When the 16th-century English coined the term “emotion,” they could not have chosen a more appropriate etymological origin. Derived from the Latin word *emovere*, meaning to move or displace, emotions mobilize the body to action. Emotional arousal refers to the activation of multiple physiological systems, affecting neurological, cardiovascular, and endocrine functioning. This mobilization places physical demands on the body, as does the regulation of these experiences. Emotion regulation requires an organism to “undo” heightened arousal and return to homeostasis, or baseline levels of physiological functioning.

Psychologists studying lifespan development of emotional processes observe age-related changes in the regulation of emotions that parallel biological maturation. As children and adolescents acquire and develop the abilities to employ impulse control, gain awareness of themselves and others, and achieve mastery over their environment, they also become increasingly effective at describing and regulating their emotions. Brain maturation and patterns of neurological functioning related to emotional processes continue to develop throughout adolescence (Giedd, 2004) with animal studies showing increases into adulthood (e.g., Cunningham, Bhattacharya, & Benes, 2002). In the latter half of the lifespan, however, the role of biological development in emotional experience and regulation is more difficult to discern. Although aging is related to physiological decrements, these declines may paradoxically aid in emotion regulation. In addition, these changes in motivational goals lead to adaptation to physiological changes that, in turn, maximizes emotional functioning.

The following chapter reviews lifespan developmental findings about emotional experience as well as the cognitive processes we hypothesize are related to age differ-
ences in emotion regulation. We first describe the scope of existing literature examining aging, emotion, and emotion regulation and then provide a brief review of this literature. Following, we discuss age differences in the biological processes involved in emotional functioning. Next, we present socioemotional selectivity theory, which posits that motivational goals change across the lifespan such that increasingly greater value is placed on emotional experience with age. After presenting this theory, we review findings suggesting that these motivational shifts lead to differences in social partner preferences, problem-solving strategies, attention, and memory that optimize emotional experience and emotion regulation. We then discuss the importance of individual differences and environmental influences in shaping age-related trajectories of emotional experience. Throughout the chapter we maintain that age-related changes in physiology provide challenges to the aging individual, but individuals adapt to these changes using strategies that maintain and sometimes aid emotion regulation. In conclusion, we offer several future directions in the study of lifespan development of emotional experience and emotion regulation.

THE STUDY OF LIFESPAN DEVELOPMENT OF EMOTIONAL EXPERIENCE AND EMOTION REGULATION

The study of age differences in emotional experience and emotion regulation is relatively new and largely uncharted, and for this reason our chapter covers a diverse set of constructs including affective experience, moods, trait and state affect indices, and coping styles. Few studies examine age differences in regulation of discrete emotions or the enhancement of emotional expression and behavior (cf. Kunzmann, Kupperbusch, & Levenson, 2005). Given the existing literature, we define emotion regulation as low levels of negative affect and high levels of positive affect as opposed to the regulation of discrete emotions (see Gross & Thompson, this volume, for a complete description of emotion regulation). We focus this review on normative aging, a topic which is far from complete yet must be understood completely to comprehend the ramification of diseases, such as dementia and Parkinson’s, on emotional functioning. We then discuss cognitive and social processes that are theoretically linked to antecedent emotion regulation strategies, yet we also recognize that future studies need to tie these processes more directly to emotion regulation. Despite the multiple methods of analysis and varied methodology reviewed in this chapter, we maintain that this collection of studies paints a fairly consistent pattern regarding age differences in affective experience. These findings overturn previous stereotypes that once dominated the zeitgeist of emotion and aging, forcing researchers to address how age differences in emotional experience, cognitive processes, and physiological functioning work in concert to yield relatively preserved if not enhanced emotional well-being in later life.

AGE DIFFERENCES IN EMOTIONAL EXPERIENCE

Emotional Well-Being

Emotional experience, like all psychological phenomena, is dependent on physiological functioning. Early theorists relied on their knowledge of biology when positing that emotional well-being and regulation would parallel biological functioning, peaking in the early 20s and declining thereafter (Banham, 1951). So pervasive were these assump-
tions that few researchers bothered to test these theories, and for many years the portrayal of emotion and aging was bolstered more by conjecture than by empiricism (as argued by Schulz, 1985).

Studies examining age differences in emotional experiences have since dispelled the myth of age-related decline. Older age is not associated with high levels of emotional distress (Kobau, Safran, Zack, Moriarty, & Chapman, 2004); for example, reports of subdromal depression—feeling sad, blue, or depressed within the past 30 days—decrease linearly among increasingly older age groups (Kobau et al., 2004). Self-reported negative affect is lower in older adults than in middle-age and younger adults (Lawton, Kleban, Rajagopal, & Dean, 1992), as are rates of anxiety and major depressive disorder (see reviews by Blazer, 2003; Piazza & Charles, 2006). A longitudinal study revealed a steady decline across young, middle, and older adulthood (Charles, Reynolds, & Gatz, 2001). The only caveat to these findings is a slight age-related increase in depressive symptoms documented in some studies, with such increases, though modest relative to depression levels in young adults, more prominent among octogenarians than septogenarians (see reviews by Blazer, 2003; but see Kobau et al., 2004). Notably, however, age increases in negative affect and depression are eliminated once researchers control for functional limitations and chronic illness (e.g., Kunzmann, Little, & Smith, 2000). Life satisfaction (i.e., a global cognitive assessment of the affective quality of life) follows a longitudinal curvilinear trajectory, with increases throughout early and middle adulthood and highest in the 60s, where it then begins to decline (Mroczek & Spiro, 2005). Importantly, however, life satisfaction ratings for the oldest adults included in the study—people in their 80s—equal those of the youngest adults in their 40s. Positive affect, assessed by self-reported experiences from the prior 30 days, is rated higher for older than younger adults (Mroczek & Kolarz, 1998).

