature of cognition/emotion relationships, the functional effectiveness of the individual can be enhanced or degraded by the kinds of cognitions and emotions that are experienced as one grows older. For example, would older adults rely less on emotions as a source of information to guide judgment, given decreases in affective arousal levels with age?

Theoretical Issues

As noted earlier, there is relatively little research exploring whether there are age-related changes in the nature of emotion/cognition relationships. The majority of research in aging has focused on theories examining age-related differences in arousal or activation of emotion, with less emphasis on the cognitive interface with emotional functioning (Fillipp, 1996). Cognitive-emotion theories and research on aging have centered more on the functional significance for behavioral outcomes such as in the domain of everyday problem-solving and coping with stress (e.g. Aldwin, Sutton, Chiara, & Spiro, 1996; Blanchard-Fields, Jahnke, & Camp, 1995; Labouvie-Vief, Hakim-Larson, & Hobart, 1987) and less on the role of emotion in an information-processing context. Such research has focused on qualitative changes with age in goals and values, emotional understanding, and the cognitive appraisal-emotion relationship (Blanchard-Fields, 1996a; Carstensen, 1992; Labouvie-Vief, DeVoe, & Bulka, 1989; Ryff, 1985). Given that emotional arousal theories are addressed elsewhere in this volume, attention to these theories will be given in the context of how age-related changes in emotional arousal impact the nature of cognition-emotion relationships in social-cognitive development in adulthood.

Two major approaches to cognition and emotion in adulthood and aging reflect a developmental reorganization of self and knowledge and

a contextual approach. The developmental reorganization of self and knowledge is best reflected in Labouvie-Vief's theory of cognitive-emotional integration in adulthood (1992; also see Chapter 7). Labouvie-Vief contends that in the developing child and adolescent there are two dissociated modes of knowing: our emotional system (a personal, context-sensitive understanding of the world and self) and our cognitive or rational system (an impersonal, abstract understanding of the world and self). The socialization process teaches us that the "emotional" self should be subordinated under the "more important" rational self. She proposes that with maturity comes the ability to integrate these two systems, thus experiencing them as equal rather than disproportionate in importance. For example, concrete sensations and feelings interact with instead of being subordinated to logical, rational, thinking to produce more mature and flexible coping. As we shall see, there are a number of empirical studies that demonstrate better emotion regulation with increasing age (Blanchard-Fields et al., 1995; Labouvie-Vief, Hakim-Larson, DeVoe, & Schoeberlein, 1989; Lawton, Kleban, & Dean, 1993).

The contextual approach focuses more on the influence of changing social roles, life goals, and life contexts that influence emotions across the life span. For example, some studies demonstrate that as adults grow older and change life contexts, their problem-solving goals become more concerned with other people, intimacy, and generativity as well as reflective of cohort-related socio-emotional rule systems that influence reasoning and behavior (Blanchard-Fields, 1996b; Sansone & Berg, 1993). Along the same lines, Carstensen's (1992) theory of socioemotional selectivity suggests that given reduced resources in the life contexts of older adults, they construct their environment to maximize social and emotional gains and minimize social and emotional risks. Whereas the primary goal for young adults is to seek social contact for information gain and future contacts, older adults are more concerned with affective gain and intimacy (Frederickson & Carstensen, 1990).

A third theoretical issue that is well-represented in cognitive aging research has only begun to have its presence felt in emotion-cognition aging research: processing resource capacity (e.g., Salthouse, 1991). In some social cognition theories and research on emotion-cognition relationships, for example, the reliance on emotional information to inform social judgments depends upon greater complexity and time pressure of the judgment task (e.g., Schwarz & Clore, 1996). The question is: do older adults rely more on feelings as a source of information, given greater

demands on processing capacity? Although there is limited research on this issue, this question will be addressed later in a discussion of some current research.

Review of the Empirical Literature

As noted earlier, more emphasis has been given to qualitative changes in the nature of emotion as it impacts adaptive behavior, and less emphasis on emotion as a component of an information-processing system. Three general areas of research will be briefly reviewed, followed by approaches to the study of age-related emotion-cognition relationships in my own program of research.

Problem Interpretation

A focus on how an individual defines interpersonal and/or social problems suggests a number of ways in which cognition and emotion are related. Showers and Cantor (1985) demonstrate how mood states direct decision-making strategies and the importance of the role emotion plays in how the individual construes a problem space. Both emotional and cognitive aspects have been shown to influence how the individual constructs their social reality (Blanchard-Fields, 1986; Labouvie-Vief, 1992).

As noted earlier, Carstensen (1992) found that older adults place a greater value on quality of relationships. Similarly, adults are shown to have more interpersonal goals than children and focus on the importance of regulating affect (Lawton, Kleban, Rajagopal, & Dean, 1992; Sansone & Berg, 1993). Similarly, other research finds that young and older adults have different interpretations of various problems as a function of the degree of relevance to their everyday functioning and their distinct life and developmental contexts (Berg, Klaczynski, Calderone, & Strough, 1994).

Related to problem interpretation are problem-solving goals. From a contextual perspective, effective everyday problem-solving performance can be defined in terms of the achievement of desired goals (Berg & Klaczynski, 1996). In fact, preference and selection of alternative problem-solving strategies may reflect attempts to achieve different goals (Sansone & Berg, 1993). Evidence suggests that older adults have a greater diversity of goals, with a heavy emphasis on interpersonal goals and affective regulation (Lawton et al., 1992; Sansone & Berg, 1993; Strough, Berg, & Sansone, 1996). The literature on age differences in various

dimensions of emotion further demonstrates the importance of emotion as a motivating force in triggering cognitive strategies (e.g., problem-solving strategies).

The mainstream social cognitive research on motivated processing suggests that goals such as mood repair and maintenance and ego enhancement, among others, guide information search as well as social judgments (e.g., Erber & Erber, 1994). This phenomenon has been widely demonstrated in the laboratory. This line of theorizing lends itself to recent research and findings on the importance of affect regulation goals in older adulthood, as discussed above, and age-related differences in affect intensity, quality, and frequency.

Both physiological and self-report data suggest that affect intensity decreases with age as a function of inevitable biological aging (Diener, Sandvik, & Larsen, 1985; Levenson, Carstensen, Friesen, & Ekman, 1991) although tempered by individual variability (Fillipp, 1996). Research on frequency of affect suggests that older adults do not experience more negative affect than younger adults (Ferring & Fillipp, 1995; Levenson, Carstensen, & Gottman, 1994; Smith & Baltes, 1993). It appears that the basic emotional system remains stable throughout adulthood. Lower emotional intensity in older adults may, therefore, be due to preferred affect-regulation strategies used to avoid potentially negative emotionally arousing situations (Levenson et al., 1991). Finally, the quality of affective valence has been shown to change with age. For example, younger adults define positive affect more in terms of psychophysiological arousal and excitement than do older adults (Lawton et al., 1992).

In sum, age-related differences in the experience of emotion suggest that older and younger adults may have differential motivational goals that influence social judgments, the selection of problem-solving strategies, and decision making in social contexts. For example, in emotionally salient contexts, will older adults adopt more affect-reducing strategies? Is this most evident in dealing with negatively laden situations and outcomes? Although the area of adult development and aging has witnessed a recent proliferation of studies in emotion and strategy selection, more research is needed to answer these questions.

Emotion, Cognitive Appraisal, and Strategy Selection

The social cognition research on cognitive appraisal and emotions has been primarily conducted on college-aged students. There is less work

examining whether or not changes in the relations between cognitive appraisal and emotion occur in adulthood and aging. Weiner and his colleagues (Weiner & Graham, 1989) elaborate on the cognitive-emotion-action linkage and suggest that emotions play a mediating role in the relationship between causal attributions and specific types of action. In other words, emotions, rather than thoughts, were the more direct determinants of action. They did not find that the magnitude of this mediating relationship differed among age groups. However, they did find that the elderly reported less anger (and more pity) than younger participants, yet were more willing to help a person in need, regardless of the cause of the need. Weiner and Graham (1989) concluded that linkages between emotion, thinking, and behavior remain stable in healthy older adults, accompanied by an increase in social concerns and tolerance.

Folkman and Lazarus (1988) do not simply conceptualize actions, in the form of coping, as a response to emotions. They contend that cognitive appraisal of a stressful situation generates emotions which influence coping and, in turn change the stressful person-environment relationship. In their model emotion and cognition (i.e., cognitive appraisal), as well as action, can simultaneously serve as both cause and effect.

With respect to age differences, they found that young adults' use of positive reappraisal was related to a decrease in feelings of disgust and anger and an increase in pleasure and confidence, while older adults' use of positive reappraisal was associated with an increase in worry and fear. Young adults' use of confrontive coping was associated with an increase in disgust and anger, whereas older adults' use of confrontive coping was not related to any positive or negative emotions. Folkman and Lazarus (1988) argued that older adults might be more temperate with respect to negative emotional affect and/or might have developed their interpersonal skills in such a way that social support is more effective for them. There is support for the notion that cognitive developmental differences are more apparent in such areas high in emotional saliency, i.e., coping with stress, and interpersonal reasoning (Blanchard-Fields, 1986; Labouvie-Vief, 1992).

For example, Blanchard-Fields and Norris (1994) examined how relativistic causal attributions are influenced by the emotional saliency of situations. They examined whether individuals confronted with an emotionally laden context display more or less interactive (relativistic) causal attributions (i.e., considering a combination of dispositional and situational information in making the causal judgment), and asked if this is related

to age differences. In order to examine the issue of emotional saliency, they had respondents ranging in age from adolescents to older adulthood rate social dilemmas in terms of the emotional salience of the situation for them. Vignettes were separated into three levels of emotional saliency (aggregated across age groups): high, medium, and low. They then examined age group differences in the relativistic rating measures as a function of level of emotional saliency. Although adolescents were lower on relativistic ratings overall, these differences were primarily a function of the level of emotional saliency, i.e., adolescents scored lower on interactive attributions only for medium and high levels of emotional salience.

As noted earlier, emotion has an important impact on strategy selection (Weiner & Graham, 1989). Again, older adults may be motivated to select strategies that reduce negative affect. In fact, Lawton has argued that with increasing age and experience, adults are better able to manage negative emotions (Lawton et al., 1993). Better management of negative emotions may partly account for the fact that older adults maintain psychological well-being despite an increase in stressors that typically accompany aging (Aldwin et al., 1996). Older adults have been found to develop better coping skills to reduce the experience of negative emotions. For example, in a study by Lawton and Albert (1990) older adults report that coping with negative affect requires a conscious strategy, such as more cognitive control. Similarly, Aldwin et al. (1996) find that the oldest of older adults render most problems trivial. They interpret this finding by suggesting that there is a change in the temporal characteristics and appraisal of stress from episodic to chronic, accompanied by a shift from coping to general management skills.

Conclusions

When the study of social cognitive strategies and judgments includes both cognitive and emotional components (in the nature of the stimuli as well as in strategy choice), age differences are demonstrated. Strategies and judgments in older adults appear to be motivated by the regulation of negative affect. This becomes most apparent when strategy selection in a variety of problem-solving domains is examined (Blanchard-Fields et al., 1995). For example, emotion-focused strategies (i.e., the regulation of distressing emotions) are preferred by older adults as compared to younger adults (Folkman, Lazarus, Pimley, & Novacek, 1987; Prohaska, Leventhal, Leventhal, & Keller, 1985). This is an area that has received considerable attention in my program of research.

EVERYDAY PROBLEM SOLVING AND EMOTIONAL SALIENCE

In a number of studies, we have found that older adults use a variety of strategies as a function of both the type of issues they are addressing in a particular domain (e.g., relationship, home management problems) and the emotional salience of the problem situation. A number of studies have examined the competence and increased experience of older adults' problem solving for instrumental everyday tasks such as those described by Marsiske and Willis (1995). In contrast, the majority of my work has explored everyday problem solving in more emotionally laden interpersonal contexts, such as relationship conflicts. From a developmental perspective it may be the case that youthful problem solvers may be less adept at integrating and regulating their cognitive and affective systems (Blanchard-Fields, 1986; Labouvie-Vief, 1992). With this in mind, my program of research has involved presenting individuals with a number of hypothetical problem situations ranging in emotional salience. We were interested in whether older adults have more diverse and adaptive strategies in dealing with highly emotional and interpersonally ambiguous social problem situations.

The general method we have taken in assessing problem-solving strategies is to present hypothetical problem scenarios to individuals of varying ages. The problem scenarios were culled from everyday problem situations reported by younger, middle-aged, and older adults in previous work by both my colleagues and other researchers (e.g., Blanchard-Fields & Robinson, 1987). We have used several different methods of assessing the types of solutions used by individuals. The methods range from having participants rate the degree to which they would employ particular strategies in each problem situation, to a paper-and-pencil method of eliciting open-ended responses as to what strategies they would employ in these situations, to an interview method in which audio-taped individuals think aloud responses as to the kinds of problem-solving strategies they would use in these situations. We have also assessed participants' solutions to and descriptions of everyday problems that they have personally experienced. Some examples of typical hypothetical problems used are given below.

A father has a 16-year-old daughter who keeps taking his car several times a week. The family has only one car. What should he do? (*Low emotional salience*)

A person takes care of a blind and diabetic mother. She is beginning to have serious kidney trouble and is hard to care for. The doctor is recommending a nursing home. What should the person do? (*High emotional salience*)

The scoring procedure for the problem-solving scenarios was developed in a number of studies based on the four response styles generated by Cornelius and Caspi (1987). These include problem-focused action, cognitive problem analysis, passive-dependent behavior, and avoidant thinking. Both problem-focused and cognitive-analysis strategies involve direct efforts to solve the problem either through direct action or logical analysis, respectively. In contrast, passive-dependence and avoidant strategies involve managing one's emotions through withdrawing or depending on others and avoiding or suppressing one's emotions, respectively. Solutions to problems each received four scores, one for each problem-solving style. Ratings were based on a 4-point scale that indicated how much a particular problem-solving style was used or endorsed (from "no use" to "vague use" to "clear use" to "major use"). In this way we could determine the extent to which individuals' endorsements or productions of these four problem-solving styles vary as a function of the particular types of problem-solving situations and/or domains. Also, we could examine whether this variation is affected by age and related accumulated experience (familiarity with the problem, controllability).

Instrumental Domains: Consumer, Home Management

In several studies we examined the types of strategies individuals employ in more low emotionally salient instrumental domains of everyday living, such as solving consumer-oriented problems (what do you do when you've purchased defective merchandise) or home-management problems (dealing with a landlord who refused to make expensive repairs that are needed). We examined the strategies endorsed by adolescents through older adults (using the rating scheme just described). Overall, we found that a) there were relatively few age differences in problem-solving strategies endorsed in these domains. Instead, problem-focused action was the predominant strategy endorsed by all; and b) when age differences did appear, older adults and middle-aged adults used more direct action problem-focused strategies, as well as more cognitive analysis of the situation in the consumer domain, than did adolescents and young adults (Blanchard-Fields &

Camp, 1990; Blanchard-Fields et al., 1995). These findings suggest that older adults do not necessarily lack the ability to engage in cognitively complex strategies (as these two strategies have been rated in previous work). This makes sense. The types of situations we used, although somewhat ambiguous given the everyday context, are very straightforward with respect to the action needed to achieve a positive outcome (e.g., return a defective piece of merchandise, effective shopping, etc.). In addition, middle-aged and older adults do have the advantage of accumulated experience in such consumer-oriented situations.

Interpersonal Problem Solving

The more interesting age differences in our research have to do with more emotionally salient problems where the individual is engaged in conflict with people such as co-workers, friends, and family members. Recall that previous research suggests that older adults interpret everyday problems differently than younger adults in that they focus on interpersonal concerns of the problem and in regulating emotions in a problem situation (Sanson & Berg, 1993). Thus our program of research has taken into consideration the importance of emotions and other social cognitive factors influencing problem solving across the latter half of the life span.

The results from three studies (each in a different phase of the research process) lend support to three characteristics of older adults' problem solving in an interpersonal context. In interpersonal and emotionally salient situations:

- (a) older adults tend to demonstrate flexibility in their use of problem-solving strategies. In other words, they know best when to "do" and they know best when to "let it be";
- (b) older adults are more comfortable with ambiguity and uncertainty inherent in interpersonal problems; and
- (c) older adults are better able to place problem solutions and appraise the problem in context, i.e., they are context-sensitive in their reasoning.

We have provided evidence for these characteristics in a number of studies we conducted when comparing consumer and home management domains, as discussed earlier, with domains that reflect interpersonal content, such as family and friends and problem situations rated high in emotional salience.

Study 1

In a recent study, we directly examined the emotional salience of problems (ranging from high to low) as a determinant of the degree to which individuals reported a particular problem-solving strategy (Blanchard-Fields et al., 1995). In low and high emotionally salient situations, there were relatively few age differences in the use of instrumental and proactive problem-solving strategies (i.e., problem-focused and cognitive analysis). However, in high emotionally salient situations, older adults consistently endorsed more passive-dependent and avoidant strategies than either young or middle-aged adults. The type of problem situation encountered influenced the observation of age differences. Older adults, like young and middle-aged adults, used more problem-focused strategies in less emotionally salient and more instrumental task situations (e.g., returning defective merchandise). In addition, when the situations were higher in emotional salience (e.g., moving to a new town, taking care of an older parent) older adults used more emotional regulating strategies (e.g., suppressing emotions, not trying to alter an uncontrollable situation) along with the problem-focused strategies.

We suggest that older adults may be engaging in a more differentiated approach to problem situations, in that they use diverse strategies in handling problems as a function of the nature of the situation: instrumental, interpersonal, or emotional. Adolescents and younger adults tend to approach these emotionally salient problems with the idea of controlling the problem and fixing it. They appear to be uncomfortable dealing with the ambiguity and emotional nature of the problem. In contrast, older adults do not appear to be disturbed by the ambiguity and uncertainty of emotionally laden problems, and thus are more willing to surrender to the situation (i.e., accept it as it is) when it is high in emotional salience and/or uncontrollable.

We have found support for developmental differences in approaching and solving emotionally salient problem situations in several studies. For example, older adults were better able to differentiate the cause from the outcome of a stressful event, and, in turn, allocated self-blame only when they felt responsible for the cause (Blanchard-Fields & Robinson, 1987). This was not so for more youthful individuals. This adaptive form of selective problem-solving to situations perceived as internal or external on the part of older adults is further supported by another study we conducted. This demonstrated the ability of older adults to effectively

choose between emotion- or problem-focused problem solving, depending on the appraised controllability of the situation (Blanchard-Fields & Irion, 1988). When a situation was appraised as controllable, both young and older adults used more problem-focused strategies. However, when the situation was appraised as uncontrollable, older adults tended to use more emotion-focused strategies, whereas younger adults still endorsed more problem-focused strategies.

Study 2

In a study currently in progress, we extended our previous research to the relationship between emotional salience and problem-solving strategies. Instead of a paper-and-pencil method of eliciting open-ended responses (of strategies they would employ), we employed a think-aloud interview to increase the richness of the information elicited from our participants. In addition, we expanded the coding scheme to include a more representative sampling of problem-solving strategies, particularly in the emotion-regulation domain. Young, middle-aged, and older adults were interviewed as to how they would solve two personal problems, high and low in emotional salience, and four hypothetical problems, two high and two low in emotional salience. We also asked them what emotions were or would be experienced and how they would manage these emotions.

I would like to report on a limited portion of our data which has, so far, been qualitatively scored. As of now, we have scored a subsample of our participants in the hypothetical problem-solving situation. We scored the problem solutions and emotion solutions as to the degree to which three problem-focused and four emotion-focused styles were produced. Problem-focused styles included planful problem solving, cognitive analysis, and regulation of others' behavior or beliefs. Emotion-focused styles included active avoidance of thoughts and feelings about the situation, managing reactions through either confronting the emotion by expressing it or by suppressing the emotional response, accepting the situation as it is, and consciously reflecting on one's emotions. The additional strategy categories allowed a more fine-grained analysis of emotion-focused styles.