One conceivable explanation for the low levels of distress in older adults is that it reflects a serendipitous consequence of reduced physiological reactivity—that is, an inability to experience emotions. However, emotional experience does not appear flattened or diminished. Though older adults report lower frequencies of negative emotions in daily life, there are no age differences in the reported intensity of both positive and negative emotions once elicited (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000). In controlled laboratory studies that examine emotions when participants relive emotionally charged events, interact with spouses about highly charged conflicts, or watch film clips to elicit emotions, there is little evidence for age differences (Charles, 2005; Levenson, 2000; Levenson, Carstensen, Friesen, & Ekman, 1991; Tsai, Levenson, & Carstensen, 2000). In fact, when different age groups viewed film clips inducing feelings of sadness and threat related to events that are particularly salient for older people, such as nursing home placement or the onset of illness, subjective ratings of negative emotion were highest among the older adults (Kunzmann & Gruhn, 2005).

**Emotional Reactions to Negative Life Events**

Studies examining age differences in peoples’ reactions to negative events reveal additional advantages for older adults. Compared to younger people, older people report better control over emotions (Gross et al., 1997). Considered on their own, the veracity of subjective reports could be questioned. Yet in a study in which adults ranging from 18 to 94 years old were asked to report the emotions they were experiencing five times a day throughout the course of a week, the probability of continuing to feel a negative emotion from one time point to the next decreased with age (Carstensen et al., 2000).
Researchers have also examined distress differences in response to both minor daily stressors, such as interpersonal arguments (Almeida, 2005), and major life events, including coping with loss of physical health, property, and social ties (Folkman, Lazarus, Pimley, & Novacek, 1987; Lichstein, Gatz, Pedersen, & Berg, 1996). Older adults perceive daily stressors as less severe and less threatening than do younger adults (Charles & Almeida, 2005) and report less negative reactivity than younger adults after an interpersonal conflict (Birditt, Fingerman, & Almeida, 2005). When coping with chronic physical health conditions, older age is related to appraising conditions with less blame and hostility (Folkman et al., 1987) and lower feelings of hopelessness in response to chemotherapy treatment (Gil & Gilbar, 2001). These age differences extend to other situations of loss as well: Older adults experienced lower levels of distress than middle-age adults when faced with the damage or complete loss of their homes in a flood (Phifer, 1990), and very old adults reported less stress during spousal bereavement than did their slightly younger counterparts (Lichstein et al., 1996).

Reductions in negative affect may be partially influenced by maturational changes through which people develop perspectives on life that help them appraise events in ways that reduce negativity. For example, older adults are less likely to appraise a stressful event as threatening how others perceive them compared to younger adults (Almeida, 2005). Consistent with this premise, older adults are capable of suppressing their emotions (Kunzman et al., 2005) but engage in this physically and cognitively costly regulation strategy less often than younger adults (John & Gross, 2004).

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**EMOTIONAL FUNCTIONING **
**WITHIN THE PHYSIOLOGICAL DOMAIN **

Emotions are physiological processes, and the first theorists of emotion and aging predicted their statements on age-related biological decline. The findings reviewed previously have overturned assumptions of greater affective distress with age, and now researchers are studying how age-related changes in biological processes may be related to these emotional experiences. Research on the biology of emotion and aging raises arguably as many questions as answers. Biologists are still differentiating normative processes from disease processes, a task made even more difficult by the vast heterogeneity in rates of declines among individuals as well as within an individual across different organ systems (e.g., Rowe & Kahn, 1997). Despite these challenges, studies of biology are necessary to understand how the aging process influences emotional functioning. Next we describe age differences in three biological systems—brain structure and functioning; cardiovascular function, and neuroendocrine activity—and how these changes may be related to emotional experience.

**Brain Structure and Functioning**

Studies of brain morphology reveal age-related reductions in brain volume, with small declines prior to age 50 and more substantial linear declines thereafter (DeCarli et al., 2005). Most brains exhibit cortical gliosis, a scarring that appears as a consequence of neuronal cell death (e.g., Beach, Walker, & McGeer, 1989). Existing neurons often show signs of dysfunction; structural abnormalities reveal themselves in neurofibrillary tangles, and demyelination leads to slower reactivity. Although researchers continue to struggle with distinguishing disease processes from normal age-related declines in the
aging brain (e.g. Small, Tsai, DeLaPaz, Mayeux, & Stern, 2002), it appears that there are normative reductions in brain volume, which involve reductions in both gray and white matter and synaptic density as well as reductions in neurotransmitter levels (see review by Raz, 2000).