Preliminary findings indicate that age interacted with the emotional salience of the problems, particularly when examining the emotion-focused strategies, and when participants were asked how they would or did handle emotions in the problem situation. The interview procedure

was structured to explicitly evoke emotion-related strategies. Once again, we found that all individuals produced planful problem-solving strategies. However, younger adults produced more planful problem-solving strategies in high emotionally salient situations, and older adults produced them more in low emotionally salient situations. With our more elaborated emotion-focused coding, we found that in high emotionally salient situations, older adults were more likely to accept the situation as it is. In contrast, middle-aged adults were more likely to acknowledge or reflect on emotional reactions in order to understand them. In addition, in many situations, older adults were more likely to engage in an active suppression of emotional reactions (i.e., keeping their feelings to themselves). Finally, younger adults were more likely to confront and express emotions to others.

Again, older adults' responses were related to the emotional impact of the problem situation encountered. When the situations were higher in emotional salience, older adults used more emotion-regulating strategies. This relates back to the research demonstrating that older adults are better able to regulate negative affect in life situations (Carstensen, 1992; Lawton et al., 1992).

Study 3

Finally, in a master's thesis project conducted by Tonya Watson, we are examining the limitations of the multiple-choice format of endorsing problem-solving strategies. Typically, studies have presented only a limited number of solutions for participants to choose from, or have used an open-ended format which elicits problem solutions individuals can produce at only one point in time. We feel that we haven't begun to tap the numerous types of solutions individuals use or decide not to use in problem situations. Thus, we have elicited a wide range of solutions to four problems, two representing low emotionally salient situations and two representing high emotionally salient situations. Young, middle-aged, and older adults were presented with 73 solutions to each problem and were asked to sort the solutions along the dimension of least favored to most favored (11 categories). Included in these solutions were problem-focused and emotion-focused strategies that were either individualistically or interpersonally oriented. In this way, we could obtain a broader picture of the types of strategies favored by individuals of different ages, and the types of strategies they do not use.

I would like to summarize results from the qualitative analysis of the data thus far. In low emotionally salient situations which were very instrumental in nature (e.g., a relative overstepping their boundaries in asking for help) young adults preferred responses aimed at decreasing their burden (e.g., encouraging the relative to move in with another family member). Older adults focused more on the feelings of the relative (e.g., concluding that the relative has no control over the situation). In addition, instrumental strategies were preferred more by older and middle-aged adults, whereas young adults focused more on perspectives of the characters, especially those of a younger age.

In high emotionally salient situations (e.g., a spouse having an affair) there were more age differences. Young adults were more confrontive in expressing emotional responses by making sure the "other" knows how you feel or "airing out their feelings." Middle-aged adults were less confrontive in that they preferred to seek assistance from outside sources (e.g., legal advice, support groups). They preferred to analyze the situation before taking action. Older adults were more restrained in their response (e.g., "Act as if nothing is going on" or "Don't let the spouse see the pain and hurt they've caused"). These age differences were consistent across both high emotionally salient problem situations.

In contrast to the flexibility in responding found in earlier studies, these particular dilemmas produced effects that were tied to a particular age or cohort. The possible influence of age-relevance of a family car dilemma (i.e., young adults identifying with the teen who is overextending the use of the family car) is a case in point. In this situation, the young participants tended to choose strategies which benefited them directly and immediately. Possible cohort differences could be operating in the highly emotional situations. For example, a distinct pattern emerged for the older adults. They consistently chose to suppress emotional reactions to situations. Again, this is similar to the findings reported above in Study 2. These findings could relate to the socialization of this cohort that grew up during the Great Depression, where it was quite adaptive to suppress feelings and keep a stiff upper lip. Finally, middle-aged respondents were more instrumental and pragmatic and took a more analytical approach to the problems. Perhaps this is a function of a baby-boomer cohort approach to problem situations. Further research needs to tease apart the developmental trends associated with experience from those that are influenced by cohort differences.

Summary

Overall, the above studies suggest that emotion is essential for rational decision making in an everyday context; in other words, we need to integrate the emotional component into our thinking. In fact, adult developmental differences were amplified in emotionally laden problem contexts. It was shown that affect directs and is directed by interpretation and representation of the problem situation. In turn, the nature of this process affects problem-solving strategy selection. This underscores the need to examine the emotional and cognitive interface when individuals construct interpretations of social situations, or a problem space. It was also shown that older adults may have greater flexibility in responding to situations high in emotional salience. Similarly, the social cognition literature suggests that social intelligence involves the ability to construct multiple alternatives of a situation and use affective appraisal and emotional regulation as coping mechanisms, thus allowing flexibility in adapting old strategies and learning new strategies (Cantor & Kihlstrom, 1989). However, this finding needs to be tempered by the possibility of the effects of socialization tied to a specific generation (as to how to behave in certain types of social situations).

ATTRIBUTIONAL PROCESSING IN ADULTHOOD AND AGING

The above review of the literature and the discussion of my current program of research on everyday problem-solving is primarily derived from the developmental reorganization and contextual approaches to the study of emotion and cognition. What about the information-processing approach? Again, in the mainstream social cognitive literature it was suggested that with increased complexity of task and increased time pressure, there is more reliance on affect driven social judgments. However, given enough processing time, young adults use more elaborative processes to take in multiple forms of information. By contrast, do older adults rely on automatic affect-based processing given possible processing limitations? There is very little research addressing this issue. However, in a master's thesis project conducted by Yiwei Chen, we addressed this possibility.

The social cognition literature posits a sequential model of processing social information when making social judgments (i.e., causal attributions)

(see Gilbert & Malone, 1995, for a review). The initial stage consists of a spontaneous and relatively automatic process, where an individual would initially blame the main character for a negative outcome in a problem situation. This is followed by an adjustment stage, in which situational or other information is used to adjust for the initial dispositional attribution. We assessed whether older adults would rely more heavily on the initial dispositional attribution and whether they would engage at all in the adjustment stage. Thus, we compared the performance of younger and older adults using an attributional processing task. The following conditions were employed: In condition 1, participants made a causal dispositional rating (e.g., how responsible is the main character for the negative outcome) immediately after they finished reading a vignette. In condition 2, they had a 30-second delay after reading the vignette before making the rating.

Older adults made higher dispositional ratings than younger adults only in the immediate rating condition. Whether a spontaneous adjustment stage occurred depended upon the age group examined and the content of vignettes. Older adults made less dispositional attributions if they were given more time to think about the situations than in the immediate judgment condition. However, younger adults made more dispositional attributions if given more time to make the judgments.

It is possible that the differential age effects could be explained by slower information-processing on the part of older adults. In the immediate condition (with increased time pressure), they may have relied more on an automatically activated response (dispositional attribution) which takes less cognitive effort. However, the question still remains as to whether this is due to a processing deficit, or to the activation of strong social rules and emotional information as to how to behave in this particular situation. The tendency for older adults to examine multiple factors involved in the situation if given enough time to think about the vignettes (i.e., make more interactive attributional judgments) also suggests that they do have the capacity to correct their initial attributions. By contrast, younger adults did not make this correction. Were they relying more on socially driven rule systems about how an individual should act in this situation or other situational factors? More research is needed on the socialized rules individuals maintain about social dilemmas (e.g., "Marriage should come before career"). We are currently assessing these social rules as they exist in different age groups. Preliminary findings suggest that there are age differences in strongly held social rules which are

evoked by different social situations; such rules do influence the types of social judgments made and strategies selected. Again, as discussed earlier, an important question to ask is whether these age differences result from cohort differences in socialization processes, life stage differences, or increased experience.

CONCLUSIONS

There is a growing literature that continues to provide evidence for adulthood changes in affect intensity, the use of affective appraisal, one's social knowledge base, and emotional regulation. This knowledge base stresses the importance for future research to examine social cognitive functioning such as everyday problem solving and social judgments within an emotional context. There are a number of areas that need further elaboration and examination. First, there is an accumulation of evidence suggesting changes in emotional intensity as well as emotional understanding as we grow older. In concert, there is much theoretical speculation suggesting that these changes should influence problem-solving interpretation, strategy preferences, and social judgments. However, there is a need for more empirical work to substantiate such a relationship. For example, if, indeed, older adults are motivated to reduce negative affect, studies need to assess this motivational structure (e.g., the goal to increase or decrease emotional stimulation) and relate it to on-task performance (e.g., selection of problem-solving strategies, interpretation of problems, selection of intimate contacts, etc.).

Second, instead of simply manipulating the emotional salience of a situation, it would be useful to focus also on the individual's phenomenological experience of emotion; i.e., an analysis of the current level of functioning of emotional self-experience from early to later adulthood before and/or during task performance. There is an abundance of research in mainstream social cognition suggesting that one's current mood or emotional state influences social judgment. Such on-line assessment of current emotional states in older adults, as compared to other age groups, would help determine whether changes in emotional experience (e.g., affect intensity) modify this relationship (e.g., between mood and memory, affect and causal attributions) as a function of age. In this way, important factors (such as changes in processing capacity) can be identified that may not have been considered with the limited age range typically used

in social cognition research. In other words, developmental changes in knowledge systems and processing operations may impact how social-cognitive functioning proceeds. It may be the case that the models developed in mainstream social cognition may be too static and unable to incorporate such developmental phenomena.

Third, the need to take into consideration the relationship between components of emotional functioning and cognitive functioning in order to understand human functioning coincides nicely with recent thinking in neuroscience. For example, Damasio (1994) discusses how a person can be extremely competent on standardized intelligence tests and fail miserably in making choices in everyday life where there is no single correct answer. To investigate this discrepancy in functioning he has located what appears to be a collection of systems in the human brain dedicated to goal-oriented thinking processes and decision-making processes, with a special emphasis on personal and social domains. In addition, this same collection of systems appears to be involved in emotions and processing of body signals. Individuals with damage to these areas have difficulty placing values on decisions. In other words, all decisions have equal value, and thus they cannot make a choice. Damasio argues that rationality involves emotions and that we cannot eclipse affect in making everyday rational decisions. Instead of simply examining strategy choices, we need to examine how individuals go about making their choice of particular problem-solving strategies, social judgments, and the values associated with them.

Finally, what appears to be a deficit in one area (whether it be cognition or emotion) may instead serve an important adaptive role in social cognitive functioning. For example, current thinking does not necessarily view a general reduction in affect intensity as a deficit. Instead, it may represent effective self-regulation, without precluding the possibility of intense emotional responses under specific eliciting conditions. In sum, the search for aspects of the aging process which have adaptive value for developing adults may be advanced with more studies examining the interface between cognition and affect.

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Aging and the Plasticity of the Self

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Theoretical advances in cognitive neuroscience may offer new insight into the process of psychological development. The dual mechanisms of neural plasticity, indiscriminant synaptogenesis, and activity-dependent pruning of unused connections appear to articulate the connective structure of both the cortex and memory. At the same time, general principles of function in distributed neural networks are being suggested by computational models. The theoretical power of these advances is considerable. A major reformulation of neuropsychological development may soon be possible in which a common set of principles is able to describe both neurophysiological and psychological development across the life span.

In this chapter, we consider the computational principle that plasticity necessarily degrades the stability of a distributed representation. We find that it makes a straightforward prediction for human development: *By differentiating and specifying the memory system, neuropsychological development produces greater historical determination of perception, and less flexibility in adapting to environmental change.*

We begin by reviewing mechanisms of neural plasticity in the ontogenetic specification of the cortex, and how these appear to form the basis for learning and memory throughout development. The role of emotion becomes clear when it is recognized that activity-dependent pruning of unused synapses is dependent on processes of neural arousal that are integral to variations in mood level, alertness, and motivation. We then consider the computational mechanisms of learning in connectionist modeling, and propose that a robust constraint on learning in these distributed models, the stability-plasticity dilemma, also constrains the functional operations of the human brain. The distributed architecture of the cortex shows that information processing is holistic: memory organization is achieved by a densely interconnected, functionally integrated corticolimbic system. Cognition is therefore organismic, incorporating constraints from the entire brain and body. It is also cumulative, with each new operation of perception and reasoning constrained by that person's learning history. Understanding these characteristics shows that human experience is inherently developmental, with changing constraints on learning and memory at each phase of the life span.

TRENDS IN PSYCHOLOGICAL DEVELOPMENT

It is important to acknowledge that we are speculating beyond the scope of inquiry that would be considered appropriate for either the neuroscience literature or the computational modeling literature. The study of neural plasticity has been concerned primarily with specific neural mechanisms within sensory or motor systems (Greenough, 1984). Similarly, although the computational models have yielded general principles, the research has been concerned primarily with the models themselves, and only recently have there been explicit parallels to mechanisms of the human cortex (McClelland, McNaughton, & O'Reilly, 1995). In contrast, our interest is in the general implications of connectionism and neural plasticity for how the human brain and mind change across the life span. In addition, consistent with the broad scope of the present chapter, the evidence we propose to explain deals not with specific laboratory studies of children or the aged, but with basic characteristics of psychological development that we take to be apparent to casual observation.

Children are highly flexible, and they are largely ignorant of the world. Old people tend to become rigid in their thinking, and they bring a wealth

of experience to each learning situation. These are generalities, of course, and they may be seen as stereotypes. Developmental psychologists may be particularly likely to take issue with them, pointing out the remarkable knowledge of even young children, and emphasizing the capacity of many old people to remain creative and flexible to the end. Yet we feel it is important to frame the fundamental phenomena as clearly and simply as possible. The progression from flexibility to rigidity is a basic fact of life span development.

Learning and memory undergo fundamental changes from infancy to senescence. Young children show infantile amnesia. A normal 5-year-old can apply sophisticated cognitive operations, with excellent access to concrete details of recent memory. But she or he will have strikingly poor access to events that occurred two years earlier. In contrast, it is not uncommon for a normal 70-year-old to have difficulty separating the events of last week from those of last month, and to lose much of the episodic detail that comes naturally to a child's telling of recent events. Yet the older person finds that experiences from decades ago come readily to mind, forming an intimate historical context for current experience. Although it is common to think of memory simply as deteriorating with age, more careful observation shows that there are fundamental qualitative changes.

These developmental changes in the human memory system dynamically constrain subjective experience. The awareness of events in time undergoes a major shift between childhood and adult development. For a 9-year-old, a summer lasts a long time. It is an epochal period, in which friendships, attitudes, and self-concepts may be fundamentally transformed. For the 50-year-old, the summer is quickly gone, leaving the self relatively untouched. It is as if the experience of time is cumulative, with each event taking its place within a global, historical awareness.

Can the cognitive neuroscience of memory address these broad issues of life span development? We propose that it can, in several ways. First, the evidence on neural plasticity shows that there is an isomorphism of neuroanatomy and memory, such that experiential changes are also changes in the fine architecture of cortical networks. The medium is the message. If we study the architecture of the medium, we may decipher the coding of the message. Second, the anatomical evidence shows that the corticolimbic networks of the human memory system are highly integrated, such that each perception and action is constrained by, and constrains, the entire memory system. Given the consolidation of past history, personal

motivation, and expectancy for the future across the reentrantly linked corticolimbic networks, memory should be considered as a holistic, self-organizing system: the self. Third, connectionist modeling principles imply that there is a cumulative differentiation of the memory system, in which the sheer connective inertia leads to an inexorable progression toward greater stability and less plasticity. Even if the brain remains entirely healthy, the result is a qualitative shift in self-regulation, toward greater continuity of identity and less capacity for accommodating to a changing world.

NEURAL PLASTICITY AND MEMORY

In its embryonic differentiation, the connective architecture of the vertebrate brain is self-organizing. Particularly for the telencephalon (forebrain) the genetic code does not specify the network connections, but rather provides modes of functioning that allow self-organization of the connections. Thus, in the first trimester of human pregnancy, sensory receptors begin sending neuronal projections to the diencephalic sensory target structures (Trevorthen, 1985). As shown by classical neurobiological studies of the goldfish tectum, the mapping of sensory space onto the target structure is not genetically defined, but must be self-organized through a process of overabundant connectivity and subtractive elimination. The connections that comprise correlated visual input are retained. Because adjacent retinal areas receive correlated data, a simple self-organizing process of subtractive elimination is able to reproduce a map of visual space within the target network of the optic nerves.

Throughout both prenatal and postnatal periods of ontogenesis, the organization of neural plasticity is achieved through the initial exuberant growth phase and the activity-dependent subtractive phase (Innocenti, 1983). In the initial exuberant growth phase, synaptic connections are made without a differentiated architectural plan. In the subtractive phase there is a Darwinian elimination of the less functional connections. Only the most active synapses are maintained (Janowsky & Finlay, 1983). The result is a sculpting of the neural substrate by the informative content of the sensory and motor traffic.

Studies of the cortical mechanisms of memory have suggested that the synaptic modifications closely parallel those which occur in the ontogenetic differentiation of the cortex (Singer, 1987). The primary principle

seems to be a Hebbian one: Synapses are maintained when inputs are correlated (von de Malsburg & Singer, 1988). The implication of this remarkable parallelism seems to be that the mammalian capacity for learning represents an evolutionary conservation of an embryological mechanism—self-organizing neural plasticity—throughout an extended developmental period (Tucker, 1992). Human ontogenesis has elaborated this neotenic extension into a juvenile period that allows plasticity, and learning, to continue over many decades.

Maturation and Age-Related Changes in Neural Plasticity

Although many mammals enjoy a protected juvenile period, allowing the protracted plasticity required for complex learning, sexual maturation typically marks the onset of adult behavior. At this point, routinized, effective behavior patterns must replace the equipotential flexibility of the juvenile. Some degree of plasticity is retained by the adult brain, and the extent of adult plasticity has been an important recognition in recent neuroscience research (Merzenich, Recanzone, Jenkins, Allard, & Nudo, 1988; Recanzone, Merzenich, & Schreiner, 1992). However, the general progression of neural maturation is one in which embryologic plasticity is decreased in order to achieve the stability of the adult brain.

An important anatomical marker, myelination, signals both a decrease in neural plasticity and the appearance of maturation in cortical networks (Innocenti, 1983). Anatomical studies have also demonstrated that juvenile plasticity may be retained to a different degree by different regions of cortex. Although studies by Merzenich and associates (Merzenich et al., 1988) have shown that sensory and motor areas of neocortex may retain a degree of plasticity in the adult brain, classical observations showed that plasticity remains greatest in the association areas of the cortex (Hecaen & Albert, 1978). The significance of this fact must be understood in terms of the changing concepts of the function of the “association” areas in organizing memory and cognition.

NETWORK ARCHITECTURE OF THE PRIMATE CORTEX

The traditional understanding of cortical organization began with the observation that sensory and motor functions could be mapped to specific cortical areas (“primary” cortices). Regions with multimodal input, such

as areas of the parietal, temporal, and frontal lobes, were described as "association" areas, and these were assumed to play the leading role in the cognitive integration of perception and behavior. The more primitive areas of cortex (archicortex and paleocortex) on the medial surface of the brain, the limbic lobe, were assumed to be responsible for integrating the functions of the cortex with the subcortical homeostatic and motivational circuits.

Over the last several decades, it also became apparent that the limbic cortex and limbic structures (amygdala, hippocampus, and associated diencephalic nuclei) were essential for normal memory functions (Squire, 1992). With the exception of routinized motor skills and perceptual priming in sensory areas, intact connections between the neocortex and the limbic areas are required for memory formation. Because remote memories are not lost following limbic lesions, the storage appears to take place over extended areas of neocortex (Squire, 1992). The critical role of limbic-cortical interaction therefore seems to involve the process of memory consolidation.

Because researchers in neuropsychology adopted the cognitive paradigm from psychology, much of the research has considered memory to be a specific, isolated mental operation. The literature on limbic system contributions to motivation, emotion, and psychopathology has had little influence on the study of limbic contributions to memory. The importance of a more integrated, common-sense approach to neuropsychology has become obvious as anatomical studies have illuminated the general architecture of mammalian cortex. The limbic cortices are the first to have evolved, and they form a core from which the neocortical networks have expanded (Pandya, Seltzer, & Barbas, 1988).