Notably, decline is not uniform across and even within specific brain regions; that is, some areas are more affected than others. The limbic system and the prefrontal cortex are brain regions most critical for emotional processes, and they exhibit very different patterns of decline from each other with age (see Mather, 2004, and Raz, 2000, for comprehensive reviews of age-related change in brain morphology and functioning, and Davidson, Jackson, and Kalin, 2000, and Davidson, Fox, and Kalin, this volume, for neurological substrates of emotional experience). The limbic system, including the hippocampus and amygdala, is a group of interconnected structures located in the midbrain. This area, referred to as the old or paleocortex, is seated below the neocortex and is involved in perceiving, encoding, and recalling emotional stimuli. Within the limbic system, aging is related to declines in some areas and relative stability in others. For example, the amygdala, critical for rapid identification and processing of emotional information, is relatively well maintained with age compared to the prefrontal cortex, and age differences only appear in people age 60 and older (Grieve, Clark, Williams, Peduto, & Gordon, 2005; Mu, Xie, Wen, Weng, & Shuyun, 1999). The hippocampus, an area within the limbic system involved in memory consolidation of both emotional and nonemotional material, exhibits normative age-related declines in the dentate gyrus and subiculum subregions, but not in the entorhinal cortex, an area where decline is clearly observed only among cases with dementia (Small et al., 2002).

In contrast to the limbic system, the prefrontal cortex is associated with pronounced decline. Reductions in synaptic density, dendritic arborization, and increases in neurofibrillary tangles are pervasive in the prefrontal cortex (see review by Raz, 2000; DeCarli et al., 2005). The prefrontal cortex responds more slowly to emotional stimuli than the limbic system (e.g., LeDoux, 2000) and is believed to be responsible for higher-order reasoning about emotional experience and behavior. Located at the foremost region of the frontal lobe and including dorsolateral, orbitofrontal (also called the limbic frontal lobe), and mesial prefrontal subregions, this area is important for executive functions—such as planning, inhibition, and social behavior—as well as emotional processing and emotion-related thoughts and behaviors (see review by Davidson et al., 2000). The importance of the prefrontal cortex for emotional functioning is illustrated in clinical case studies (e.g., Phineas Gage, whose easygoing and restrained personality was dramatically altered after damage to the prefrontal cortex and later characterized by aggressive tendencies and impulsive, uninhibited behavior) (Davidson et al., 2000).

**Beyond the Brain: Cardiovascular and Neuroendocrine Functioning**

The brain sends messages about emotional stimuli via the peripheral nervous system to activate multiple systems, including both cardiovascular and neuroendocrine processes. Heart rate increases and the epithelial cells lining the vasculature either constrict or dilate in response to an arousing stimulus. Although this overall pattern of reactivity is observed at all ages, reactivity is reduced among older adults (Cacioppo, Berntson, Klein, & Pochmann, 1997), which likely has a biological basis. For example, epithelial cells increase in rigidity with age (Berdyeva, Woodward, & Sokolov, 2005), and greater rigidity in the cells lining the vasculature translates to a slower arousal response. In fact,
age-related reductions in cardiovascular activity are often more pronounced than age-related changes in other physiological processes (Cacioppo et al., 1997). When people are placed in socially evaluative situations, however, older adults display greater cardiovascular reactivity than do younger adults (Uchino, Holt-Lunstad, Bloor, & Campo, 2005).

The neuroendocrine response portrays a similar story of reactivity with age. The perception of either a real or imagined threat activates a cascading neuroendocrine response along the hypothalamic–pituitary–adrenal (HPA) axis. This system mobilizes the body for action through a series of reactions beginning in the brain and ending with the release of cortisol by the adrenal glands. Although cortisol is a necessary hormone for physiological survival, prolonged elevations of cortisol levels can lead to deleterious physiological effects, including immune dysfunction and glucose intolerance (see review by Sapolsky, this volume).

In both human and animal models, cortisol reactivity in response to psychological and physical stressors is prolonged with age, such that returning to baseline levels takes longer with age (see review by Björntorp, 2002; Otte et al., 2005). According to the glucocorticoid cascade hypothesis, this slower recovery of the HPA axis results from an age-related reduction in receptors located in the hippocampus that are responsible for the inhibition of activity along the HPA axis (Sapolsky, Krey, & McEwen, 1986). Thus, inhibitory failures may be related to greater reactivity among older adults, causing a prolonged elevation of cortisol in response to stress among older adults relative to younger adults.