EMOTIONAL REGULATION FROM THE LIMBIC CORE

The critical role of the limbic areas in both motivational and mnemonic processes shows that even the massive cortex of humans is organized developmentally, with the extensive neocortical representational capacity remaining dependent on the adaptive control of consolidation provided by the limbic core (Tucker, 1992). The amygdala, hippocampus, and associated limbic cortex have important connections with brainstem neuro-modulator systems as well as the cholinergic nucleus basalis system. Through regulating these general activating systems, the limbic regions

may alter the activity-dependent pruning of unused connections, not only in embryonic differentiation of the cortex, but in each instance of adapting the synaptic structure of memory to new information. If there is a disruption of these systems, such as may occur when depression complicates the neuropsychological status of an old adult, the effect may be not only a “functional” impairment of memory, but a “structural” loss of synapses that may lead to a progressive decline.

With their close connectivity with the hypothalamus and brainstem circuits, the limbic cortices are closely modulated by internal need states (Mesulam, 1985). Retracing the progressive differentiation of neocortex from primitive limbic cortices in phylogenesis, the primate comprises multiple representational networks, emanating from paralimbic (allocortical and periallocortical) areas through traditional “associational” areas to the finely differentiated isocortex of “primary” sensory and motor areas (Pandya et al., 1988). The general organization of the cortex thus begins with a limbic core representing the internal milieu, and progresses toward an isocortical interface with the external environment (Mesulam, 1985). The general picture of the connectivity is one in which the evolution of each more differentiated network of isocortex created an onion architecture, as each new superficial network interposed itself between the thalamic input/output connections of the environmental interface and the paralimbic core (Tucker, 1992).

In this architecture, the paralimbic core provides the essential adaptive control that regulates memory consolidation according to the significance of events in relation to past history and current needs. The connectivity is such that integration must be achieved at the core: The sensory and motor isocortices are isolated “islands” with limited connectivity. If connectivity indicates function, we should expect the limbic networks to be essential for abstract semantic function. This is what has been observed, in fact, in aphasia. Lesions that produce semantic deficits are invariably found to encroach on limbic cortices (Brown, 1989).

REENTRANT PROCESSING AND BAYESIAN PERCEPTION

The key theoretical challenge for understanding this general architecture of the brain may be to interpret how representations are transformed across the multiple linked networks from sensory and motor cortices to the paralimbic core. Processing is more “abstract” at the paralimbic level,

but it is also "bound" within a syncretic matrix of multimodal constructs, motivational constraints, and incipient action dispositions. The functional integration of the brain cannot be attributed to any network level, but must be framed as a task for synchronizing multiple networks in concert.

The processing between one linked network and the adjacent one is described as "reentrant" in that the connections allow the representation in one network to be conveyed through point-to-point links with the next network. However, the connectivity between isocortical areas and limbic cortex is not symmetrical. The isocortical-toward-paralimbic "feedforward" connections project to layer IV of the cortex (Barbas & Pandya, 1989). Because layer IV is the target for thalamic input to sensory cortex, this pattern would be consistent with the hypothesis that isocortical networks have evolved to provide progressively more complex modeling of the thalamic input (Tucker, 1992). The paralimbic-toward-isocortical "feedback" projections proceed from deep ("output") layers of the paralimbic network toward the superficial ("local processing") layers of the more isocortical network.

In the sensory systems, the reentrant traffic across these networks serves to consolidate an integrated perception through combining the mnemonic representations of past experience with the new sensory data. The corticolimbic consolidation is very likely energized by limbic excitement. At the neurophysiological level, electrical stimulation of any area of cortex results in kindling or recruitment of increased electrical excitement in limbic areas (Doane & Livingston, 1986). Assuming a simple isomorphism of physiology and function, we can speculate that corticolimbic consolidation of memory proceeds similarly, with the vigor of reentrant consolidation tuned by the adaptive resonance within limbic tissue.

In such a framework, perception and memory are separated by multiple gradients, rather than by the distinct boundaries often assumed in psychological research. Because neural networks are able to extract the common features of varied input events, they are able to provide a Bayesian model of pattern recognition, in which prior experience can be used to constrain the uncertainty of each perceptual (Russell, in press). Corticolimbic networks provide different Bayesian representations at each level, with the more generic representations at the more paralimbic levels constraining the patterns that are organized from sensory data.

Such close integration between the pattern recognition of perception and the representations of memory have been acknowledged in Shepard's (1984) psychological studies of perception. On psychological grounds,

Shepard proposes that there may be multiple forms of mental representation, ranging from that which is closely aligned with sensation to that which is wholly emergent from memory. Although perception is often viewed as a passive process, Shepard argues that the perceptual capacities shown by subjects in psychological experiments imply that the mind must actively organize its apprehension of the environment, through a process in which the expectations formed in memory act as templates for new events.

THE STABILITY-PLASTICITY DILEMMA

Judging from cortical anatomy, the negotiation between memory and sensory data proceeds in different forms at the four or so network levels interposed between limbic structures and the thalamic input to primary sensory cortex. At the paralimbic core we find the greatest interconnectivity across modalities, the greatest retention of juvenile plasticity, and the greatest integration of adaptive constraints. These are the characteristics that must be essential to the central integration of the memory system, the core self. At this level, we can also expect the greatest realization of the stability-plasticity dilemma.

Connectionist computational models are capable of producing results which, although grossly simplified, are more like human cognition than the operations of traditional digital computers. Neural networks excel at pattern completion, even with degraded input data (Rumelhart & McClelland, 1986). Having established very few basic parameters (most notably rate of connection weight change, a measure of plasticity) these networks can "learn" appropriate responses to a set of stimuli, either trained by feedback or on their own. Intriguingly, neural networks also show graceful degradation of information representation when damaged, similar to biological neural networks.

Among the general properties shown by connectionist networks, there is a fundamental problem that limits the capacity of the network to adapt to changing circumstances. Because the same connection weights must be adjusted to accommodate all representational processes, new learning causes a potentially catastrophic loss of prior learning. This is the stability-plasticity dilemma, whether to retain or adapt.

Theoreticians such as Grossberg have recognized that this dilemma is a critical one for models of distributed representation (Grossberg, 1984). The degree of catastrophic interference can be adjusted by changing

learning parameters. The more quickly new items are learned, the more damaging the learning is to prior information. By "interleaving" the new information with practice on the prior learning, the network's weights may be adjusted so that the prior learning is not degraded catastrophically. McClelland and associates have theorized that an interleaving process may be initiated by the hippocampus in the limbic-cortical consolidation of memory (McClelland, McNaughton, & O'Reilly, 1995). However, although mechanisms such as interleaving may tune the balance between stability and plasticity, the dilemma remains. Greater plasticity means less stability. Learning requires not just assimilation, but accommodation, of the existing representational structure to the new data. If a common network is used for all cognitive operations, there may be an inherent tradeoff between adapting the network to accommodate new data and stabilizing its representation of prior experience.

DEVELOPMENT AND CHANGE

Considering its connectivity, we propose that the human cortex *is* a common network used for all cognitive operations. As such, it, and we, may need to negotiate the stability/plasticity dilemma as an integral process of psychological development. Linked across multiple representational networks by the adaptive resonance generated at the paralimbic core, each perceptual experience is consolidated with an invariant outcome: either the novel data are incorporated, transforming the self, or the data are lost, maintaining the prior self. Of course, a compromise may be struck between these end points, but, until there is evidence to the contrary, it is a reasonable hypothesis that the stability/plasticity dilemma is a zero-sum game, with the primary issue for self-regulation being which way to tilt the balance.

Grossberg (1980, 1984) has recognized that, if distributed neural networks are responsible for mental representation, control of the stability/plasticity problem is a fundamental issue. He proposes that a separation of the representational networks allows arousal mechanisms to gate the resulting interference across the networks as a function of novelty of the input and its adaptive value (Carpenter & Grossberg, 1988). Although the neurophysiological mechanisms remain to be specified, it is interesting to consider processes such as corticolimbic kindling in the regulation of stability/plasticity across the multiple cortical networks in memory

consolidation. Adaptively significant information gains enough limbic resonance to alter the memory system and thus to become incorporated within it.

The similarity of new information to the existing representations is a fundamental factor in determining both the constraints on perception imposed by prior experience and the degree of catastrophic interference imposed by the learning process. Computational simulations have suggested that if the input pattern is orthogonal (unrelated) to the remembered patterns, it may be learned with no interference with memory (Rumelhart & McClelland, 1986). Predictably, if the new data are completely orthogonal to prior representations, there is also no facilitation in the perception of the new pattern by prior experience.

Judging from the rate of myelination in the human brain, neural maturation and the resultant decrease in embryonic plasticity occurs initially for sensory and motor isocortices, and only later for "association" and paralimbic areas (Yakovlev, 1962). In this outer-to-inner progression, maturation reverses the phylogenetic trend, such that the more primitive paralimbic areas retain plasticity into adulthood after the isocortical areas have become stabilized. This plan allows sensory and motor patterns to be adapted to the environment early in development, whereas the more generalized representational functions of intermediate association and paralimbic networks retain their functional plasticity. In the domain of language, for example, this progression appears to fix perceptual discriminations and motor articulation to the native tongue early in childhood. In contrast, the semantic representations of corebrain networks retain their plasticity, such that adults can learn to use a new language abstractly, even if not fluently.

Although these regional network differences are important, the general progression in mammalian ontogenesis begins with the embryonic bias toward plasticity, at the expense of synaptic stability. For human juveniles, the period of plasticity is extensive. The embryonic quality of the early plasticity results in wholesale transformations of the memory system, such that learning is rapid and there is complete amnesia for the episodic details of prior experience. With increasing articulation of the cortex in adulthood, memory plays an increasing role in constraining learning, such that prior experience brings expertise to familiar problem-solving tasks. However, the bias toward stability appears to produce a corresponding deficit in the capacity to adapt to, and remember, novel events.

Thus, with our radical neoteny, we humans find ourselves in something of a suspended juvenile delinquency, with corebrain networks maintaining

an embryonic mechanism for activity-dependent self-organization well into adulthood. However, the mammalian progression toward stability and rigidity of adult behavior after sexual maturity eventually occurs for humans as well, and a dominant theme of adult development must be the continual decline of cognitive plasticity. Myelination appears to be fairly complete even for the frontal lobes by early adulthood (Yakovlev, 1962). Myelination and probably other mechanisms of neural maturation bring on the rigidity of age as a characteristic of the healthy adult brain, even without the complication of neurological deterioration.

Furthermore, even without neurophysiological mechanisms of maturational stability, the computational models of distributed networks suggest that the incorporation of experience itself will produce greater inertia in the representational apparatus. With a fresh, uncommitted network, each new input pattern transforms the connection weights. With a highly trained network, the recognition of events that are consistent with the training is a highly expert process, but the ability of a single novel event to alter the network is severely limited. Experience thus produces an inherent representational inertia that increasingly constrains one's adaptability to novel events.

IDENTITY OR ADAPTATION

The rigidity of age, and the impermanence of youth, are thus predicted by a simple theoretical principle. We take these characteristics of age and youth to be familiar facts of life. In academia, for example, new ideas are best entertained by graduate students. Unburdened by expertise, they remain capable of memory, and are easily infatuated by new concepts. Having gained a new insight, they are irreversibly transformed. The price of knowledge is identity.

In contrast, the senior professors contain a wealth of historical knowledge, and if current events abide by the rules of history, they are highly expert in perceiving continuity in patterns that appear chaotic to the novices. However, if history is not fully predictive, the old professors flounder. Burdened by representational inertia, their venerable concepts are impregnable to new evidence. They may be irritated, certainly, by the inability to comprehend the new ideas that seem so appealing to the students. Fortunately, the irritation is brief; without representational plasticity, they soon forget.

The fundamental nature of the change required to accommodate new learning is chronicled in the history of science. Kuhn observed that major

advances in scientific thought are produced not by gradual accretions of fact, but by a revolution, a fundamental reorganization of the world view (Kuhn, 1962). To some extent, the rigidity of the old paradigm is a function of the social institutions of that way of doing science, the conventions that constitute the culture of the field. But Kuhn and others have recognized that a paradigm shift is also a personal challenge, one that remains unmet by most senior luminaries. As Max Planck observed, it takes a generation for change to occur in science, because the old guard must first pass on.

To the extent that memory is holistic, to the extent that it combines motivation and abstract representations integral to one's personal history, intelligence might be understood as an operation of the self. In this sense, the stability/plasticity dilemma presents an existential choice: identity or adaptation. New learning is inherently challenging because it is a threat to the familiar self. The act of incorporating a new insight, if it is a significant one, is inevitably an act of self-transformation, and therefore a disruption of the historical self.

AWARENESS AND CHANGE

Psychotherapists have remarked on the "neurotic paradox," the way that clients hold on to their familiar problems even when a more effective and less painful way of living is presented to them. This occurs because what is at stake is not just behavioral inertia. Given the stability-plasticity dilemma, a significant change requires abandoning the old self, such as it is.

Developmental trends in coping with change are recognized in the popular culture: The liberal bias of youth gives way to the conservative bias of age. Individuals may even remark on their passage across the divide. But, for any particular opportunity for change, the existential choice of stability versus plasticity is unlikely to be a conscious one. The transformation of the self caused by each learning event is typically unnoticeable, such that only the cumulative effect is significant. Even for major insights and paradigm shifts, what appears different is the world, not the self. A gap may be opened with the former reality, to be sure. But the self is such an implicit construct that awareness of change occurs only in retrospect. Similarly, it is unusual that change is avoided because of a conscious recognition that it poses a threat to the familiar self. Rather, what appears in awareness is that the new way of thinking is strange, inconsistent with the knowledge that is held with certainty.

Yet whether the outcome is learning and transformation or conservation and identity maintenance, the self is the implicit vessel for consciousness. Because the mind is, more or less, an integrated whole, the outcome of each conceptual challenge has direct implications for the structure of the self. And the self is the context that constrains each conceptual structure. Although the dynamics of these organizational processes are carried out largely in unconscious forms, awareness is so inextricably linked to memory that there is an important sense in which consciousness emerges as a developmental manifestation of the self.

For the young person, development is on a steep trajectory, and consciousness is narrowly bounded in the present. Young children show not only amnesia for remote events, but source amnesia. When told a new fact, such as a description of an animal they have never seen, many 4-year-olds soon think they always knew this fact (Taylor, Esbensen, & Bennett, 1994). They can easily bring the knowledge to mind, but the historical span of consciousness is so limited that they cannot remember a self that existed before the new information. The temporal span of consciousness continues to extend throughout childhood, but the child's experience of events, such as the passing of a summer, are bounded by a self that is emergent, a dynamic proposition that is reformulated with each significant insight.

For the old person, on the other hand, a significant history of life experience forms the embedded mnemonic context for present awareness. Identity has historical substance, crystallized through the many significant personal events of a lifetime. Each perception and action are organized within the self context, constrained by many experiences with similar situations. Consciousness is increasingly historical: The awareness of the meaning of each experience is given substance by its resonance with a rich memory system. From this perspective, sacrificing a well-crystallized identity may exact too great an existential price. Faced with the stability/plasticity dilemma, rigidity may be a necessary strategy of aging.

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Emotional Well-Being in Adult and Later Life Among African Americans: A Cultural and Sociocultural Perspective

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INTRODUCTION

In order to understand emotional well-being among African Americans, or any group of people, it is important that those being studied be put in a cultural context within the society in which they live. This examination of cultural context will allow for identifying and examining what, if any, influences factors such as economic status, educational level, racial discrimination, and socialization have on emotional well-being. Three key concepts are, therefore, important to this discussion: culture, sociocultural resources and emotional well-being.

Culture is defined as a way of life shared by members of a population (Ogbu, 1993). The essential attributes of culture include two factors: 1) that it is shared, and 2) that it provides a vocabulary of symbols to express meaning, perceptions, and evaluations ascribed to various aspects of shared social life. Culture is sometimes precise and at other times it is ambiguous,

and it can be constantly reshaped and stretched by its users (Keith, 1990). Culture includes customs or institutionalized public behaviors as well as thoughts and emotions that accompany and support these behaviors (LeVine, 1974). Sociocultural resources are defined as social characteristics of a group such as income, education, and employment levels that are linked to cultural attributes within a group (Bronfenbrenner, 1993).

From a sociological perspective, well-being is evaluated both objectively and subjectively. Emotional well-being is defined in this discussion as a subjective evaluation of one's life. Life satisfaction, happiness, and morale are often used by researchers to measure well-being. Using these definitions of culture and sociocultural resources, the discussion that follows includes information on the role of culture on understanding emotional well-being among adult and older African Americans.

As a cultural group, African Americans share a way of life that is rooted in both African and African American cultures. Their values, customs, ways of thinking, symbols, and institutions have been shaped by their African heritage and American socialization. Further, according to the anthropologist John Ogbu (1993), the cultures of the diverse groups of people in the American society have also been shaped by whether groups entered the United States voluntarily or involuntarily. Ogbu proposes that unlike voluntary minorities such as European immigrants, involuntary minorities such as Native Americans and African Americans (who became minorities as a result of slavery, conquest, colonialization or forced labor) are positioned at the lowest rung of the social structure. The low social position of involuntarily immigrants affects their overall life chances, lifestyles, and development.

Ogbu's ideas regarding the social status of involuntary versus voluntary immigrants are supported by differences in the social position of Blacks as compared to that for Whites in this society. As of 1994, the median income for single Black females was \$9,508, and \$11,266 for White females (United States Bureau of the Census, 1994). Among males in 1994, the median income for Black males was \$14,605, as compared to their White counterparts whose median income was \$21,981. Household income for Whites is almost double that for Black households, \$32,960 and \$19,533, respectively. This income differential is in part a result of the high incidence of single Black females who are heads of households with children under age 18. At least two-thirds, 66%, of single Black women who are heads of their households have children under age 18, as compared to 58% of single White females (United States Bureau of

the Census, 1994). Further, the social position of African Americans as involuntary immigrants is also evidenced by their occupational status. Among the highest-paying occupations (professional and technical) Blacks comprise no more than 7% of professional jobs versus 89% for Whites, and Blacks occupy 10% of technical and administrative jobs while Whites hold 84% of these jobs (United States Bureau of the Census, 1994). Even when Blacks and Whites have comparable levels of education, Blacks earn lower incomes. This fact is particularly true for Black females. Although life expectancy has risen for Blacks and Whites in this country in the last 25 years, Black males live almost 10 years less than White males, 64 and 73 years, respectively. The gap is not as pronounced between Black and White females (United States Bureau of the Census, 1994).

The above sociodemographic characteristics provide information on understanding the context and culture in which African Americans develop. As Ogbu (1993) suggested, the many facets of a person's culture, such as their racial classification and their social, educational, economic, political, and spiritual locations within a society, shape and direct their identity and sense of self. Other theorists, in particular, Vygotsky (1978) and Bronfenbrenner (1993), laid a rich theoretical foundation for understanding the roles that historical roots, context, and culture play in development. Vygotsky's theoretical views emphasized that human development is embedded in societal and phylogenetic change which occurs over socio-historical time. He further theorized that cultural attributes, such as skills and tools for problem-solving and learning to react to situations, influence developmental outcomes. Similarly, in his ecological model on human development, Bronfenbrenner theorized that development takes place in different interrelated systems. These interrelated systems, which comprise an ecology of human development, can affect opportunity structures and life-course options. Most important, Bronfenbrenner proposed that cultural attributes help set the contextual stage in which one is able to develop in other systems (e.g., school, workplace) that effect human development.

Guided by many of the ideas of Vygotsky (1978) and Bronfenbrenner (1993), Tudge, Putnam, and Valsiner (1996) suggest that a coconstructionist approach to development views culture as one part of a system in dynamic relation with all other parts that affect development, such as biology and genetics. They assert that culture and development are in a continually changing dynamic interaction with one another, and that they

are inextricably linked. The child development literature offers much insight into the effect of the dynamic interaction between culture and context on the social and emotional development of minority children, who live in poverty, have poor educational opportunities, and survive in environments with high crime (McLoyd, 1990; Wallen, 1993).

Social structural conditions that affect development in childhood have similar outcomes in later life. Limited education, joblessness, and poverty in adulthood influence social and emotional development in later life. These social conditions limit opportunities in adulthood that foster a sense of well-being. Ryff (1989) suggested that in the research on well-being in adult and older age groups, researchers need to look beyond the social structural factors that shape peoples' lives, to study the life experiences and opportunities that such factors afford or deny people. She further asserts that her own study on psychological well-being conducted in 1989 may be faulted for creating yardsticks of self-evaluations that are unattainable, unattractive, or irrelevant for individuals at different locations in the social structure. She, therefore, concludes: "This awareness that culture, history, ethnicity, and class gives rise to different, perhaps competing conceptions of well-being has been neglected in prior theorizing in this domain" (p. 1079). Given the current population profile of this country, which includes at least 21 racial classifications representing an array of cultural groups (United States Bureau of the Census, 1994), it is suggested here that American society is a rich laboratory for developing conceptual and theoretical views suggested by Ryff on well-being across the life cycle among diverse groups.

With the above discussion in mind, several key questions guide the remainder of this chapter. First, what do we know about emotional well-being and sociocultural factors within the African American community? Second, how can we better understand depression and anger/hostility, as indicators of well-being, among African Americans from a cultural and sociocultural perspective? Lastly, what is the relationship between depression, anger, and physical health among African Americans? The literature suggests that depression and anger may be good indicators of emotional well-being among African Americans because of the social position and experiences of Blacks in the American society (Anderson, 1989). Further, the literature provides findings on depression and anger among African Americans to support some of the conceptual ideas that will be discussed later.

EMOTIONAL WELL-BEING AND SOCIOCULTURAL RESOURCES

Conceptually, Ogbu's (1993) theoretical ideas on "entrance" into and "places" within a society provide focus for discussion of cultural and sociocultural factors and emotional well-being among African Americans. Further, conceptual views by Tudge et al. (1996) also provide guidance for interpreting what we know about emotional well-being and sociocultural factors within the African American community. Therefore, three factors are important to this discussion:

1. the role of having ancestors who were enslaved and whose descendants hold a subordinate position in the American society today some 132 years after the Emancipation Proclamation was signed;
2. the existence of cultural duality as a core feature of the social and psychological context in which African Americans develop a sense of well-being; and
3. the interaction between race/culture and emotional well-being.

CULTURAL HISTORY, DUALITY OF SELF AND EMOTIONAL WELL-BEING

Although it is beyond the scope of this chapter to include a detailed discussion on the place of history in understanding the well-being of African Americans, some information is given to provide a sociohistorical context for understanding the culture in which African Americans have developed their conception of well-being and the factors that contribute to it. This information is of specific importance to understanding well-being among older African Americans because of the proximal impact slavery had on their socialization via their parents and grandparents, who were slaves or children of slaves. Numerous historians have documented the harsh reality of life during slavery for people of African descent. Slavery, with its many vicissitudes, created a world for people that was tenuous on a day-to-day basis regarding basic survival. One's life was valued as a form of labor, but at the same time slaves knew that their value as a commodity in the form of labor could be replaced (J. H. Franklin, 1994; Gutman, 1976; Herskovits, 1941/1990; Stuckey, 1987). Slavery also included stripping slaves of their names, language, eating

habits, social customs, norms, and values. Such changes allowed slave owners to reorganize and redefine the life of their slaves and create a world for them that was a distant approximation of life that existed among free people. As a result, the social and psychological world of slaves meant one was not allowed to gain status and develop an identity beyond that assigned by his or her owner. Physical movement was also highly watched and monitored (Herskovits, 1941/1990; Stuckey, 1987).

In spite of the harsh conditions under which slaves lived and the high degree of control placed over them, insurrections took place, and many slaves attempted to run away at any cost. Even death was viewed as a viable alternative to their existence, resulting in suicide among many of them (Stuckey, 1987). Additionally, slaves also created what Goffman (1961) called an "underlife," whereby survival mechanisms were created through organized rules and regulations, and a highly structured social hierarchy was developed. Examples of an underlife are reflected in prisons, where social norms, rules, and even a system of communication is developed among prisoners to gain control over their environment and lives. Collectively, the underlife that evolved among slaves during slavery served a significant role in the development of a subculture within the larger slave community. This subculture provided a context in which slaves developed identities, perceptions of themselves, and ways in which to assess their well-being beyond that determined by their owners.

As noted by several historians (Blassingame, 1979; Gutman, 1976; Stuckey, 1987), the development of this subculture created a dual existence for slaves that was central to survival, and laid the social and psychological foundation for future generations of African Americans to learn how to adapt and survive in the American society. DuBois (1903/1993) almost a hundred years ago called this dual existence a "twoness" of Black Americans: "Two souls, two unreconciled strivings in one dark body" (p. 9). In our contemporary literature, DuBois' labels have been replaced with terms such as "racial socialization" and "cultural dualism," whereby members of a group are socialized to know that they function in two (and often contradictory) worlds that at times are integrated and other times exist in a parallel manner. Thus, perceptions and meanings assigned to many experiences vary across these dual existences. Even speech patterns and what is communicated have been found to vary depending on which cultural setting African Americans experience. When done effectively, African Americans engage in code-switching, which indicates an ability to linguistically move across cultural contexts without losing their sense

of self and identity (Kochman, 1987; Smitherman, 1991). According to some researchers, positive and successful developmental processes at the social and psychological levels among minority children are most evident when they have acquired the knowledge and skills to negotiate, coordinate, and integrate the “twoness” or “dualism” of their identity (Bowman & Howard, 1985; Spencer, 1983, 1990). The development of Black children is also enhanced when they learn to code-switch in language as well as understand what is being communicated and how it is being communicated in different cultural settings (Smitherman, 1991).

CONNECTING CULTURE, SOCIOCULTURAL RESOURCES AND WELL-BEING

Given the paucity of data on emotional well-being among adult and older African Americans, it is proposed here that the literature on social and emotional development of African American children and adolescents may offer some conceptual guidance. For example, if adult emotional development involves focusing on inner dynamics, individuation, the integration of outer and inner reality, and a greater sense of emotional regulation (Carstensen & Turk-Charles, 1994; Labouvie-Vief, DeVoe, & Bulka, 1989), how might this vary according to the context of socialization and the culture in which development takes place? If the self develops and an identity forms in dual cultures, as was noted earlier in the historical evolution of African Americans in this society, what role, if any, would cultural dualism and racial socialization play in influencing whether one is depressed or is angry, and how one learns to regulate such emotions? Without the needed variation (social class, race, ethnicity, and culture) in samples for research conducted on emotional well-being, little can be suggested or concluded from the literature. The limited research that is available shows that well-being, as measured by depression and anger in this discussion, varies between Blacks and Whites in this society. Information on some of these differences is discussed in the following sections of this chapter.

DEPRESSION AND SOCIOCULTURAL FACTORS AMONG AFRICAN AMERICANS

Research on depression as a measure of emotional well-being in adult and later life shows that women, unlike men, are more likely to experience

depression in adulthood (Newman, 1989). Depression is also more likely to occur among the poor and those with limited education (Anderson, 1989). Dressler and Badger (1985) found that depression among African Americans is more likely to occur among women, younger persons, divorced and separated persons, and those who are unemployed. Brown, Milburn, and Gary's (1992) findings show that stressful life events, such as health problems, and not socioeconomic factors, are better predictors of depression in later life for African American men and women. Weaver and Gary (1995) also found that depression for older African American men was associated with low household incomes, increased life events, and the presence of physical illnesses. In regard to racial comparisons, some research shows that when social class is controlled, there is no difference between the incidence of depression between Blacks and Whites in this society (Mirowsky & Ross, 1980; Steele, 1978).

Using findings across eight epidemiologic studies, Kessler and Neighbors' (1986) research shows that when race and social class are used as interaction terms, and not pitted against each other as alternative predictors of distress, a more realistic view of the impact of these factors on well-being is evident. The effect of the interaction of race and social class on depression also implicitly supports the notion of cultural duality among African Americans.

Kessler and Neighbors (1986) hypothesized that lower-class Blacks may experience more psychological distress than do Whites of comparable status because of the possible joint effects of poverty and discrimination, or the synergistic effects of these factors, or the lack of financial success that functions to shield Blacks from distressing aspects of discrimination. They also suggested that lower-class Blacks, as compared to their White counterparts, may also experience higher levels of distress because they have more barriers to moving ahead in life. This interpretation of the effects of racism and discrimination on health was further advanced by James, Strogatz, Wing, and Ramsey (1983) through the use of their John Henryism Scale. This scale measures efficacious mental and physical vigor, a commitment to hard work, and a single-minded determination to achieve one's goals. James et al. reported that for Blacks and Whites, John Henryism was directly and significantly associated with life satisfaction and perceiving oneself in good health. However, for Blacks, unlike found among Whites, scores on the John Henryism scale varied by socioeconomic status. Lower-class Blacks, as compared to their middle-class counterparts, scored lower on John Henryism and were at greater risk for

developing hypertension because they often lacked the coping resources to affect their life chances and opportunities. They also reported that lower-class Blacks, as compared to middle-class Blacks, were less able to effectively address the discriminatory practices against them, due to limited resources.

Related findings reported by Krause (1993) from a national probability sample reveal that older Blacks, who are disproportionately poorer than their White counterparts, have a lower level of life satisfaction than found among older Whites. Krause suggested that this finding may be attributed to the differences found between the interrelationship of past aspirations, plans, and present circumstances. Further, it is suggested here that when Krause's findings are placed within a broader American societal context, older Blacks as compared to Whites functioned under very harsh social, economic, and political discriminatory practices, many of which were legal, to gain an education and acquire economic security. Thus, life satisfaction for older Blacks may elude them because of a history of experiencing the negative effects of discriminatory institutional practices. As Ogbu (1993) purported, there can be lifelong negative consequences to a group that enters into a society as an enslaved or conquered people.

As noted above, it is clear that limited social and economic resources can affect emotional well-being. Conceptually, it is suggested here that more research is needed to understand how lower-class Blacks (as compared to those who are middle- and upper-class) can develop the resources, whether social, psychological, or economic, to effectively exist in dual cultures. Wilson's (1996) seminal work on poor urban African Americans, *When Work Disappears*, addresses the importance of social and psychological resources in preparing lower-income African Americans for the world of work. Wilson's findings show that urban poor Blacks have not acquired the necessary social and psychological tools for job readiness and performance. He contends that years of limited education, housing and neighborhood segregation, dysfunctional family life, and the absence of role models who work, have limited the urban poor's access and ability to function effectively in the world of work in the broader society.

When interpreted from the theoretical ideas of Ogbu (1993) and Tudge et al. (1996), poor urban Blacks have not learned to exist in dual cultures, and they lack the resources to overcome the unreconciled strivings described by DuBois (1903/1993). They lack the resources, mostly educational and social, to live in their environments and maintain jobs in the larger culture. Paradoxically, although rarely discussed or studied, some

scholars suggest that middle- and upper-class Blacks, who appear to have developed the necessary cultural dualism to function in both their own culture and in the broader culture, experience marginality from within and outside their own culture (hooks, 1995). Middle-class Blacks may not feel as depressed as Kessler and Neighbors (1986) found for lower-class Blacks who could not move ahead or realize their aspirations; but they may not feel very satisfied and happy about their lives either. In their marginal positions in life, which bring about feelings of cultural and social dislocation, alienation, and disconnection from others, well-being may have eluded middle-class Blacks. These feelings of dislocation and alienation may not be evident on existing measures of depression. It is proposed here that other measures that are culturally sensitive to these issues may better capture the emotional well-being of socially and economically successful African Americans. Obviously, much more research is needed to better understand how these successful individuals learned to overcome discrimination and prejudice. They appear to have the socioeconomic characteristics to feel satisfied and happy about their lives, but may feel marginal in their success and aspirations. It is possible that anger, alienation, and feelings of anomie may better reflect the emotional reality of many middle-class African Americans.

The work of Taylor and Grundy (1996) may offer some conceptual guidance in this discussion. These researchers developed the Nadanolitization Scale (this scale is named after some bleaching cream Blacks used to lighten their skin so as to appear less black) to measure what they call internalized "racialism." Internalized "racialism" refers to the extent to which Blacks internalize racist stereotypes and adopt White views of themselves. Although implicit, items in the Nadanolitization Scale reflect macrolevel cultural socialization (e.g., societal values, norms, and beliefs) that help shape others' perceptions of African Americans and African Americans' perceptions of themselves. Several researchers (A. Franklin, 1986; Tomes & Brown, 1986) who have used the Nadanolitization Scale in their research found that Blacks who scored highest on internal racialism were more depressed than those with lower scores. Those who scored higher on racialism were also low on cultural conversion (the ability to integrate mainstream and subcultural values, norms, and beliefs), which indicated an inability to develop a double consciousness of self. In other words, they lacked the twoness of self that DuBois (1903/1993) suggested was needed to effectively move across different societal settings and interpersonal interactions.

Although Taylor and Grundy (1996) suggested that cultural conversion is a powerful antidote to “racialism,” some research indicates that racial socialization may be equally as powerful. Effective racial socialization at the microlevel (family, school, and/or place of worship) may serve to buffer internalizing racial prejudice and discrimination. When, however, socialization at the microlevel buffers or serves as a support mechanism, racism, although experienced, may not be internalized. Instead, racism is understood as a part of one’s reality, but not as a part of one’s identity. Bowman and Howard (1985) found that when African American parents provide their children with race-related socialization, they have a greater sense of personal efficacy and sense of control over their environment. Further, according to these researchers, racial socialization provides buffers between racial barriers and the individual goals of Black children. Again, as noted earlier, the child and adolescent development literature may facilitate developing conceptual and theoretical views to better understand issues such as those raised by Kessler and Neighbors (1986) regarding the influence of social class and resources on depression among African Americans in adulthood. It is possible that racial socialization as a cultural resource may serve as a mediator when examining factors that influence depression in adulthood and later life for African Americans. Future research in this area may find that lower-class Blacks may not have acquired the necessary racial socialization to effectively function in both their own culture and in the broader society.

ANGER AND SOCIOCULTURAL FACTORS AMONG AFRICAN AMERICANS

Anger as an indicator of emotional well-being among African Americans in this society has strong sociohistorical and sociocultural roots. As noted earlier, much more is understood about the development and well-being of a people when one examines, as Ogbu (1993) suggested, the conditions under which they enter into a society and mechanisms available to them to gain a social place within it. Sociohistorically, African Americans have had a range of emotional reactions to their entrance into the American society as slaves and after slavery as oppressed people who functioned under Jim Crow laws, *de facto* segregation, and housing, school, and job discrimination. Anger, as evidenced from different bodies of literature, appears to be a common and pervasive emotional response and adaptive

strategy to the manner in which African Americans entered the American society and subsequent sociocultural experiences (Anderson, 1989; hooks, 1995).

Research on anger shows that it can serve both negative and positive functions. At its worst, the expression of anger can promote high levels of conflict, resentment, and severe health problems, resulting even in death. In a positive manner, anger can serve as a line of defense to threats to survival (Johnson & Greene, 1991), energize behavior (Novaco, 1976), and promote personal control or mastery over one's environment (Izard & Kobak, 1991). For African Americans, findings show that anger serves as a form of resistance, defense, readiness to respond to threat, and preparedness for the ongoing conditions of oppression and discrimination (Johnson, 1990; hooks, 1995). The expression of anger, however, varies by economic level, education, and age among African Americans. African Americans who are unemployed, compared to those who are employed, are more likely to outwardly express anger (Johnson & Broman, 1987). Findings also show that educational level, which interacts with income, affects expressions of anger among African Americans (Scherwitz, Perkins, Chesney, & Hughes, 1991). Those with the highest levels of education are more likely to have resources that will allow them to better regulate their anger and find alternative means to respond to anger-provoking situations (Barefoot, Peterson, Dahlstrom, & Siegler, 1991). Older African Americans are more reflective in their expressions of anger than younger African Americans (Harburg, Gleiberman, Russell, & Cooper, 1991). By being more reflective, older Blacks, more often than their younger counterparts, think about their emotions before they respond, assess their choices as to how to respond, and use more varied responses to feelings of anger. As a result, it appears that older African Americans are better at regulating their expressions of anger, a finding which supports the literature on aging and emotion regulation (Labouvie-Vief, Hakim-Larson, DeVoe, & Schoeberlein, 1989). Regardless of the expression of anger as it relates to economic level, education, or age, findings consistently show that the continual experience of anger, whether suppressed or not, has negative mental and physical health effects for African Americans (Anderson, 1989; Johnson & Broman, 1987).

African Americans who suppress their anger tend to have higher rates of hypertension, coronary heart disease, and, for women, higher rates of obesity (Anderson, 1989). As previously noted, the likelihood of feeling angry is more prevalent among African Americans with the least amount

of sociocultural resources. The lack of educational and income resources among certain African Americans, in particular males, put them at greatest risk for emotional stress, which has been found to interact with anger (Harburg et al., 1991). In fact, African American males with low incomes, unlike White males, more often internalize anger and hostility, and they are at higher risk for developing hypertension and coronary heart disease (Johnson & Broman, 1987; Johnson & Greene, 1991). Although anger has been found to serve in the positive role of providing a line of defense and alerting one to danger, Black males often cannot use anger as a positive resource. It is difficult for Black men to use anger in a constructive manner because many of the threats to their survival are institutional in structure (e.g., discriminatory practices in job hiring and promotion). This is not meant to suggest that the Black male is always a social victim or defenseless, but it does point to the problematic aspects of the sociocultural context in which African Americans strive to develop emotional well-being in adulthood and later life.

CREATING POSITIVE EMOTIONAL WELL-BEING FOR OLDER AFRICAN AMERICANS

Several suggestions are made here to address the question as to how positive emotional well-being in the context of depression and anger as cultural realities of African Americans may be fostered. I believe that effectively acquiring and managing racial socialization which fosters personal efficacy, high self-esteem, and self-perception can foster well-being in later life. The word "acquiring" is important to this discussion, because some studies show that when African American children are socialized to know that there is a distinct and functional aspect to racial socialization, they use their socialization to buffer racial discrimination and effectively cope with stress associated with their social position in the American society (Bowman & Howard, 1985; Wallen, 1993). Racial socialization also provides the ability to know that cultural dualism does exist, and that this dualism can serve as a psychological resource in later life. As noted earlier, effectively managing cultural dualism can provide social and psychological resources to African Americans. It gives them the ability to know how to respond to different situations that at times are at odds with one another and one's sense of self. Cultural dualism can also foster a stable sense of self, even when faced with situations that are at

odds with one's definition of self. For example, when Blacks are faced with overt discrimination, which often results in anger, dualism can allow for a reframing of that experience to reduce the impact of its meaning to one's self-definition. Thus, the part of the self that encourages one not to respond is still intact, in spite of having faced a situation that could possibly make one question his or her self-worth and meaning. In this instance, cultural dualism is both functional and adaptive.

Further, when African American communities function effectively, they can provide social support from friends, families, and places of religion that can help buffer negative experiences that foster depression, anger, and resentment. McNeilly et al. (1995) found that when African Americans experience anger as a result of racist provocation, those who had social support (someone to validate, affirm, and understand their experiences) were not as emotionally affected as compared to those without social support. Their findings show that social support moderates the emotional effects of racist provocation. Similarly, other researchers (Edens, Larkin, & Abel, 1992; Karmarck, Manuck, & Jennings, 1990) found that socioemotional support provided by friends, as opposed to strangers, has a more positive effect on the blood pressure and heart rate of the person faced with stressful experiences. It is further suggested here that when Black communities and families are connected, friends and family members are available to provide support to each other when one is faced with discrimination and racism. This support may foster emotional well-being and help reduce health effects, such as hypertension and heart disease, that have been found to be associated with exposure to racism.

CORRELATES OF EMOTIONAL WELL-BEING IN AFRICAN AMERICANS

Research on African American family ties and relationships shows that family closeness can buffer much of the stress African Americans experience. Several researchers (Dilworth-Anderson, 1994; Dilworth-Anderson & Williams, 1996; Dressler & Badger, 1985; Ellison, 1990; Martin & Martin, 1978) have found that African American families provide a significant amount of support to their members. Ellison (1990), for example, found that although there was a strong relationship between close family relations and personal happiness among Blacks, regardless of age, only the life satisfaction of older Blacks, unlike that found among their younger counterparts, was influenced by family ties.