**Integrating Physiological Changes and Emotional Experience**

Considered along with findings from studies of functional brain imaging (as opposed to studies of brain morphology), a consistent picture begins to emerge across both physiology and experiential data. Brain activation in response to emotional stimuli shifts throughout childhood and into early adulthood toward less activation in the amygdala and greater activation of the prefrontal cortex (Giedd, 2004). Comparing brain activity when people view emotional images, the same age-related shift away from activity in the amygdala and toward activity in prefrontal cortex is found when comparing younger and older adults (Gunning-Dixon et al., 2003). Gunning-Dixon and colleagues commented that the increased reliance on frontal regions was puzzling given that age-related decline is greatest in the prefrontal cortex. Other researchers, however, have explained differences in amygdalar activation in terms of an age-related increase in motivations to regulate emotional experiences (Mather et al., 2004). We know that conscious thought processes reduce amygdalar activation when participants actively strive to regulate negative emotions (Schaefer et al., 2002). Mather et al. (2004) speculate that subconscious changes in motivation also influence activation. Behaviorally, older adults display attentional preferences for positive over negative emotional images (Mather & Carstensen, 2003) and also show heightened amygdalar activity that is greater when viewing positive than negative images (Mather et al., 2004).

The similar intensity for emotional experience discussed earlier (e.g., Carstensen et al., 2000) may also result from activation of different brain regions by age; for older adults, the prefrontal cortex may be largely responsible, but for younger adults, the amygdala may play a greater role in emotional experience. Because the amygdala is involved in the physiological stress response to emotional stimuli (e.g., LeDoux, 2000), this shift from amygdalar to prefrontal cortex activation may be the reason that physiol-
ogy is attenuated with age even if appraisals of these emotions are similar across age groups. Although neuroendocrinological and cardiovascular response to stress may be prolonged in aging, lower amygdalar activity relative to the prefrontal cortex may slow or decrease the likelihood of activation of the HPA axis in response to stress.

In addition to changes potentially influenced by motivational differences, serendipitous effects of physiological and neurological changes with age should not be dismissed as playing no role in improved regulation. Decreases in synaptic density and neurotransmitters as well as slowed cardiovascular response may at times aid emotion regulation. Older adults exhibit reduced cardiovascular activity in response to relived emotions (Levenson et al., 1991) and to films eliciting happiness (Tsai et al., 2000). Cardiovascular reactivity is also attenuated among older adults when involved in conflicts with their spouses (Levenson, Carstensen, & Gottman, 1994) and when viewing negative pictures (Smith, Hillman, & Duley, 2005). Moreover, cardiac reactivity is lower for older adults when recalling autobiographical memories arousing both negative and positive emotions (Labouvie-Vief, Lumly, Jain, & Heinz, 2003; but see Kunzmann & Gruhn, 2005). Overall, older adults exhibit reduced reactivity, and this reduction has been hypothesized to be one reason why older adults regulate their emotions better than younger adults (Cacciopo et al., 1997; Levenson, 2000).

Socioemotional Selectivity Theory

Socioemotional selectivity theory (SST) is a lifespan theory of motivation that offers a conceptual framework to organize and integrate findings noted earlier or into a coherent model of emotional development. SST is grounded fundamentally in the uniquely human ability to monitor time and to adjust time horizons over the life course (see Carstensen, Isaacowitz, & Charles, 1999). At conscious and subconscious levels, this ubiquitous accounting of time guides the relative importance of two constellations of goals that dominate human thought and behavior. One set of goals includes knowledge and information-based goals and is prioritized when time is perceived as expansive. With a long future ahead, accruing knowledge is valued for its potential to inform future pursuits and enable strivings for future payoffs. The other constellation of goals includes those focused on emotions, encompassing motivations to derive meaning in actions, optimize emotional experiences, and invest in activities for their emotional significance. When time is perceived as limited, people will forego knowledge-related goals that are directed for future use and instead focus on more proximal, emotion-related goals. Often these goals conflict and priorities must guide behavior. For example, spending time trying to discover ways to solve problems in a relationship to avoid future conflicts, or foregoing an evening with friends to gather information pertaining to a financial investment, is an example of knowledge-related goals overriding emotion-related goals. Of course, life activities and motivations are difficult to dichotomize, and uniformly defining them as either information related or emotion related paints an overly broad swathe over multiple activities. An emotional goal can contain informational qualities, and information related goals can be emotionally gratifying. The relative importance of emotional and information goals is always present and measured, however, and people direct their attention and energies on goals based on the emotional and informational significance they provide.

Because time perspective is inherently linked to place in the lifespan, growing older is accompanied by an increasing awareness of the ephemeral nature of existence: As a
result, emotional goals increase in relative importance to knowledge-related goals as people age. The theory maintains that people become increasingly selective in their choice of social partners as they age to make their social interactions become more emotionally meaningful and satisfying, a strategy of antecedent emotion regulation. The theory also suggests that people allocate more effort to maintaining emotional balance, attempting to improve important relationships, accepting small disagreements as not worth the effort, and using experience-based skills to manage social relationships well. Yet, the theory also maintains that motivational shifts operate at a subconscious level by directing attention to positive and away from negative information. In other words, according to socioemotional selectivity theory, motivational shifts that occur with age result in cognition operating in the service of emotion regulation.