Stable and satisfying marriages in the African American community have also been found to positively affect the emotional well-being of Black men and women. Zollar & Williams (1987) found that married Black men tend to be happier than those who are unmarried. They also found that although Black women derive satisfaction from their marriages, more Black men than Black women reported that their marital happiness had a greater influence on their overall happiness. Chatters (1988) and Tran, Wright, and Chatters (1991) found that older Blacks who were widowed or separated were at a higher risk for diminished feelings of well-being than were older Blacks who were married. James, Tucker, and Mitchell-Kernan (1996) found that Black men, unlike women, reported lower levels of depression when they were invested in their marriages. As reported by other research, this finding supports the idea that the institution of marriage may be more central to the emotional well-being of men than women (Vanfossen, 1981; Veroff, 1981).

Similar to the positive effects family relations can have on promoting well-being among African Americans, religion and spirituality in the Black community have also been found to positively influence emotional well-being. Historians (Gutman, 1976; Stuckey, 1987), academic theologians (Lincoln & Mamiya, 1990), and social scientists (Levin & Taylor, 1993; Taylor et al., 1987) have documented the central role religion and spirituality have played in fostering "wholeness" and well-being in the African American community. During slavery, the Jim Crow era, and subsequent years of legal discrimination, Blacks used spirituality and later organized churches to help reframe their experiences, define themselves, and develop a sense of worthiness, as well as to develop strategies to combat their negative treatment by society. As a result, churches provided Blacks with an array of services that were typically not available to them in the broader society. Churches provided social services, a political platform, and a place for the socialization of its members (Stuckey, 1987; Taylor et al., 1987).

In addition to religion and spirituality providing goods and services to the Black community, some researchers (Levin, 1994; Levin & Schiller, 1994; Levin & Taylor, 1993) have found that religious involvement among African Americans influences their physical and emotional mental health. Levin and Taylor (1993) found that although Black women, as compared to men, were significantly more involved in their places of religion, Black men were also highly involved. This finding holds true for other groups where findings show that White females, unlike their male counterparts,

are more involved in the church and demonstrate more religious commitment (Beit-Hallahmi & Argyle, 1975). These findings suggest that females, based on level of involvement, may receive more socioemotional support from their places of religion than men, which positively affects females' emotional well-being. In particular, Brown, Ndubuisi, and Gary (1990) found that greater religiosity, which includes religious involvement, was associated with fewer depressive symptoms for both males and females. They also found, however, that the influence of religion on depression for women was more direct, than found among men.

As evidenced from this discussion, the African American community has several important mechanisms within it to foster positive emotional well-being in later life. Early childhood socialization processes, close family relations, stable marriages, and places of religion have provided much of the strength in African American communities that has helped ameliorate feelings of depression and anger in later life.

SUMMARY AND DISCUSSION

Emotional well-being among adult African Americans is rarely studied by researchers. The limited research available is largely atheoretical and lacks conceptual frameworks that take advantage of the distinct cultural characteristics and sociocultural conditions in the African American community. Using depression and anger as indicators of emotional well-being, findings show that social and economic conditions are strongly related to depression and anger for adult African Americans. Given the rate of poverty, unemployment status, poor single women with children, and the high divorce rate in the African American community, many African Americans may lack the resources that foster well-being. A significant finding in the literature that needs special attention is the higher incidence of depression and anger among lower-income Blacks, as compared to lower-income Whites. In fact, findings show that low-income Blacks have more emotional problems than either low-income Whites or middle-income Blacks and Whites. Research guided by a cultural and sociocultural perspective may provide better insight into the meaning of this finding.

As previously discussed in this chapter, understanding of the culture and sociocultural resources in the Black community can provide a conceptual beginning for understanding findings discussed in this chapter. Cultural characteristics such as dual consciousness or cultural dualism, as well

as racial socialization, can provide conceptual guidance to the study of emotional well-being among African Americans. I believe that it is the integration of this type of cultural information that will expand our knowledge base and provide more realistic interpretations of what we find.

Further, research conducted by some developmental psychologists and anthropologists who study ethnic minority children may offer conceptual direction in the study of emotional well-being in adulthood for African Americans. As noted in this chapter, the theoretical views of Ogbu (1993), an anthropologist, provide a framework in which to think about how oppressed people develop. He encourages researchers to think about the manner in which a group enters a society and how the opportunities afforded them shaped and directed their development through the life cycle. Therefore, history, culture, and social structure would be important to understanding the emotional well-being of African Americans.

Conceptualizing the study of emotional well-being from a cultural and sociocultural perspective also speaks to using a multidisciplinary approach: sociology, psychology, anthropology, and history. As evidenced from the information in this chapter, data collection may need to be both qualitative and quantitative in nature. Given that so little is known about emotional well-being among adult and older African Americans, it is suggested here that qualitative data may be the necessary starting point for data collection to direct future research. Qualitative data would allow for grounded theorizing. When using this theoretical approach, researchers inductively develop concepts from empirical data, which leads to theory-building. As Glaser and Strauss (1967) noted, theories are built from the bottom up, and are based on observations when researchers use a grounded theory approach. Concepts can be identified and information can be gathered to develop measures that are relevant to the group under investigation. Grounded theorizing would also allow subjects, African Americans in this case, to identify experiences they define as contributing to their emotional well-being and the meanings they assign to these experiences.

Again, limited information is available on emotional well-being among African Americans in this society. Different bodies of literature from the social and behavioral sciences and the humanities offer conceptual guidance to conduct future research. Information on culture and sociocultural resources framed within a grounded theory approach can provide a conceptual and theoretical focus to the study of emotional well-being among adult African Americans.

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Subjective Well-Being and Age: An International Analysis

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As the populations of many nations age, concern about the quality of life of senior citizens has heightened. “Quality of life” is a broad, multifaceted construct that requires both subjective and “objective” measures (e.g., economic and social indicators) for an ideal appraisal. One aspect of quality of life is subjective well-being (SWB), the person’s own evaluation of his or her life. Such evaluations may be judgments about the person’s life as a whole (life satisfaction) or evaluations of specific domains of life (e.g., work, marriage). In addition to such cognitive judgments about one’s life, SWB also includes affective reactions—pleasant and unpleasant emotional experiences. Unpleasant emotions signal that the individual feels something is wrong in her life, and pleasant moods signal that the individual believes that things are going well. Subjective well-being is an important component of quality of life because it is based on an individual’s own appraisals, and therefore relies on what the person believes is important, based on his or her own standards. In contrast, “objective” measures depend on decisions made by academicians or policymakers, who decide what is desirable and the weights to be given to each variable. For general overviews of the field of SWB, see Diener

(1994), Diener and Larsen (1993), and Myers and Diener (1995). Diener and Suh (in press) discuss how measures of SWB, economic indices, and social indicators can complement each other in assessing quality of life.

In some quarters, there is a concern that subjective measures are "soft." There is now evidence to suggest, however, that measures of SWB have substantial validity and reliability, and are not invariably contaminated by response artifacts (e.g., Diener, Sandvik, Pavot, & Gallagher, 1991; McCrae, 1986). Despite the favorable measurement evidence, it is true that self-report measures of SWB can be influenced by momentary factors (e.g., Schwarz & Strack, 1991) and by memory biases (e.g., Thomas & Diener, 1990). The present review relies on self-report surveys of well-being because this is virtually the only evidence that is available on a cross-national basis. In the future, however, it will be important to corroborate the conclusions drawn here with a broader set of measures of SWB (see Sandvik, Diener, & Seidlitz, 1993).

One limitation of employing only subjective measures to assess quality of life is that people have a tremendous capacity for adaptation. For example, studies show that persons with severe disabilities, the chronically mentally ill, and those with low income have positive levels of SWB (Diener & Diener, 1996). Thus, it is not wise to rely only on subjective measures to assess the quality of life. Because of people's resilience, they may report positive SWB even in conditions that we consider undesirable. Thus, scales of SWB should be one approach among several in assessing quality of life; we must also assess external conditions, objective health, and so forth. Nonetheless, subjective indicators paint a picture of how individuals view their own lives, in which they are able to weight what they believe is important.

Studying the SWB of seniors will hopefully facilitate applied endeavors to enhance their quality of life. We also believe, however, that studies of the SWB of the elderly go beyond this applied purpose, and can shed theoretical light on basic psychological processes. For example, we can examine people's positive and negative emotionality to determine whether they become less emotional as they age. This knowledge can help us understand biological changes and processes of adaptation that might influence affect. Another example of the theoretical understanding that can be gained from examining age trends in SWB is the question of whether objective conditions necessarily influence people's life satisfaction. Might it be that people in different objective conditions have different standards and expectations, and therefore might be equally satisfied? As we will

see, older persons may have equivalent levels of life satisfaction even when their objective circumstances are less desirable. Thus, studies of SWB across the life span might yield not only insights on how to improve people's quality of life, but also greater psychological understanding of processes related to emotion and to evaluating one's life.

Partly obscured by the inconsistent findings across U.S. studies, however, a complete agreement has not been reached among scientists on the relation between age and well-being, possibly because many studies are based on small samples of convenience. For instance, some researchers noted that life satisfaction increases, or at least does not drop, with age (e.g., Campbell, Converse, & Rogers, 1976; Herzog & Rogers, 1981; Larson, 1978), whereas life satisfaction is found to decline with age in other studies (e.g., Doyle & Forehand, 1984; Robinson & Shaver, 1973; Wilson, 1967). Costa, et al. (1987) and Stacey and Gatz (1991), on the other hand, found no age differences in overall well-being, but did find lower levels of both positive and negative affect among elderly people. Reviewing a number of large-scale international studies that rely on probability samples should expand our perspective in understanding the relation between age and well-being.

INTERNATIONAL STUDIES

The following review focuses on international surveys of well-being. In these studies, respondents in many nations are queried about their life satisfaction and levels of "happiness." The sampling is highly sophisticated in these studies, and often approximates a representative sample within nations. Furthermore, the sample sizes are large by behavioral science standards. In addition, many and diverse nations have now been studied. Thus, international surveys of SWB are likely to yield stable and meaningful results that go beyond the findings of the typical samples employed in this field.

In studies of SWB, at least three major components must be assessed: life satisfaction, pleasant affect, and lack of unpleasant affect. Thus, the following review will focus on evidence in each of these three domains. In addition, some evidence is available on domain satisfactions in areas such as finances and social relationships.

Early International Survey: Cantril (1965)

The seminal work of Cantril (1965), in an early psychological study of international well-being, was based on a data set of nearly 20,000 respondents across 14 nations. When necessary, samples within each nation were weighted to adjust for the proper rural-urban ratio. Individuals were asked to indicate where they currently stood on a self-defined "ladder" of life, with the top anchoring point ("10") reflecting one's best possible life and the bottom point ("0") reflecting one's worst possible life. Respondents were also asked where they thought they stood in the past and where they thought they will stand in the future.

Because of the unequal range and number of age categories used across nations, it is difficult to draw straightforward generalizations from these data. Nonetheless, comparisons among different age cohorts within each country suggest that the eldest age groups were more satisfied with their past and current life, but less satisfied with their future life prospects than other cohorts. For instance, of the total 14 countries surveyed, the eldest age cohort in each nation showed the most satisfaction with their past life in 13 countries, and also was most satisfied about their current life in 8 nations. In contrast to their sanguine attitude towards their past and current life, however, the eldest age cohort was the most pessimistic age group in evaluating their future life in 9 of the 14 countries.

Another way to examine Cantril's (1965) data is to compare the average percentage of the young (less than 29), middle-aged (30 to 49), and elderly (over 50) cohorts that responded either in the *high-range* (7 to 10) or the *low-range* (0 to 3) of the ladder scale across 14 nations. When asked to indicate their thoughts about their current life, 24.2% of the young group, 22.3% of the middle-aged group, and 29.3% of the elderly group responded in the *high range* of the ladder scale. On the other hand, 27.5%, 29.1%, and 25.2% of the young, the middle-aged, and the elderly group, respectively, responded in the *low range* of the ladder scale. Although the differences are small, the overall results of Cantril's findings suggest that elderly people feel as good or even better about their past and present life than younger people, but somewhat less so about their future.

World Values Survey I and Eurobarometer: Inglehart (1990)

Inglehart studied data from the Eurobarometer studies from 1980 through 1986, and for Canada, the U.S., Hungary, and Japan in 1981 and 1982.

The Eurobarometer studies are conducted twice each year by the European Economic Community nations to survey the well-being of those societies; the World Values Survey I was carried out in an effort to compare the values and attitudes of 24 nations across the world. A total of 163,538 respondents in 16 nations were included in the two surveys studied by Inglehart.

For reports of both life satisfaction and happiness, there were only tiny differences between age groups. For example, 80% of young adults reported that they were satisfied or very satisfied with their lives, whereas this percentage was 81% for those aged 65 and older. There was a tendency for the lowest SWB values to be in the middle-age groups, but these differences were very small. An interesting finding occurred when the authors controlled for income, education, marriage, and other factors. The older age group had less of various resources. Thus, when these assets were controlled, the oldest age group (65+) had the highest adjusted life satisfaction and happiness. Inglehart writes that the “oldest group is relatively satisfied with their lives despite their comparatively low levels of income, occupation, and other variables; when we adjust for the depressing effect of these factors, the oldest group emerges as significantly more satisfied than the others” (pp. 225–6). Inglehart explains this finding as depending on the lower aspirations of people who have fewer resources. In other words, people who have less can partly compensate for this by desiring and expecting less.

European Nations Surveys: Okma and Veenhoven (1996)

Okma and Veenhoven (1996) studied the covariation of age and SWB in European samples that overlap with those used by Inglehart. They analyzed data from 8 nations around 1980 and 1990. For life satisfaction, Okma and Veenhoven found that the Eurobarometer sample of approximately 300,000 participants showed an almost flat line with age. From age 18 to 90 there was almost no change in life satisfaction. For affect balance (the difference between positive and negative affect), the authors studied two European Value Surveys conducted 10 years apart and containing approximately 16,000 respondents. Okma and Veenhoven found a slow decline in affect balance from ages 18 to 48, an accelerating decline after that, and an even sharper decline in affect balance at around age 65. Nevertheless, even in old age, both affect balance and life satisfaction were positive and did not dip below the neutral point of the scale. In the

survey reviewed below, the age-dependent decline in affect balance is explored in more detail.

World Value Survey II: World Values Study Group (1994)

The World Value Survey II (World Values Study Group, 1994) was conducted in 43 diverse nations and contained approximately 60,000 respondents. The 43 societies represent 70% of the earth's population. The World Value Survey II (WVS II) was conducted in highly industrialized democracies (e.g., Canada), in socialist states (e.g., China), in former socialist nations (e.g., Russia), in poorer nations (e.g., India and Nigeria), and in wealthier societies (e.g., Australia, Switzerland, and Japan). Data were collected from all continents and from all major regions of the world. In most nations, stratified multistage random sampling was employed. First, a random sampling of areas was conducted, weighted by the population in these locations. Second, a random sample of individuals was made (based on various types of lists of citizens). Although the WVS II survey contained one of the most representative surveys of the world's population, it was certainly not perfect. For example, response rates are not provided for most nations. Furthermore, rural and poor nations and individuals were likely to be underrepresented in the survey.

Quality of Life

Life satisfaction was measured on a scale ranging from 1 ("Dissatisfied") to 10 ("Satisfied"). Figure 11.1 shows mean life satisfaction responses for the adult age cohorts in the WVS II sample. The sample was divided into 10-year age cohorts, starting at age 20. This allowed a substantial sample size in each age cohort (N s varying from 691 for the 80's group to 13,813 for the 20's group). Because only 21 respondents remained after discarding for irregularities in their data (e.g., discrepancy between reported birth year and age), the 90's age cohort was dropped from further analyses.

As can be seen, there is a slight, but statistically significant ($p < .001$), upward trend as one moves from individuals in their 20's to respondents in their 80's. When separated by sex, life satisfaction for women trends down very slightly, whereas life satisfaction for men trends upward across age cohorts. When one examines data within nations, the trends are mixed. In some nations there is an increase in life satisfaction across age groups

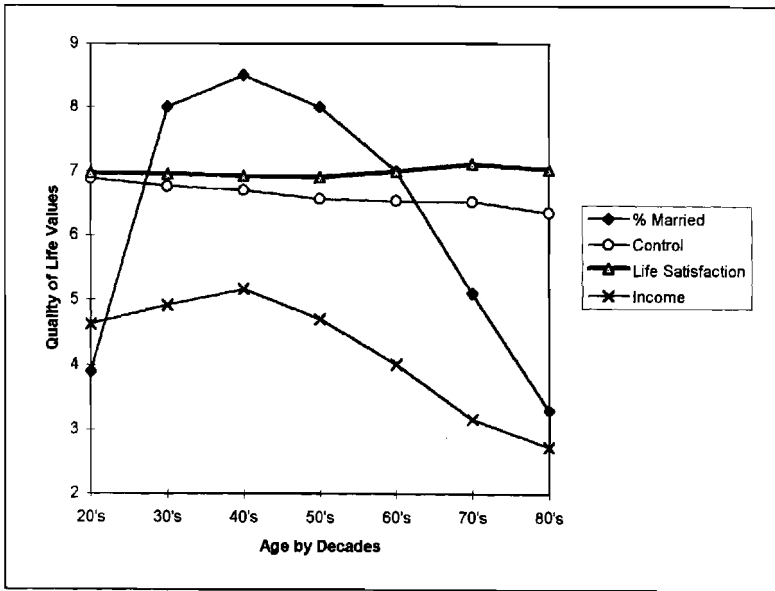


FIGURE 11.1 Quality-of-life variables.

Note: % Married is percentage divided by 10.

(e.g., Canada, Chile, and China), whereas in others there is a downward trend (e.g., Austria, Hungary, and S. Korea), and in yet others there is a mixture of small elevations and depressions across the age groups (e.g., India, Switzerland, and the U.S.A.). The conclusion seems to be that there are not large differences in life satisfaction across age groups, and there are not striking differences that replicate across nations. In other words, life satisfaction appears to be relatively stable across age cohorts in most societies. Figure 11.1 also presents several quality-of-life factors that might be thought to influence life satisfaction. ‘Control’ refers to respondents’ feelings of control over their lives. Although small, there is a slight downward decline in feelings of control across age cohorts ($p < .001$).

It can be seen in Figure 11.1 that income and marriage also decline substantially across the age cohorts starting in the 50’s. Although 85%

of the 40's cohort is married, only 33% of the 80's cohort is. Marriage is considered to be a resource because it correlates in this and other samples with SWB. Income also shows a downward trend from the 40's to the 80's groups. Thus, life satisfaction trends up slightly, whereas the other three quality-of-life variables trend downward. In the case of income, the drop is fairly substantial, and in the case of marriage, the drop is enormous. Despite the sharp decline in the percentage married after the decade of the 40's, the data also show a continual rise in satisfaction with home life. It should be noted that marriage relates significantly to life satisfaction and home satisfaction in every single age cohort in this sample. We will later return to the question of how objective circumstances that relate to well-being can be lower for older persons while life satisfaction remains high.

Family Variables

A more detailed review of the life satisfaction and marriage data is revealing. Married people are significantly happier than unmarried people in the following categories—single, widowed, divorced, and separated. However, the trend in life satisfaction is interesting. In the 20's, only 39% of people are married, and the married respondents are only slightly happier. In the 30's, 40's, and 50's, marriage rates hover around 80%, and in these cohorts the unmarried respondents are substantially less satisfied with life. In the 60's, people start to become widowed, and the percent who are married drops. By the 80's, only about a third of the sample is still married. But for the age cohorts in their 70's and 80's, people who are married exhibit high satisfaction. It is perhaps that when people are at an age where most people are married in a society, and therefore they expect to be married, it is worse to be unmarried. However, in the older age groups in which most people are not married, those who are still married find particular satisfaction. An alternative explanation is based on selection effects. When most people are married, perhaps a greater percentage of the remaining unmarried people are those who are predisposed to dissatisfaction. And for those who remain married into their 80's, perhaps we have respondents who are hardy and resilient, and who would be happy regardless of their marital state. We cannot completely disentangle these alternative explanations without longitudinal data.

Some insight into the locus of the marriage effect on life satisfaction can be gained, however, by examining widows and widowers at different

ages. For instance, George, Okun, and Landerman (1985) found that widowhood had a much stronger negative effect on the life satisfaction of younger (age 18–34) than older (age 60–96) adults in a national U.S.A. sample. Consistent with the previous U.S.A. finding, the cohorts of young widows in their 20's and 30's are far below the sample average on life satisfaction, whereas widows and widowers in their 80's do not show low life satisfaction in the present international data. Selection into widowhood is unlikely to be based on one's level of SWB, and therefore these effects are likely to be due to factors other than personality. Thus, it appears that it is quite bad to be a widow or widower early in life when most other people are not widows and when it is unexpected to be widowed. However, widowhood in older age is more tolerable because the majority of other people one's age are no longer married, and widowhood is not so unexpected.

The findings above suggest that the effects of marriage are not simply due to the absolute amount of companionship provided by this institution, but are embedded in a matrix of age-specific expectations and societal structures. Because it appears to be much worse to be a widow/widower when one is young than when one is old, people's expectations or alternative social contacts play a large role in the advantages afforded by marriage. This finding, which is congruent with the life satisfaction and marriage data presented in the paragraph above, suggests that the age and marriage effects are not simply due to selection effects. Instead, the data suggest that the effects of marriage on life satisfaction depend on one's expectations and how typical one's situation is among one's age cohort.

Although there is a slight, but significant, tendency for people with more children to have higher life satisfaction in the WVS II, it is not the case that children matter more for the life satisfaction of older respondents. In other words, the hypothesis that older people will be more satisfied if they have children around, whereas young people have greater life satisfaction because they have greater freedom and income without children, is not supported by the data. There is not an interaction such that children matter more to life satisfaction as one gets older. We cannot determine whether the small benefit accruing to those with children in this sample is due to a selection of the people who have offspring, or is a causal effect of having progeny.

Religiosity

Past findings suggest that religious people are happier (Ellison, 1991; Hunsberger, 1985; Myers, 1992). In the World Value Survey II sample,

respondents who pray more frequently are more satisfied, but this pattern occurs across all age groups. The correlations of amount of prayer and life satisfaction are not greater in the older age groups. Once again, this runs counter to the stereotype that young people can enjoy themselves through fun activities, but old people must turn to spiritual matters. Old people do think of death significantly more often as reported in the survey, but their frequency of prayer is no more related to their life satisfaction than is young people's.

The Structure of Affective Well-Being

Recall that Okma and Veenhoven (1996) found that affect balance, the difference between unpleasant and pleasant emotions, declined in older age cohorts. An analysis of the WVS II data in this regard is instructive. Bradburn's (1969) Affect Balance Scale (ABS) was administered in most nations, and this scale provides separate measures of pleasant and unpleasant affect. Bradburn and others (e.g., Costa & McCrae, 1980; Diener & Emmons, 1984; Lawton, 1984; Watson, 1988) previously showed that it is important to measure both pleasant and unpleasant affect because they can be somewhat independent, and have different correlates. Although evidence in support of a two-factor theory of affect has also been documented from elderly samples (e.g., Kercher, 1992; Stacey & Gatz, 1991), past examinations of the structural invariance of measures have not always been encouraging (e.g., Shmotkin, 1991).

The WVS II data are an excellent sample in which to analyze the structure of affect across age groups because of the large number of respondents and the heterogeneous samples. Questions of factorial invariance across age groups are important because SWB can be meaningfully compared only if there is a stable structure across these groups. In order to insure adequate sample sizes in each age cohort, 20-year age periods were grouped together (20-39, 40-59, 60-79, 80-99). The findings are crystal-clear—there are two factors in every age group, and the positive and negative affect items have a simple structure in every group. In each age group, only two eigenvalues were above 1.0, and both eigenvalues were always of similar magnitude. When the two factors were rotated using oblimin, they correlated at virtually zero in every age group. The positive affect items always loaded on one factor at .40 or higher, and the negative items always loaded .40 or higher on the other factor. No items cross-loaded on the opposite factor greater than .29, and the cross-loadings were typically much smaller. Thus, the structure of affect clearly seems to contain two factors across all age groups.

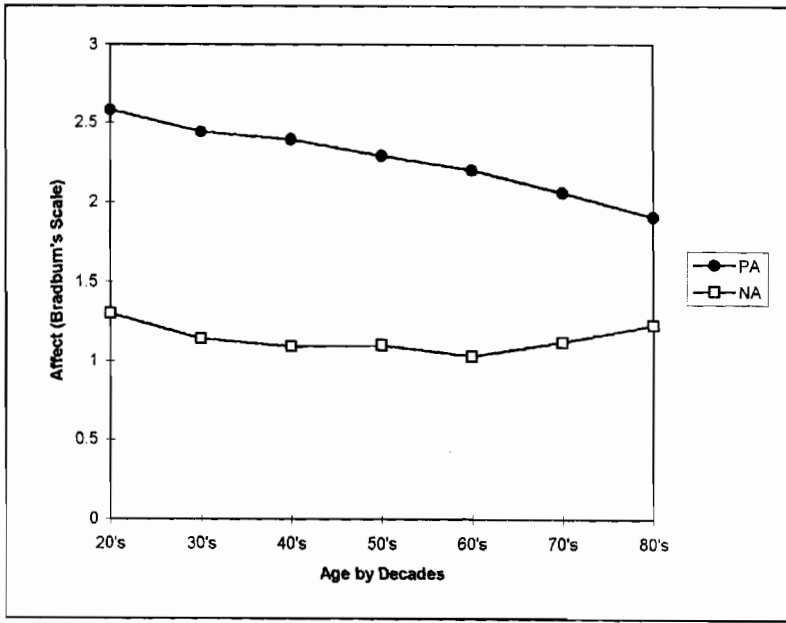


FIGURE 11.2 Affect by decades of life.

The relative independence between pleasant and unpleasant affect raises the possibility that the pattern of pleasant and unpleasant affect change across age may not necessarily be identical. Age trends in the WVS II in pleasant and unpleasant affect, shown in Figure 11.2, reveal interesting age trends. As can be seen, there is a very slight downward trend in unpleasant affect from the 20's to the 60's, but then a slight increase afterwards. The slight downward trend up to the 60's is mostly produced by male respondents, and for women, negative affect is relatively flat across age cohorts. A further breakdown of these data indicates that unpleasant affect declines across age cohorts for married people, but not for unmarried respondents.

An examination of the scores for pleasant affect, on the other hand, indicates a much stronger and more predictable decline across age cohorts. At each succeeding decade, there is a decline of pleasant affect, and this

occurs for both sexes. In addition, this decline occurs across most nations, although in a few (e.g., Finland) pleasant affect remains relatively stable over the age cohorts. Pleasant affect declines regardless of whether people are married or not, and for all income groups. Thus, the decline in positive affect across age groups is robust in the WVS II data.

An interpretation of the decline in the pleasant affect is made difficult by the fact that the data are not longitudinal. Thus, the decline could be due either to cohort effects or aging effects. Nevertheless, the findings do cast doubts on some hypotheses about the relation of age and affect. The data do not support the idea that as people get older their emotions become blunted because they have habituated or adapted to more life conditions and events. The unpleasant affect data show no consistent decline over age cohorts, and therefore the habituation hypothesis seems unlikely. In fact, there have been indications that the relative importance of emotion increases across age cohorts in memory recall data (Carstensen & Turk-Charles, 1994) and in preference decisions for social partners (Fredrickson & Carstensen, 1990).

The data also throw suspicion on the idea that selection due to mortality produces the differences in affect across the age cohorts. The number of individuals dying across the young age cohorts is undoubtedly quite small, whereas the decline across the older age cohorts is likely to be substantial. Nevertheless, the decline in pleasant affect is steady throughout adulthood.

If we can rule out a number of plausible explanations, what hypotheses remain to explain the decline of only pleasant emotions across age cohorts? In demonstrating the relative independence of positive and negative affect, numerous researchers have found that positive and negative affect are each correlated with different factors (e.g., Clark & Watson, 1988; Costa & McCrae, 1980; Emmons & Diener, 1985; Lawton, 1984). As corroborated by Baker, Cesa, Gatz, and Mellins (1992), findings in the field converge on the notion that situational variables influence positive affect, whereas the primary etiology for negative affect is dispositional. If this is the case, the process of physical aging may have a more direct effect on the determinants of pleasant affect (e.g., amount of social activity) than on the primary causes of negative affect (e.g., stable dispositions). Opportunities for pleasant stimulation and social engagement decrease with the physiological constraints of aging. As a result, pleasant affect may show a continuous decline across age, in contrast to the absence of age differences in levels of unpleasant affect. This possibility was partly supported by the fact that the correlation between the number of social organization

engagements and pleasant affect increased gradually across succeeding age cohorts. No age difference, however, was found between the number of social engagements and unpleasant affect.

Another hypothesis is that there is perhaps a cohort effect such that each succeeding generation is more open to pleasant emotions. This cohort effect would have to be worldwide, but this is possible in light of Inglehart's (1990) findings on postmaterialist value changes in cultures. Inglehart maintains that there is a shift in values as nations become industrialized, and this move toward "postmaterialist" values might be accompanied by higher levels of positive affect. A decline in pleasant emotions across succeeding cohorts is consistent with data presented by Costa et al. (1987) for the U.S.A. They found that older persons were lower in both pleasant and unpleasant affect, but that longitudinal changes did not occur on these variables.

One last hypothesis to explain the decline in pleasant affect across age cohorts is in terms of arousal. It may be that older persons have fewer high arousal emotions, and that this is revealed in the pleasant affect data because the Bradburn measure used in the World Value Survey does not assess low-activation pleasant emotions. This interpretation is supported by the fact that responses to the item "Particularly excited or interested" shows a steeper decrease across age groups than do the less intense pleasant affect items. It is interesting to note that for unpleasant emotions, the Bradburn scale assesses both higher arousal and lower arousal emotions (e.g., Upset versus Lonely). Importantly, the three lower arousal emotions increase with age, and the two unpleasant higher arousal emotions decline with age. It may be that unpleasant affect is relatively flat across age cohorts in the WVS II because there was a relative balance of activated and unactivated unpleasant emotions. Thus, the decline in pleasant affect across age groups might be a function of the measure used. To the extent that less activated pleasant emotions are assessed (e.g., contentment), we might not see the decline that is evident in the World Value Survey II.

A more definitive conclusion about the causes of the decline in pleasant affect across age cohorts will be possible only when international longitudinal data are available, and when a wide range of pleasant and unpleasant emotions are measured. For instance, Lawton, Kleban, and Dean (1993) found that excitement and arousal become less salient in the positive affect structure of older adults. Accordingly, greater insight would be gained by examining both highly activated and less arousing emotions in future studies. Furthermore, it will be helpful if future measures differenti-

ate between scales of emotional intensity and the frequency of emotional experiences.

Financial Satisfaction

Across age cohorts, there is a steady increase in the WVS II in reported financial satisfaction. Thus, older cohorts express greater satisfaction with their incomes, despite the fact that their objective incomes are declining. After the 40's, we see rising financial satisfaction across age cohorts, but a dramatic decline in income levels. We will see that this parallels the findings of the next international survey, in which satisfaction with particular domains increases with age, despite objective declines in these areas.

Well-Being in Specific Life Domains: Butt & Beiser (1987)

Butt and Beiser (1987) conducted a large international study on well-being in specific life domains. A total of 13,858 respondents across 13 nations participated in their study. In addition to the U.S. and European nations, the study included samples from diverse continents, such as South America (Brazil), Asia (India, Korea, Philippines, Singapore, Japan), and Australia. Probability and quota sampling were the primary procedures used in this study, with some overrepresentation of urban areas. Each nation's sample was divided into four age groups: 18 to 25, 25 to 34, 34 to 49, and 50 and over.

For satisfaction with human relationships, there was a steady increase across the four age groups, and this occurred across most groups for all the nations. Satisfaction with material needs tended to go up across age groups, although this was not true in every nation. For example, in India, young men were more satisfied with their material needs than were older men. The authors attribute the relatively low levels of material satisfaction among the young adults in most societies to the fact they have met relatively few of their material aspirations compared to older persons.

Religiosity tended to go up across the age groups, although there were exceptions. Job satisfaction was the one variable that tended not to show an increase across age groups. Instead, it was highest in the middle two age cohorts. The youngest age group tended to show lower satisfaction with job relations. Although the older group also showed lower job-relation satisfaction, this was likely to have been an artifact of the method used. (All respondents were asked all questions, and thus even retired

people were asked if they were satisfied with their job. Because only yes and no answers were allowed, the lower job satisfaction in the older group is likely to have resulted from this artifact.)

The Butt and Beiser data offer further insight into how satisfaction can increase across age cohorts, despite the fact that objective conditions may in some ways be worse for older groups. Recall that older groups on average have lower income and are less likely to be married, and that both these variables relate to life satisfaction. In Figure 11.3 we show the Butt and Beiser data averaged across nations for human relationship satisfaction and satisfaction with material needs. As can be seen, both types of satisfaction tend upward across age cohorts. In addition, Butt and Beiser present evidence that religiosity also increases across the age groups. Although older individuals are less likely to be married and are more likely to have lower incomes, they are more satisfied with relationships and material life! This suggests that the older age groups have lower comparison standards or desires, or have come to terms with their objective conditions and interpret these conditions in a more positive light. Alternately, older persons have learned behavioral adaptations that make them more effective in dealing with their environments, even with fewer resources.

Butt and Beiser (1987) offer the following conclusion:

The stereotype that older persons are unhappy with the processes of aging, that they are lonely and isolated, neglected and sick, does not hold true for people in most parts of the world, where to survive is to flourish. Even the very old can and do approach death with a sense of comfort and spiritual well-being. (p. 94)

Methodological Issues

Because the international surveys are all based on self-reports by respondents, a number of questions can be raised about them. For one thing, people of different age groups might have different perceptions of the socially desirable response, or show different levels of compliance with what they think the interviewer expects of them. For example, Moum (1995) found that young people reported fewer symptoms in an interview compared to a self-administered questionnaire, whereas older respondents showed a much lower level of this impression-management effect.

A further measurement limitation is that the scales used in the studies reviewed above are not the strongest ones available. For example, one-

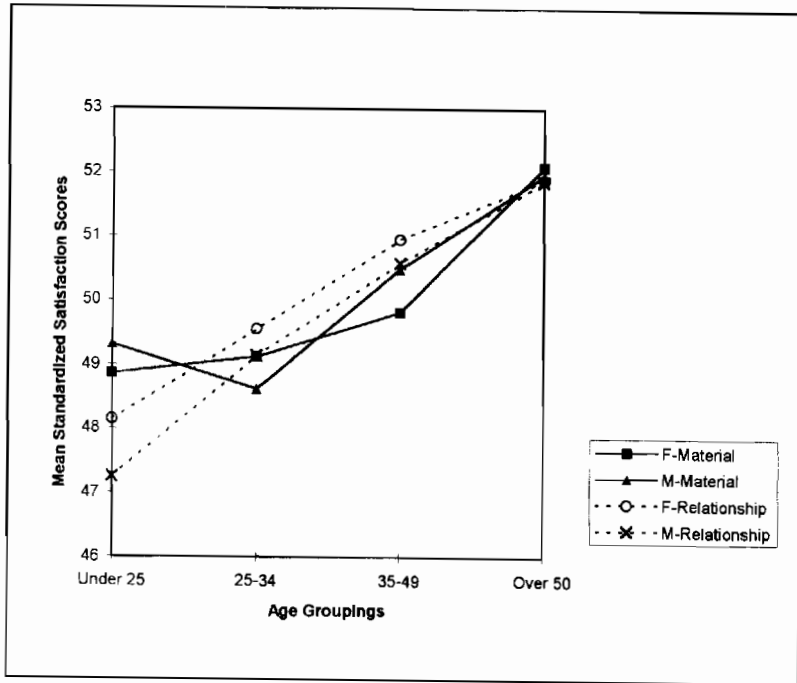


FIGURE 11.3 Domain satisfactions. Data from “Successful Aging: A Theme for International Psychology,” by D. S. Butt & M. Beiser, 1987, *Psychology and Aging*, pp. 90–91.

Note: F = Female. M = Male.

item scales of life satisfaction have poorer validity than a multi-item scale such as the Satisfaction with Life Scale (SWLS; Pavot & Diener, 1993). Bradburn’s Affect Balance Scale has weaker validity than several alternative scales (Larsen, Diener, & Emmons, 1985). Thus, scales such as the PANAS-X and SWLS ought to be included in future surveys. Another important advance would be to use measures of specific discrete emotions (e.g., anxiety, anger, depression, affection, and joy) in the survey studies, not just global positive and negative emotions. Such measures would give us a more precise idea of the types of changes in affect that occur across the life span.

Another shortcoming that has been stressed in this review is the lack of longitudinal data. Without such data, we cannot fully understand the reasons underlying the trends we have uncovered. Cohort effects and age effects are confounded in the data we review. In order to make stronger statements about age trends in SWB, a large longitudinal study is essential.

Another limitation of the data reviewed is that it is based on self-report surveys. In order to guard against measurement errors, it would be desirable to compare the outcomes with other diverse measurement methods, such as amount of smiling, informant reports, memory measures, and objective indices (e.g., suicide rates). Furthermore, the trends in survey studies should be compared to behavioral measures (e.g., pleasant activities) and physiological measures that reflect well-being or ill-being (e.g., cortisol).

Finally, although the sampling of respondents in the studies reviewed was strong compared to most studies in the behavioral sciences, the sampling was far from perfect. For example, in some nations, the rural poor people were undersampled. Perhaps the most serious potential problem with respondent sampling in these studies is the problem of nonresponders. In most nations the response rates were not indicated. We can imagine, however, that response rates were often far below 100%. Future studies will be strengthened if response rates are reported and if methods are employed to estimate the responses of nonresponders. Despite our quibbles with the sampling procedures used, the samples reported in this review are so much stronger than most available data that they take a large step forward in this regard.

Conclusions

A number of important conclusions can be drawn from the strong data sets provided by international surveys. Because the samples are very large and are drawn from many nations, more confidence can be placed in the conclusions that are reached. First, life satisfaction shows no decline with age, despite the fact that certain resources such as marriage and income that correlate with well-being do decline with age. This is consistent with the findings of George et al. (1985) who found that age moderated the effects of income, health, and marital status on life satisfaction. At the very time when older persons are experiencing lower levels of marriage, income, and feelings of control, they show increased levels of financial satisfaction, satisfaction with material needs, and satisfaction with human relationships. What are the possible explanations for the stable or increas-

ing level of life satisfaction across age groups, despite the changes in objective conditions? Older people may lower their level of aspirations and standards as they age (Campbell et al., 1976) and adjust personal goals in reference to their current resources and competencies (e.g., Brandtstädter & Renner, 1990; Rapkin & Fischer, 1992). A related possibility is that older cohorts have lower expectations, and therefore are more easily satisfied. Finally, the decline of objective resources in the later periods of life may be overshadowed by subjective factors in the elders' judgments of life satisfaction. For instance, psychological "fear of aging" (Klemmack & Roff, 1984) and social comparison mechanisms (Heidrich & Ryff, 1993) are sometimes better predictors of elderly people's well-being than objective resources, such as health.

The second important conclusion from this review is that positive affect is lower in successive age cohorts. This might be an age-cohort effect. Until longitudinal data are accumulated that are based on stronger scales, however, we cannot be certain of the cause of this effect. Unpleasant emotions remained relatively constant across age cohorts. For men, life satisfaction increased slightly across cohorts and negative affect decreased slightly. For women, life satisfaction and negative affect remained virtually constant across age cohorts. In contrast, pleasant affect declined for both sexes in most nations. One possibility is that these trends depend on the arousal level of the emotions that are assessed, but broader measures of affect are needed to test this possibility.

Third, the factor structure for positive and negative affect clearly replicates across age cohorts. The factor structures of the Bradburn measure are virtually identical in the different age cohort groups. This is supportive of the idea that the relative independence of positive and negative emotions may have a different etiological underpinning (e.g., Baker et al., 1992). It also suggests that different age groups can be validly compared in terms of positive and negative affect.

Although the findings on life satisfaction and age are heartening, researchers should be cautious of prematurely embracing the idea that there are no age differences in SWB. The bad news here is that pleasant affect is lower across age groups in virtually every nation and demographic category. The good news is that this decline may be a cohort effect or arousal effect and is not necessarily a negative concomitant of aging. The other good news is that life satisfaction does not decrease, nor unpleasant affect increase, as people's resources decrease. Thus, there is reason to be optimistic about people's ability to adapt, and still achieve positive

levels of life satisfaction as they grow older. Furthermore, if objective conditions improve for older people, there is even greater reason to be sanguine about the life satisfaction of senior citizens.