One central postulate of socioemotional selectivity theory was tested in the context of social interaction. New friendships take time to develop, and investing the time necessary to gain information about this person is beneficial when cultivating this friendship for long-term benefits. Close friends and family members offer less new information and new opportunities but more immediate affirmation and emotional connection. Recognizing how different social interactions yield different benefits, Carstensen (1992) interpreted the well-established age-related decline in social interactions as neither an inability by older adults to make new friends (e.g., Maddox, 1963) nor a strategy for older adults to disengage from social interactions (e.g., Cumming & Henry, 1961) but as the result of older adults selectively pruning certain types of social partners from their networks based on their current life goals. Whereas social interactions with close friends and family members would be prioritized and remain a vital part of their life, new friends and acquaintances would not be as highly valued or sought after as people grew older. These patterns of relationships were found in both longitudinal (Carstensen, 1992) and cross-sectional (Lang & Carstensen, 1994) studies. Furthermore, social preferences were related to emotional and informational goals as postulated by SST; older adults weighted emotional goals more heavily in their preferences for social partners, whereas younger adults more heavily weighted the potential for knowledge and future-related possibilities (Fredrickson & Carstensen, 1990; Lang & Carstensen, 2002). Time perspective, defined as how much time people perceived was left in their lives and measured by asking people questions such as the extent that they feel that they have a long future ahead of them, or that time is running out, influenced the weighting of these goals; an open-ended time perspective was related to information and knowledge-related social goals, and a limited time perspective was related to emotion-focused social goals (Lang & Carstensen, 2002).

SOCIAL PARTNERS AND EMOTION REGULATION

SST makes specific predictions regarding how age-related changes in social partner preference and interactions serve emotion regulatory goals. In fact, Carstensen, Gross, and Fung (1997) argued several years ago that age-related improvements in well-being could be accounted for by the antecedent emotion regulation strategy of situation selection (see also Gross & Thompson, this volume), whereby older adults more often avoid socially toxic environments than do younger adults. Older people have smaller and more carefully pruned social networks than younger people do, and they contain relatively larger percentages of emotionally close social partners than younger peoples’ networks. Well-known social partners offer interactions that are more predictable and reaf-
firm the self (Pasupathi, 2001), perhaps explaining why older women report more stable self-descriptions of themselves than do younger women (Charles & Pasupathi, 2003). Younger people's networks, by way of contrast, often include many social partners who were not chosen freely but rather are incorporated because of relationships to work or offspring (Lang & Carstensen, 1994; Lansford, Sherman, & Antonucci, 1998). Thus, with age social networks probably become easier to navigate emotionally. Because most strong emotions occur in social contexts, careful selection of social partners is arguably a highly effective strategy.

Because goals influence thoughts and behaviors, socioemotional selectivity posits age-related differences in emotion regulation strategies when faced with interpersonal conflict, such that older adults will engage in strategies aimed at maintaining emotional well-being. As a result, socioemotional selectivity posits that older adults will engage more often in situation modification when interacting with close friends and family members, whereby they will opt for more passive strategies aimed at emotion regulation as opposed to more active strategies aimed at discovering more information about the problem. Findings support this tenet, showing that older adults more often report emotion-focused, passive strategies in response to highly emotional interpersonal conflict situations (Birditt & Fingerman, 2005), but not for problems related to consumer issues or home repairs compared to middle-age adults (Blanchard-Fields, Chen, & Norris, 1997; Blanchard-Fields, Jahnke, & Camp, 1995; Blanchard-Fields, Stein, & Watson, 2004). In contrast, middle-age adults opt for strategies to solve interpersonal problems that focus on problem-solving, a strategy that often includes gathering facts about the problem and sorting out details to find solutions for the dilemmas.

EMOTIONAL EXPERIENCE AND REGULATION BEYOND INTERPERSONAL INTERACTIONS

Emotional Salience

SST posits not only differences in social partner preferences and interactions but also specific patterns of emotional experience as a function of time perspective, and therefore age as well (Carstensen, Fung, & Charles, 2003). The salience of emotional information is posited to increase among successively older age groups and extend beyond the confines of social interactions. In a study examining memory for emotional and nonemotional material, individuals ranging from teenagers to octogenarians read a passage from a novel and were later asked to recall as much of the information that they could (Carstensen & Turk-Charles, 1994). Findings from this incidental memory paradigm indicate that the proportion of emotional information increases linearly as a function of age. In addition, emotional saliency is greater with age when recalling autobiographical information (Alea, Bluck, & Semegon, 2004). Older adults also recall emotional details of prior information more than perceptual details (Johnson, Nolde, & De Leonards, 1996; Mather, Johnson, & De Leonards, 1999), and they weight this information more heavily when making confidence ratings for their memory performance (Hashtroudi, Johnson, & Chrosniak, 1990).

Further evidence of greater emotional saliency with age is found in studies examining everyday problem-solving strategies. Older adults weigh the emotional saliency of a problem more strongly before selecting a problem-solving strategy than do younger adults, choosing different strategies for highly emotional situations than low emotional situations (Blanchard-Fields et al., 2004; see review by Blanchard-Fields, 1997). In daily
problem-solving situations, older adults prefer both problem-solving and emotion-focused coping strategies and view them as both effective, whereas younger and middle-age adults prefer and perceive problem-solving strategies as most effective (Watson & Blanchard-Fields, 1998). In a problem-solving task in the laboratory, older adults rely more heavily on emotional information whereas younger adults rely on memory and learning (Wood, Busemeyer, Kolding, Cox, & Davis, 2005). Despite these very different strategies, both age groups successfully complete the task.

In addition to increased emotional saliency with age, SST posits that emotion regulation will become increasingly valued as time grows shorter (Carstensen et al., 2003). As a consequence, motivations to appraise situations more positively, focus on positive information, and remember this information in ways that optimize well-being grow stronger with age. Older adults are not blind to negative information—they focus on negative information and are able to detect negative information sometimes as well as younger adults (Mather & Knight, 2006), but they are less likely to focus on this information and to recall this information later, using the emotion regulation strategy of attention allocation to focus more on positive than negative stimuli. Negative information is favored over positive information in youth, a bias that shifts in adulthood. This developmental shift in the ratio of positive to negative is referred to as the “positivity effect” (Carstensen & Mikels, 2005; Carstensen, Mikels, & Mather, 2006; Mather & Carstensen, 2005).

**Age-Related Advantages of Selective Attention**

SST posits that increases in emotional saliency will lead to differences in attention for emotional information, particularly for positive information. According to the theory, older adults will engage in attention allocation toward positive information as an emotion regulation strategy more often than do younger adults. In one study, individuals were placed before a computer screen as two faces, one with a neutral expression and another with either a positive or negative expression, were presented on the left and right of the screen. After this 1-second presentation, a dot flashed on either the left- or right-hand side of the screen and the participant was asked to identify where the dot had appeared (Mather & Carstensen, 2003). Older adults responded more slowly when the dot was placed in the position of the previously viewed negative facial expression and more quickly when the dot followed a positive facial expression. Response time for younger adults was unaffected by the valence of the facial expression. The authors interpreted their findings as an age-related positive bias; older adults, more focused on the positive faces, had faster response times when the dot flashed in the position where they had focused their attention. In another study of more effortful attentional processing, younger and older adults read positive and negative information about two different automobiles and were asked to choose between them. When viewing these options, older adults spent a greater proportion of time on the positive aspects and a lower proportion of their time focused on the negative aspects than did younger adults (Mather, 2006). Other studies of attention, memory, and aging do not display a positivity effect, particularly studies that require rapid automatic processing (see review by Mather & Carstensen, 2005). Researchers posit that this discrepancy in the literature only highlights the motivational aspect driving age differences in effortful processing (Mather & Carstensen, 2005); motivations influence effortful processing more than automatic processing, and age differences for effortful processing suggest greater priority on emotion regulation with age.
These changes in attention cannot be dismissed as simple denial of negative stimuli. In studies published by Hess and colleagues (see review by Hess, 2005), older people show particular sensitivity to negative information about people. When descriptions of prospective social partners are presented and participants are asked to make judgments about them, older adults rely more heavily on the negative information than do younger adults (Hess & Pullen, 1994). Even when positive information about a person is subsequently presented, older peoples' views change little. One could view such judgments as a protective mechanism whereby older adults avoid contact with risky strangers or acquaintances. Interestingly, older adults are least likely to change negative views when characteristics concern a person's morality and more likely to modify views when information pertains to intelligence. For example, older people are unlikely to modify their views of a cheater if told that the person later behaved in an honest manner. In contrast, they are relatively more likely to modify their opinions about a person who first appeared unintelligent but later displayed some degree of intellectual acumen (Hess, Bolstad, Woodburn, & Auman, 1999). Moreover, when older participants are told that they would later share their impressions with another person, thereby making them interpersonally relevant, the information is better remembered (Hess, Rosenberg, & Waters, 2001).

Studies of source memory reveal a consistent pattern, suggesting that attention allocation is motivated by goals directed toward antecedent emotion regulation. When older people are asked to source information related to an interpersonally relevant characteristic (e.g., Was the source honest or dishonest?), they perform better than when asked to source information according to gender (e.g., whether the person who provided the information was male or female) (Rahhal, May, & Hasher, 2002). In fact, when source is focused on an interpersonally relevant characteristic, older people perform as well as younger people. Overall, this pattern of findings suggests that older adults pay attention to information that holds emotional relevance, which in and of itself may aid emotion regulation.