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The Social Context of Emotional Experience

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Emotional experience in later life presents an intriguing puzzle. Aging is associated with a host of undesirable changes that constrain action and threaten psychological well-being; for example, hearing, vision, and mobility are increasingly restricted. Physical health declines. Social partners get sick and die. The very thought of such changes is upsetting, and even if one managed to cope with the physical consequences of aging, the loss of significant others would seem certain to generate emotional distress. However, despite the genuine objective losses that accompany aging, older adults do not, on average, show a reduction in various indicators of emotional well-being. On the contrary, they report high levels of happiness, relatively little loneliness, and describe their social relationships as very good. Moreover, they display few signs of emotional distress in the form of psychopathology, and report less negative emotional experience than do their younger counterparts.

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How do older adults fare so well emotionally in the face of these considerable losses? Although many factors contribute to the positive profile of emotion in later life, we contend that one important reason that older individuals fare as well as they do is that emotion regulation improves with age. More specifically, we argue that age is associated with increasingly selective social partner choices and engagement in an increasingly smaller, but emotionally meaningful, set of social relationships. It is these social adjustments, we assert, that permit individuals to minimize the experience of negative emotions and increase or maintain the experience of positive emotions. To develop this argument, we first review traditional perspectives on emotion in old age. We then argue that because emotion is inherently social, patterns of social interaction are intimately tied to the frequency and the intensity of emotions that people experience in everyday life.

We ground our argument in socioemotional selectivity theory, a lifespan developmental theory that holds that emotional goals are prioritized in later life such that aging individuals are increasingly motivated to regulate their emotional states. According to this theory, the well-documented age-related decline in social contact reflects a selective pruning of the social network, a process that maximizes emotionally rewarding experience. After giving an overview of the theory, we turn to the literature on emotion and social interaction in old age and attempt to delineate the life-course trajectory of emotional regulation, and consider the reasons why the emotional sphere may be relatively spared from the ravages of the aging process.

TRADITIONAL VIEWS OF EMOTION IN OLD AGE

Traditionally, emotional experience in old age has been depicted as diminished in intensity and rigid in expression (Banham, 1951). Jung (1933) wrote: “[A child’s psychic processes] are not as difficult to discern as those of a very old person who has plunged again into the unconscious, and who progressively vanishes within it” (p. 131). These early characterizations of the elderly person as emotionally distanced were based largely on observations of social behavior. Older people interact less with others and appear to resist efforts by others to make new friends and participate in social functions (Carstensen, 1986; Carstensen & Erickson, 1986). Given the degree to which emotional experience is socially embedded, such an assumption is not unreasonable.

A number of gerontologists argued that barriers to social contact, rooted in an insidious ageism in Western societies, and coupled with deaths of loved ones and poor health, lead to the impoverishment of available social structures and of subsequent opportunities for emotional satisfaction. What came to be known as "activity theory" posits that, if older people are to age successfully, they need to make concerted efforts to remain socially active and involved (Havighurst & Albrecht, 1953; Maddox, 1963). Otherwise, they are likely to experience a diminishment of positive emotions, and heightened negative feelings.

Other theoretical models, however, consider a general emotional disengagement to be at the core of reduced social contact (see Bromley, 1990). According to disengagement theory (Cumming & Henry, 1961) the reduction in contact observed in old age represents a diminished desire for social connectedness in anticipation of impending death. The theory states that social contact is diminished due to a mutual withdrawal between the older person and society. Disengagement theory suggests that the preconscious awareness of the imminence of death on the part of the individual instigates increased self-awareness and social withdrawal. Emotional quiescence and pensive self-reflection are considered the manifestations of psychological and social disengagement. Recognition by the social world that the older individual will soon die leads to concurrent societal detachment from the individual. In the disengagement view, social inactivity represents a normal adaptive process.

Thus, early views of emotion and aging tacitly acknowledged the role of social context in emotional experience, but concluded, prematurely, we argue, that reduced social contact reflected negative or diminished emotional states. Although these early models were interesting, they were not supported by subsequent research. Empirical findings show that rates of social contact do not predict dissatisfaction in old age (Chapell & Badger, 1989; Lee & Markides, 1990) and recent large-scale epidemiological studies show that—with the exception of the dementias—older people suffer lower rates of mental health problems than their younger counterparts (George, Blazer, Winfield-Laird, Leaf, & Fischback, 1988; Weissman, Leaf, Bruce, & Florio, 1988). By and large, older people report being even happier with their lives than younger people (Herzog & Rodgers, 1981).

Empirical support for social distancing in late life also is hard to come by. Meaningful social relationships are central in lay formulations of successful aging among both women and men (Ryff, 1991). Indeed, there

is strong evidence that even though overall rates of interaction fail to predict satisfaction in old age, social connectedness predicts mental health (Antonucci & Jackson, 1987; Lowenthal & Haven, 1968), as well as physical health and longevity (Berkman & Syme, 1979; Blazer, 1982). In short, the body of empirical findings on socioemotional status in the elderly supports neither emotional dissatisfaction, as is tacitly predicted by activity theory, nor the emotional detachment predicted by disengagement theory.

Socioemotional Selectivity Theory

Socioemotional selectivity theory (Carstensen, 1993, 1995, in press) offers an alternative explanation for reduced social behavior that reconciles some of the seemingly contradictory psychological assumptions of activity theory and disengagement theory. According to the theory, the reduction in the breadth of older peoples' social networks and social participation reflects a motivated redistribution of resources in which engagement in a selected range of social functions and close emotional relationships gives rise to meaningful emotional experience. In other words, reduction in social contact in old age reflects an active selection process in which emotionally close social relationships are maintained and more peripheral social relationships are discarded. If socioemotional selectivity theory is correct, this would suggest that aging should be associated not with emotional dissatisfaction and diminished emotional states, but rather with emotional satisfaction and enhanced emotional status.

Selective Reduction in Social Contact

Age-related reductions in social contact have been widely documented in both longitudinal (Lee & Markides, 1990; Palmore, 1981) and cross-sectional (Cumming & Henry, 1961; Gordon & Gaitz, 1976; Harvey & Singleton, 1989; Lang & Carstensen, 1994; Lawton, Moss, & Fulcomer, 1987) studies of middle-aged and elderly people. Moreover, it does appear that the reduction in social contact is selective. Figure 12.1 below illustrates that there is virtually no difference in the number of emotionally close social partners that old and very old people include in their social networks (Lang & Carstensen, 1994; see also Lang, Staudinger, & Carstensen, in press). Even in very old age, people maintain contact with emotionally close social partners. Rather, the drop in social contact occurs primarily

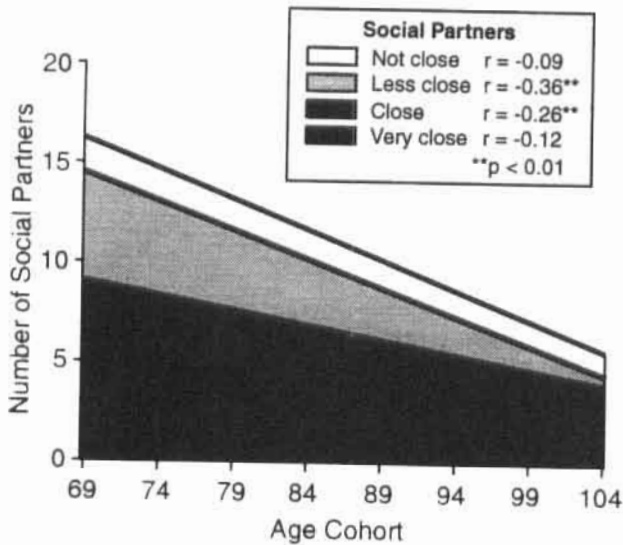


FIGURE 12.1 Distribution of very close and less close social partners in the networks of old and very old people. From "Close Emotional Relationships in Late Life: Further Support for Proactive Aging in the Social Domain," by F. R. Lang and L. L. Carstensen, 1994, *Psychology and Aging*, 9, p. 318. Copyright © 1994 by the American Psychological Association. Reprinted with permission.

among more peripheral social partners. In fact, this selective reduction results in the *proportion* (or density) of emotionally close social partners in an individual's network being highest in old age.

Naturally, we acknowledge that uncontrollable and undesirable events also contribute to the reduction in contact in old age. Passive selection (namely, reduced activity due to deaths of social partners and other social losses) is, of course, ubiquitous in old age. Some very old people even speak of being "left behind" by family and loved ones who have died before them (Bury & Holmes, 1991). However, we believe that passive selection does not negate the potential role of proactive processes that also operate toward the end of life. We reason that if networks were reduced exclusively through deaths of network members or restrictions of access, changes in social network composition would occur on a relatively unsystematic basis throughout the network, regardless of the degree to

which social partners are emotionally close to the target person. But this is not the case. Instead, the patterns described above are consistent with motivated changes in social networks in which there is a diminished desire for contact with social partners who do not offer emotional rewards.

In summary, social contact declines with age. Although early theoretical models attributed the decline to losses unique to old age, such as obstructed access to social partners or, alternatively, to approaching death, empirical evidence suggests that the decline targets primarily peripheral social partners. With age, people do appear to interact less overall, but continue to interact with emotionally close social partners, such as family members and long-time friends.

Social Goals Throughout the Life Course

According to socioemotional selectivity theory, social interaction is motivated by a constellation of social goals that range from instrumental assistance (e.g., physical protection) to psychological goals that include the regulation of emotional experience and the seeking of information about ones' culture and social surroundings. The theory claims that although the same essential set of social goals operates throughout life, with age, the constellation of goals is reorganized such that social interaction is increasingly likely to be motivated by attempts to regulate emotional experience, and increasingly less likely to be motivated by relatively future-oriented social goals, such as the acquisition of novel information.

It has been argued (Carstensen, in press) that the larger goal constellation can be subdivided into two broad classes of social motives that follow different developmental trajectories: the knowledge trajectory and the emotion trajectory. The knowledge trajectory is characterized by attempts to acquire information about the self and the social world. It includes goals that are future-oriented and stimulates social contact most when knowledge is limited and developing organisms are allocating considerable resources to maximizing preparedness for the future. The goals subsumed under the knowledge trajectory include information-seeking, social comparison, and achievement motivation. Developmentally, the knowledge trajectory starts high during the early years of life and declines gradually over the life course, as knowledge accrues and the future for which it is banked grows shorter.

The emotion trajectory includes motives to feel good, derive emotional meaning from life, establish intimacy, and verify the self. Although such

needs are important throughout life, their relative salience among the constellation of social motives is highest during infancy and early childhood, when emotional trust and relatedness are initially established, and then rises again in old age when future-oriented strivings are less relevant. Thus, the emotion trajectory follows a curvilinear function. Because knowledge strivings are so important from late adolescence to middle adulthood, they are pursued relentlessly, even at the cost of emotional satisfaction. Later in life, goals that are satisfied by the resulting “feeling” state are more likely to be pursued because they are experienced in the here and now, a valuable commodity in the face of limited time. Thus, the first half of adulthood is characterized by the knowledge trajectory, and the second half of adulthood is characterized by the emotion trajectory. Figure 12.2 illustrates the idealized life-span course of social goal salience.

One note of clarification is needed. We acknowledge that the emotion system is inherently involved in all goal-directed behavior. In a fundamental way, approach and avoidance of any stimulus, and certainly all complex human behavior, involve affect (Zajonc, 1997). Classifying some social motives as “emotional” and others as “knowledge-related” or “informational” is intended heuristically to distinguish between goals that are

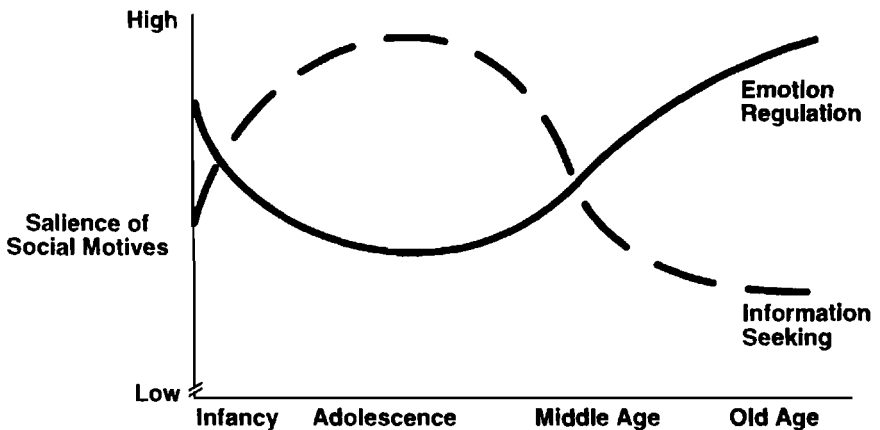


FIGURE 12.2 Idealized life course trajectory of the two social motives postulated in socioemotional selectivity theory.

pursued in order to obtain novel information and goals that are pursued because of the accompanying feelings that ensue. In the former case, behavior persists regardless of the accompanying, conscious, subjective state in order to optimize future rewards. A student may pursue repeated contacts with a crotchety professor, not because of the joy found in the contact, but because of the potential long-term payoffs. In the latter case, by contrast, the conscious subjective state associated with the behavior is itself the reward. We talk with our friends because the conversations make us smile or feel good about ourselves.

The Role of Time in Goal Salience and Social Partner Choice

The underlying premise of socioemotional selectivity theory is that people consistently (whether consciously or subconsciously) take account of the time that they have left to accomplish their goals. When the conclusion of this appraisal process is that time is limited, social goals change, shifting increasingly from those that are future-oriented (reflected in the knowledge trajectory) to those that are more present-oriented (reflected in the emotion trajectory). This type of cognitive appraisal assists people in balancing long- and short-term gains in order to adapt effectively to their particular niche in the life cycle. The “accounting process” itself has an emotional quality in that it concerns the relevance of a stimulus (or goal) (Frijda, 1986). As Zajonc (1997) puts it, “Information can become a commodity only if it is of value—which means nothing else than it can touch our emotions” (p. 591). According to socioemotional selectivity theory, information that will be useful in the distant future is of little value when time is limited. Not surprisingly, because time left in life is inextricably linked to place in the life cycle, there are age differences in perceptions of future time and in the subsequent value of informational goals. Compared to younger people, older people see fewer opportunities awaiting them and less time available to obtain goals.

According to the theory, when knowledge-related goals are accentuated, novel social partners are most appealing, because their unfamiliarity increases the likelihood that an individual will learn something new from them. When emotional goals are salient, familiar social partners are preferred, because they are more likely to provide predictable emotional experiences and feelings of social embeddedness than are relative strangers. Moreover, because many people fall into the novel (or acquaintance) category and a relative few into the familiar (or intimate) category, a goal shift that favors emotional pursuits is likely to entail fewer social contacts.

Although younger people typically prefer novel social partners and older people prefer familiar social partners, such tendencies are malleable and notably linked to the perception of time. When younger people imagine conditions in which time is limited (*viz.*, anticipating a geographic relocation) or older people imagine conditions in which time is unlimited (*viz.*, a life-extending medical advance), preferences shift strikingly. When the imagined time-frame is limited, younger people prefer familiar social partners, when the imagined time-frame is extended, the bias displayed by older people disappears (Carstensen, 1995; Fredrickson & Carstensen, 1990).

In summary, when time is perceived as limited, emotional goals come to the fore; the need for emotionally meaningful experience and deep feelings for other people in life (even if mixed in valence) increase in importance. According to the theory, this goal shift is most likely to occur in old age, but aging is not the cause. The instigating mechanism is the perception of time.

Emotion in Social Context

Our discussion thus far has focused primarily on socioemotional selectivity theory and its predictions about the ways that emotional goals motivate certain types of social activity. Specifically, we have made the case that with age, emotional goals become relatively more important than other social goals, and that these emotional goals lead to selective social interaction. At this point, we attempt to establish the life-long interdependence of emotional experience and social relationships, illustrating how selective social contact influences emotion throughout the life cycle.

Emotions are most often experienced in social contexts (Scherer, Summerfield, & Wallbott, 1983). Indeed, emotional experience is, in many ways, defined by the social context (Frijda, 1988). Although a core set of basic emotions is observed across widely disparate cultures (Darwin, 1872; Ekman, 1978), emotions quickly take on highly abstract meanings that summarize the potential benefits and costs of particular social customs and social relationships (Ekman & Friesen, 1969; Lazarus, 1991). Even at a distal level, emotional experience and expression are influenced by the social structures and cultures in which people live (Markus & Kitayama, 1991). Power and status relationships, for example, influence emotional responses and acceptable expressions of emotions in particular social contexts (Irvine, 1995; Kemper, 1978).

Social structure and culture also determine which environmental events trigger particular emotions and how people react (Hochschild, 1979; Markus & Kitayama, 1991; Rothbart, 1994). In a culture where people believe that behavior is controlled by demons, an affront by an acquaintance does not elicit interpersonal anger, whereas in a culture where behavior is considered intentional, anger is the predicted response (Ellsworth, 1991). The cultural value of particular commodities influences their affective valence. Touching fresh cow dung may elicit disgust in Westerners. But an Indian girl who lives in a culture where handmade dung cakes are marketable as a fuel supplement may handle it with considerable joy (Izard, 1991). More broadly, by influencing conceptions of the self, culture socially constructs emotional experience, in the sense that it embodies the functions, rules, and social roles of the community (Hochschild, 1979; Markus & Kitayama, 1991). People from different cultures report different commonly experienced emotions. The most common positive emotions reported by students and adults in America (a relatively individualistic culture) are feeling good about oneself, having a sense of pride, and having a sense of affirmation of one's self-worth and self-esteem, but those reported by the Japanese (a more collectivist culture) are feelings that interpersonal relations are harmonious (Markus & Kitayama, 1994).

Developmentally, by the time children begin to expand their social worlds beyond the family, they have acquired considerable knowledge about the meaning of emotions expressed in social contexts relevant to their culture and ways to influence the emotions of others (Saarni, 1979, 1988). They have also learned how to conceal their own displays of emotions and suppress emotional states when doing so allows them to pursue other goals (Dunn, 1994; Harris, 1989).

Socioemotional selectivity theory predicts that by late adolescence and early adulthood, the regulation of feeling states is relegated to a lower status because the exploration of the world demands emotional resilience in the face of failures and social rejections. Succumbing to instinctual emotional reactions, such as escaping or aggressing, is highly maladaptive. Stranger anxiety, for example, may be adaptive in early childhood, but is clearly maladaptive in early adulthood. However, by old age, the world has been explored, identities are well-internalized and—most pertinent to the theory—the basic lessons gleaned from interactions with others have been learned. It is at this point, when the prioritization of emotional goals becomes, once again, adaptive. In short, the developmental tasks of childhood, adulthood, and old age demand quite different behavioral

strategies that afford more and less salience to the seeking of new knowledge and the regulation of emotion.

Emotion Regulation Through Social Selection

Selection is a cardinal principle of human development. From birth onward, people select particular environments and trajectories, thus playing a central role in their own development (see Baltes & Carstensen, 1996; Caspi, Bem, & Elder, 1989). Selection occurs in virtually all domains and inevitably involves costs as well as benefits. At the cognitive level, for instance, as children learn one language, their abilities to learn another one are diminished. As particular friendships are developed, others are left by the wayside. In adulthood, the pursuit of expertise in one intellectual domain costs expertise in other domains. Thus, although selection is always a double-edged sword, development cannot occur in its absence. We maintain that although selective social interaction clearly limits certain types of experience, the benefits outweigh the costs throughout life, especially in infancy and old age.