**Further Evidence of Memory as an Emotion Regulation Tool**

Memory for emotions are related to current emotional states (see review by Levine & Pizarro, 2004). To the extent that memories influence current and future thoughts and behavior, memory is a powerful regulation strategy. Just as older adults selectivity attend to positive emotional stimuli in studies of attention, they also are more likely to attend to memories that are more positive relative to younger adults. Regardless of the exact mechanism, this shift in valence toward positive information with age has been documented in studies examining memory for life events as well as memory for laboratory stimuli. Memories of events become more positive over time in younger people (Field, 1981), but the strength of this effect increases with age (Kennedy, Mather, & Carstensen, 2004). These same age differences hold true for shorter periods of time as well. For example, one study compared daily reports of affective distress reported over the course of the week to an overall week-end evaluation of overall emotional distress among adults ranging from 25 to 74-years-old (Almeida, 1998). Whereas younger adults were more likely to anchor their overall weekly reports on the most stressful day, older adults' retrospective reports were more similar to the average rating across the aggregated 8 days and were thus more positive as well as more accurate as an aggregate measure of well-being.

Laboratory studies underscore the shift toward events being remembered more positively with age. In one study, younger, middle-age, and older adults were shown pos-
itive, negative, and neutral images on a computer screen and were later asked to recall and to recognize these previously viewed images from a larger set of images (Charles, Mather, & Carstensen, 2003). Younger adults recalled and recognized a greater proportion of negative images than positive or neutral images, confirming a bias for negative stimuli documented previously among younger adults (see review by Rozin & Rozyman, 2001). Older adults displayed no such negative bias, resulting in age differences that were greatest for negative images and least for positive images (Charles et al., 2003). This age-associated shift toward positive emotion was also found in a study examining age differences in recall and recognition for positive, negative, and neutral words and faces (Leigland, Schulz, & Janowsky, 2004).

Benefits of these age-related differences in memory are highlighted in another study where older and younger adults were read both positive and negative qualities of two items (e.g., two homes) and asked to choose one of the two items. After making their selection, they were given a memory task about these two options. Older adults were more likely to have a choice-supportive memory, whereby they remember the positive qualities of the option they chose and the negative qualities of the unselected option (Mather & Johnson, 2000). The authors interpret this memory bias as beneficial for increasing the happiness of a chosen selection and reducing possible “buyer’s remorse.” In another study in which older and younger adults examined positive and negative features of two choices (two apartments or two health plans), older adults were more accurate at later recognizing the positive feature than the negative features of these options, whereas younger adults correctly recognized positive and negative aspects equally (Mather, Knight, & McCaffrey, 2005).

**Physiology, Cognition, and Emotion**

Older age is related to changes in memory and attention that serve emotion regulation, yet the biological underpinnings of these processes as well as cognitive studies examining overall memory performance often point to cognitive decline (Craik & McDowd, 1987). Working memory is vital for emotional functioning and planning, as working memory allows an individual to focus on the potential for rewards and enhance goal-seeking behavior (Davidson et al., 2000). Age-related declines are evident in situations requiring working memory. For example, age differences are marked in neuropsychological tasks such as the Stroop test or the Wisconsin Card Sort, tasks that suffer from declines in inhibitory processes (Zacks & Hasher, 1997; Wurm, Labouvie-Vief, Aycock, Rebucal, & Koch, 2004).

Age declines in these inhibitory processes, however, show different patterns according to the emotional qualities of the material. In a study examining automatic processing using the Stroop paradigm, highly arousing emotional stimuli affected the performance of older adults to a relatively greater degree than low arousal information (Wurm et al., 2004). For younger adults, arousal did not predict performance. The authors posited several interpretations for this difference, including higher arousal information having a greater ability to disrupt cognitive performances among people with already low levels of capacity. Another interpretation suggested by the authors, however, is that older adults are more motivated to avoid highly arousing emotional information (Wurm et al., 2004) to improve emotion regulation. This explanation is consistent with self-reports from older adults that highly arousing emotions are experienced less frequently with age (Lawton et al., 1992).
Other inhibitory failures at the physiological level may also relate to memory for emotional material. Researchers have often considered emotional material irrelevant, and the memory of emotional features over other details an example of poor inhibitory processes (Hashtroudi et al., 1990). Benefits may exist, however, in processing this seemingly extraneous information (for a review, see Isaacowitz, Charles, & Cartensen, 2000). In a study of visual motion processing, researchers found that age-related reduced inhibition resulted in older adults outperforming younger adults in tasks requiring motion discrimination of stimuli with high-contrast patterns, a task when inhibition usually impairs performance (Betts, Taylor, Sekuler, & Bennett, 2005). Failure to focus on small perceptual details enabled older adults to make more accurate judgments when examining the object in its entirety. Although researchers studied these effects in visual processing, this phenomenon holds interesting possibilities for processing emotional information. Older adults, compared to younger adults, often describe emotional information in terms of a “bigger picture,” recalling and interpreting text using psychological themes and metaphors more than narrative details (Labouvie-Vief & Hakim-Larson, 1989; Adams, Smith, Nyquist, & Perlmutt, 1997) and discussing more evaluative and subjective information when describing their vacations rather than the itinerary (Gould & Dixon, 1993). These age differences have been interpreted as examples of inhibitory failures—failures to inhibit “irrelevant” emotional information—characteristic of aging (Persad, Abeles, Zacks, & Denburg, 2002). The vision researchers likewise saw inhibitory failure as ubiquitously negative, until they recognized advantages for the incorporation of seemingly irrelevant information when adopting a different viewpoint. Perhaps attention paid to multiple aspects of a situation may also hold positive consequences for higher-order emotional processing as well. For example, older adults consider emotions during decision-making tasks to a greater extent than do younger adults (see review by Blanchard-Fields, 1997), so perhaps these inhibitory failures allow older adults to consider a broader range of information, including information previously considered irrelevant.