The regulation of emotion through selective social interaction begins very early in life. As Rothbart (1994) states, "From the earliest days, emotion is regulated by others, and many of our emotions and cognitions about emotion [are] developmentally shaped in a social context" (p. 371). The smiles of 2-month-old infants in response to virtually any human face occur nearly exclusively in response to primary caretakers by 5 months of age (Plutchik, 1994; Spitz & Wolf, 1946; Wolff, 1963). As infants grow older, they continue to reference parental figures for emotional cues. When a stranger enters a room, for example, an infant will attend to the caregiver's face and tone of voice for emotional cues about how to react (Campos & Barrett, 1984; National Advisory Mental Health Council, 1995). No doubt, such exclusivity promotes the development of strong bonds between the infant and caregiver that have strong survival advantages (Ainsworth, 1982; Bowlby, 1973; Izard, 1991).

Initially, infants rely on other people to meet their needs. Quite quickly, however, young children learn that their actions lead to differentiated emotional experience (Gross & Munoz, 1995). They acquire various coping skills, such as shifting their gaze, or turning their heads toward rewarding objects and events and away from threatening ones (Derryberry & Rothbart, 1988; Lazarus, 1991). However, direct experience is not the only teacher. Children are also explicitly taught by their parents to avoid

contact with certain play partners and not others as they observe varying emotional consequences (Thompson, 1990). They also learn the “feeling rules” in their culture, such as who, and under what circumstances, has “the right” to feel emotions such as anger (Hochschild, 1979).

Children’s increasing competence in social domains, evidenced by the regulation of social exchanges and shared affect contagion, promotes and maintains interactions with peers (Sroufe, Schork, Motti, Lawroski, & LaFreniere, 1984). The ability to control their own negative emotions and to share their positive emotions allows children to influence the emotions of their social partners, and subsequently to meet their own emotional needs (Dunn, 1994).

Conversely, children who fail to develop emotional competence suffer social and even cognitive consequences (Reider & Cicchetti, 1989). The expression of high levels of negative emotion in the family context is associated with relatively poor performance on tasks tapping emotional understanding and negotiation of conflict, which appear to have lasting effects (Dunn & Brown, 1994). Children of depressed mothers obtain poorer scores on intelligence tests as compared to children of nondepressed mothers (Whiffen & Gotlib, 1989). Moreover, the effects of early problems in the social regulation of emotion may be long lasting. Children who display high levels of anger and aggression during the preschool years are at greater risk of behavioral problems in the elementary school years (National Advisory Mental Health Council, 1995).

Changing Social Contexts and Age

Emotional experience in infancy and early childhood is closely embedded in the family context. Indeed, it is typically within the context of relationships with biological or “fictive” kin that young children garner a sense of trust, love, and competence. Young children spend most of their time in home-centered activities (Larson & Richards, 1989). As children enter adolescence, however, the amount of time spent with family members decreases markedly and the emotions they express toward family members become more negative (Larson & Ham, 1993; Larson & Richards, 1991; Raffaelli & Duckett, 1989). Compared to preadolescents, adolescents spend only half as much time with family members and participate in fewer family activities (Larson, Kubey, & Colletti, 1989; Larson & Richards, 1991). During the same time period, interactions with friends become more frequent, and affect toward them becomes more positive. A reliable

trend emerges from late childhood to early adolescence in which young people spend increasingly more time talking with friends and less time talking with family members (Larson & Richards, 1991; Raffaelli & Duckett, 1989), a trend that continues throughout adolescence (Csikszentmihalyi & Larson, 1984).

Another trend emerges at roughly the same point in the life cycle. Whereas in early childhood the amount of time spent in activities is closely linked to the affective rewards derived from them, this association begins to weaken during the middle-school years and continues throughout most of adulthood. It appears that the weakening of hedonistic tendencies is due to a prioritization of knowledge-seeking and the pursuit of future-oriented goals. High-achieving fifth- to ninth-graders, for example, spend considerable time doing homework, even though it is associated with negative affect (Leone & Richards, 1989). Adolescent boys spend time with parents doing homework, despite the fact that spending time with family members is associated with increasingly negative affect during this period (Larson & Richards, 1991; Leone & Richards, 1989).

Early and middle adulthood may be the peak time for emotional sacrifice. Mothers spend more time in the home domain and fathers spend more time outside, even though mothers actually enjoy more positive emotions in activities away from home and fathers experience more positive emotions in the home sphere (Larson, Richards, & Perry-Jenkins, 1994). Nevertheless, these shifts appear to be satisfying. Interaction frequency and relationship satisfaction with relatives increases or remains stable throughout adulthood (Carstensen, 1992), even though interaction and satisfaction with acquaintances declines during this period.

Past retirement, in early old age, activities appear to become more discretionary, and the link between "feeling" states and time spent in activities reemerges. Older adults spend more time with family than friends, and the time that is spent with friends appears to be highly selected and quite positive. Most friends in old age are "old friends" and time spent with them typically involves shared leisure activities or conversations that transcend mundane daily concerns (Larson, 1990; Larson, Mannell, & Zuzanek, 1986). Older people spend more time in their "most-liked discretionary" activities, including interacting with friends and family members, as well as engaging in solitary activities such as reading, watching television, or working in a garden (Lawton et al., 1986-87). In fact, the more each of these activities is liked, the more time older people engage in them. Even very late in life, this trend continues. Nursing home residents

rate the best days as days that include positive family events and relatively more self-initiated positive behaviors (Lawton, DeVoe, & Parmelee, 1995).

The life-course patterns described above are consistent with the emotion and knowledge trajectories posited in socioemotional selectivity theory. Everyday emotional experience shifts from a focus on family during childhood, to a focus on friends during adolescence, back to a focus on family in later life. Very early in life, engagement in activities is linked closely with its affective rewards. Middle childhood and early adolescence marks the beginning of a trend in which preparation for life away from the family of origin, skill training, education and not-altogether-pleasant socialization show their force. It becomes highly adaptive for young people to relegate emotional goals to lesser status in their lives and to pursue knowledge-related goals relentlessly. Indeed, young adults frequently pursue knowledge-related goals at high emotional costs. In late middle age to early old age, a return to the prioritizing of emotional goals appears. We argue that this shift in priority results from two central factors. First, many early developmental tasks, such as mate selection, career development and identity formation, have been realized and/or resolved. And, second, increasing recognition that life is finite contributes to a refocusing on emotional goals. People become selective in their social interactions, favoring contact with people who are emotionally meaningful to them.

Diverse Forms of Emotion Regulation

Socioemotional selectivity theory takes as a starting point the robust decreases in social contact that occur with age. This theory interprets these decreases in terms of an increased emphasis on emotion-regulatory motives as compared with informational motives. At this stage in our argument, we broaden our discussion to consider how the changes made by older individuals in their social contexts might relate to other ways of influencing emotional experience.

A considerable amount of research in social and personality psychology has addressed psychological mechanisms that might allow for positive adjustment throughout the life span. Among these mechanisms are primary and secondary control (Heckhausen & Schulz, 1995), assimilative and accommodative coping (Brandstädter & Greve, 1994), problem-focused and emotion-focused coping (Lazarus & Folkman, 1984), shifts in possible

selves (Cross & Markus, 1991; Ryff, 1991), and social comparison (Taylor & Lobel, 1989).

One framework for organizing these diverse mechanisms is provided by the notion of emotion regulation, a general term for the processes whereby we influence which emotions we have, when we have them, and how these emotions are experienced or expressed (Gross & Levenson, 1997). There are many different ways of regulating emotions, but one broad distinction that has been proposed recently is a distinction between antecedent-focused and response-focused emotion regulation (Gross, 1997). Although many instances of emotion regulation are likely to be complex blends, we find these two broad classes of emotion regulation to be useful heuristics that point to important distinctions among emotion regulatory strategies. Antecedent-focused emotion regulation consists of those things that we do before we have an emotion that influence which emotion we will have or, indeed, whether we will experience an emotion at all. Examples of this sort of emotion regulation range from altering the way we think about the situation we find ourselves in, to taking active steps to modify the environment itself. Response-focused emotion regulation, by contrast, has as its focus the management of strong emotional impulses once they already have been generated. An example of this sort of emotion regulation would be working very hard during an unpleasant conversation with one's boss not to let any hint of irritation show.

In the next sections, we briefly describe these two general classes of emotion regulation, providing a broader context for the age-related changes in emotional experience and social context. Our argument is that there are important differences in the consequences of various forms of emotion regulation, with some forms of emotion regulation being more effective in particular contexts than others. We suggest that the hazards and travails of old age may be more than compensated for by the use of increasingly effective emotion-regulatory strategies.

Response-Focused Emotion Regulation

Response-focused emotion regulation involves attempts to manage the emotion *after* it is underway. Here, powerful emotional impulses already have been recruited, and the individual simply tries to control one aspect or another of the ongoing emotional response. Response-focused emotion regulation often targets control of the behavioral or physiological manifestations of the emotion. It can take the form of minimizing motoric re-

sponses. For example, a person who is angry might attempt to remain very still and to breathe slowly in an effort to quell the emotional response.

Another example of response-focused emotion regulation is suppression, in which one tries to hide ongoing emotion-expressive behavior. Although the literature on emotional suppression has been quite mixed, recent studies have shown that inhibiting ongoing emotion-expressive behavior leads to increased signs of sympathetic activation without providing any relief from the subjective experience of negative emotion (Gross & Levenson, 1993; 1997). This suggests that as a route to alleviating subjective distress, emotional suppression may have little to recommend it. Indeed, inasmuch as emotion-expressive behavior serves social regulatory functions (e.g., alerting others when they have angered us), it may be that suppression has social costs as well. At times, the benefits associated with hiding feelings will outweigh these costs. At other times, however, particularly if we chronically distort or inhibit our emotional expressions, our social partners will be less likely to modify their own offending behavior, and we will be more likely to continue to find our social environment unsatisfactory than if we had expressed our emotions.

At young ages when knowledge goals are prioritized, response-focused emotional regulation is very valuable. It prevents situationally inappropriate emotional expressions from intervening in the pursuit of long-term goals. For instance, a salesperson may need to hide her hatred in dealing with a troublesome customer; a subordinate may need to look interested in meetings hosted by his boss. However, in late life, when most of the life's tasks such as mate selection and career development have been completed, there are fewer reasons to hide one's feelings. Response-focused emotion regulation becomes less useful. Moreover, as the finite nature of life becomes more apparent, being able to maximize immediate emotional rewards from interactions becomes increasingly important. Older people may thus find response-focused emotional regulation less attractive, as it blocks the social regulatory function of emotions while failing to enhance subjective emotional experience.

Very few studies have compared younger and older people on this form of emotion regulation. However, Gross et al. (in press b) recently examined subjective reports of emotional experience and control in subjects representing four highly diverse cultures (Norwegians, Chinese-Americans, African-Americans, European-Americans, and Catholic nuns). A consistent pattern of age differences emerged. Compared with younger participants, older participants reported fewer negative emotional experi-

ences and greater emotional control. Findings regarding emotional expressivity were less consistent, but where there were age differences, older participants reported lesser expressivity. In a study that compared emotional behaviors during discussions of a marital conflict among middle-aged and older couples, Carstensen, Levenson, and Gottman (1995) did not find any age difference in stonewalling, which is considered by Levenson (1994) as an "interpersonal variant of emotional suppression" (p. 277). In addition, there is indirect evidence that older people may not conceal their dispositional tendencies. Malatesta, Fiore, and Messina (1987) asked older adults to report their tendencies to express 10 emotions and then asked them to pose four emotional and one neutral face. They found that the posed expressions were coded as expressing the emotional dispositions, not the emotions that were supposed to be posed. Overall, empirical evidence seems to suggest that older people do not use response-focused emotion regulation more efficiently or more frequently than younger people do. Hence, it is probably not this form of emotion regulation that accounts for the positive profile of emotion in later life.

Antecedent-Focused Emotion Regulation

Antecedent-focused emotion regulation consists of everything that an individual does in order to influence which emotion he or she will have *before* the emotion actually has occurred.

One important form of antecedent-focused emotion regulation is cognitive reappraisal, which is brought into play when the relationship between the person and the situation cannot be changed, either because it occurred in the past or for reasons beyond the control of the individual (Gross, 1997). Instead, the individual reconceptualizes or reframes the situation in such a way to alter its emotional impact.

For example, a woman whose husband has recently died may see the death as representing her husband's final release from pain, as opposed to her loss of a loved partner. A man whose mobility is limited may compare himself favorably to his neighbor who uses a wheelchair. Faced with the experience or anticipation of loss, human beings rely on a rich set of cognitive strategies aimed at self-enhancement, protection, immunization, and repair; and there is good evidence in social and personality psychology that people have remarkable power to rebound emotionally in response to even dire life circumstances (Brickman, Coates, & Janoff-Bulman, 1978). Indeed, unlike suppression, cognitive reappraisal has been

shown in laboratory studies to successfully reduce the subjective experience of a negative emotion (Gross, 1997).

These cognitive processes may be particularly important in old age, and may account for the fact that most older people feel that they are doing better than average. Many theorists have proposed that as biological functioning declines and sociocultural constraints make changing the environment impossible or undesirable in old age, older people may adapt by coping cognitively by changing their standards of comparison (Taylor & Lobel, 1989), changing their interpretations of the events (Heckhausen & Schulz, 1995; Lazarus & Folkman, 1984), changing their self-concepts (Cross & Markus, 1991; Ryff, 1991) and lowering their goal standards (Brandstädter & Greve, 1994).

In fact, in part because people expect old age to be a time of loss, older people often see themselves as faring better than most other people, or surpassing their own expectations of old age. There is empirical evidence that, on an everyday basis, older people engage in relatively more downward and less upward social comparison than younger people (Heckhausen & Krueger, 1993). Whereas upward social comparison may be most adaptive in achievement contexts, downward social comparison may be more adaptive in the service of emotion regulation. For example, it may be more adaptive for a woman who undergoes a mastectomy for breast cancer to compare herself to others who also had cancer and died than to people who did not contract the illness at all (Taylor & Lobel, 1989).

Besides downward comparison, the ability to reframe events, see them from a positive angle, and detach oneself from stressors are likely to be valuable among older people who are trying to cope with declining health and other age-related losses in their limited lifetime. Secondary control also has strong conceptual similarities to this form of reappraisal. There is an age-related increase from young to old age in flexible goal adjustment, as measured by items like, "I usually find something positive even after giving up something I cherish" (Brandstädter & Renner, 1990; Heckhausen & Schulz, 1995). Older people are more likely than middle-aged and young people to endorse statements like "Detachment or cool judgment is my best way to meet most life situations" (Lawton, Kleban, Rajagopal & Dean, 1992). Moreover, they are more likely than younger people to use strategies such as, "Learn to live with infrequent visits" in hypothetical situations that are less instrumental and more emotionally

salient, such as moving to a new town and taking care of an older parent (Blanchard-Fields, Jahnke, & Camp, 1995). When coping styles were examined across a variety of stressful contexts, older people reported less confrontive coping and greater distancing and positive reappraisal as compared with their younger counterparts (Folkman, Lazarus, Pimley, & Novacek, 1987). This form of cognitive coping, in the words of Folkman et al., may help to "short circuit the stress process, so that incidents that might otherwise have been hassles were neutralized" (p. 182).

In addition, adjusting one's self-concept to minimize the difference between the ideal self and the actual self may also become important in later life, as the potential and time for realizing the ideal self diminish. The concepts of identity accommodation and shifting possible selves capture this kind of cognitive processes. Ryff (1991) suggests that when compared with younger people, older people are likely to downwardly adjust their ideal self and to view their past more positively. Older people also report fewer possible selves, and are more likely to report those that are more closely tied to their current selves (Cross & Markus, 1991). Some elderly who have spinal-cord injuries even cope with their disability by stressing the importance of "brain" over "brawn" in defining their lives (Schulz & Decker, 1985). These cognitive processes effectively minimize the discrepancy between the ideal and actual self, making adverse life events more bearable and forestalling the experience of intense negative emotions.

Apart from employing cognitive reappraisal more frequently, there is also evidence that older people may have greater facility with this form of emotion regulation than younger people. Labouvie-Vief, DeVoe, and Bulka (1989) argue that cognitive maturity is associated with improvements in cognitive reappraisal. Older adults are more proficient at contextualizing formal logic and reintegrating logic and affect than their younger counterparts (Labouvie-Vief & Blanchard-Fields, 1982) and are better able to discount delayed rewards than are children or young adults (Green, Fry, & Myerson, 1994).

Old age is associated with losses that may be impossible or very difficult to change. Moreover, with limitations on time, older people may not find it worthwhile to invest considerable energy in changing their environments. Cognitive reappraisal, given its effectiveness in reducing the subjective experience of at least some negative emotions, may be highly adaptive during the last phase of life. However, the power of reappraisal has its

limits. Not all negative events can be reappraised as neutral, not to mention positive. The best way to regulate emotions, then may be avoiding negative events in the first place.

A second form of antecedent-focused emotion regulation, environmental selection, consists of those things we do to actively shape our own social environments, including carefully choosing the social environments in which we place ourselves. While in no way do we negate the usefulness of cognitive strategies in emotional regulation in old age, we do suspect that they are insufficient to account for the degree of positive adjustment we see in older adults. Although such strategies offer excellent defenses against negative experiences when they occur, we argue that proactively structuring the social world such that negative experiences are avoided as much as possible is also necessary. And it is this category of emotion regulation that the social changes postulated by socioemotional selectivity theory emphasizes, in its description of the active pruning of the social network by eliminating more peripheral members and retaining core members. In this fashion, through careful planning, control is exerted, either by limiting exposure to environmental features which potentially provoke strong undesirable emotions, or by increasing one's exposure to events, people, and places that have a high likelihood of inducing positive emotional states. Given the degree to which social contexts influence emotions, the management of social contexts represents an important emotion regulatory strategy.

Differential Consequences of Emotion Regulation

It now has been shown that antecedent-focused emotion regulation such as reappraisal effectively reduces the subjective experience of negative emotion, whereas response-focused emotion regulation such as suppression not only fails to do so, but also has demonstrable physiological costs (Gross, 1997). Although we know of no direct comparison of the two forms of antecedent-focused emotion regulation, we suspect that—in many circumstances—environmental selection may prove even more effective than reappraisal.

Of course, it is likely that there are other important forms of response-focused and antecedent-focused emotion regulatory strategies as well, but even the differences among emotion regulatory strategies sketched here suggest the important principle that *how* we regulate our emotions has profound adaptive consequences. We suspect that aging brings a shift

toward increasingly effective forms of antecedent-focused emotion regulation, so that in old age, individuals regulate their emotions more effectively.

Old age frequently is portrayed as a time of decreasing abilities, but in the domain of emotion, it appears that aging is associated with equivalent or even greater competence. Older subjects consistently report lesser negative emotional experience, as well as greater control over their emotions, than do their younger counterparts (Gross, *in press a*; Lawton et al., 1992). This parallel movement in the subjective experience of negative emotion and perceived emotional control speaks against the possibility that we simply passively endure changes in our social environment. Our preferred interpretation of this finding is that older subjects' greater control of emotion permits them to selectively dampen their experience of aversive negative emotions such as sadness, anger, and fear, possibly through adopting increasingly effective antecedent-focused forms of emotion regulation.

CONCLUSIONS

As people age, their social contexts change dramatically. Often, these social changes are viewed negatively, in terms of loss and abandonment. This suggests that old age should be a time of striking increases in negative emotion, and indeed, when considering age-related shrinkage in our social networks, many theorists predict an increase in negative emotions and a decrease of positive emotions. Surprisingly, this is not what happens. If anything, in fact, there is a decrease in negative emotions and a maintenance or even an increase in positive emotions.

How can this be? In this chapter, we have considered one possible explanation that derives from socioemotional selectivity theory. In this perspective, age-related changes in social context are not suffered passively, but are instead the result of strategic action. We have argued that the selective pruning of more distant associates and the retention of significant social partners serves emotion-regulatory goals. We have distinguished between response-focused and antecedent-focused forms of emotion regulation, and have suggested that as we age, there may be a shift away from response-focused emotion regulation and toward increasingly effective forms of antecedent-focused emotion regulation. In particular, we have argued that the potency of social factors as emotion elicitors

make them attractive candidates for antecedent-focused emotion regulation. Although future research will be necessary in order to assess the relative balance of various emotion-regulatory strategies that are either available or actually employed, we have suggested that old age may very well be a time of enhanced emotion-regulatory success. We suspect that this may be due largely to the increased practice of antecedent-focused emotion regulation in which important aspects of the social context are carefully managed.

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