**Age Differences in the Environmental Context of Emotional Experience**

SST posits that older adults proactively engage in behaviors directed at situation selection, situation modification, and attention allocation that serve antecedent emotion regulation purposes. Some researchers, however, have argued that greater well-being among older adults may not illustrate the ability to regulate emotions but instead reflect differences in environmental contexts, such that older adults find themselves in situations in which negative experiences occur less frequently (Lawton et al., 1992; see review by Lawton, 2001).

Findings from twin studies provide information on the powerful roles of the environment in shaping emotion-related phenotypes and how the strength of environmental influences may change with age. In behavioral genetic research, environmental influences refer not only to the situation and events completely external to the individual but also to the experiences, cognitive styles, and other internal processes that have developed over time. Researchers have found that both genetic and unique environmental influences are important for emotional experience but that the unique environmental variance for both emotional well-being (Neiss & Almeida, 2004) and the perceived severity of negative events (Charles & Almeida, 2005) is stronger among older
than younger adults. The environment—not genes—determines individual differences to a greater extent among older adults than younger adults. In addition, genetic influences on emotional experience exert a weaker role for those with physical health problems and functional limitations, and thus higher prevalence rates of chronic health problems among older adults may play a role in these age-related environmental influences (McGue & Christensen, 2005).

Behavioral genetics research underscores the importance of examining individual variation in human behavior and emotional experience. Older adults represent a heterogeneous group, and the mean differences mentioned throughout this chapter belie the vast differences observed among older adults populations. For example, Charles et al. (2001) found that declines in subjective reports of negative affect did not occur among people scoring high in neuroticism, and Mroczek and Spiro (2005) found that people higher on neuroticism were more likely to show declining life satisfaction in old age. Thus, there may be some personality types for whom emotional experience does not benefit from aging. Other people may vary in their awareness of time left in life, and thus their time perspective may not align with their chronological age. Indeed, terminally old younger adults look more similar to older people than their peers when evaluating potential social partners (Carstensen & Fredrickson, 1998).

Trajectories of physiological reactivity to emotional experiences also reveal different patterns based on environmental context, again displaying the great variability that characterizes old age. For example, a recent study (Traustadottir, Bosch, & Matt, 2005) found that although aging is related to increased cortisol reactivity to a stressor (e.g., Sapolsky et al., 1986), this increased reactivity is only observed among women who perform poorly on a treadmill task. Older women who exercise and are physically in shape, as assessed by maximum oxygen consumption during a treadmill test, do not vary in their HPA reactivity compared to younger women; among younger women, physical fitness had no relationship with cortisol reactivity. Because physical fitness influenced physiological reactivity among older adults but not younger adults, exercise and other health-promoting behaviors may play a stronger role in emotional experience and emotional reactivity with age.

Environmental influences provide pathways in which processes related to emotional experience may be modified both negatively, as in the case of poor health, or positively, as in the cases of exercise. They also, however, influence the context of these emotional experiences. Lazarus (1996) emphasizes the importance of focusing on the changing contexts of coping rather than orthogenetic factors that may have a developmental trajectory. For example, in a study in which he and his colleagues compared adult ages 35–45 years old to those 65–74 years old, they found that the younger adults were predominantly working parents whose daily stressors revolved around work and parental roles (Lazarus, 1996). In contrast, the older sample was comprised predominantly of retired people whose children were grown and no longer living with them. Instead of work and childrearing stressors, older adults discussed problems around their health and ability to carry out functional activities of daily life. When comparing coping responses across the age groups, younger adults rated their stressors as more controllable and used more problem-focused strategies compared to the older adults. In viewing these results, Lazarus interpreted age differences not in terms of developmental process or biological mechanisms but instead as a reflection of having to cope with a different set of issues and life circumstances. Thus, understanding age differences in environmental context, such as social network composition, is vital for understanding age differences in emotional experience.
FUTURE DIRECTIONS AND CONCLUSIONS

Empirical findings amassed over the past 30 years have dramatically changed the landscape of research on emotion and aging. Among healthy adults, emotional experiences and emotion regulation do not decline across the lifespan but instead are well maintained and sometimes show areas of improvement. The previous chapter provides a brief overview of emotional experience and emotion regulation in the context of physiological, cognitive, and social age-related changes. Although findings consistent with the tenets of socioemotional selectivity reveal age differences in processes of attention and appraisal, future studies will need to link these processes directly to emotion regulation. Research in emotion and aging only began in earnest near the end of the 20th century, and studies of discrete emotions and specific emotion regulation strategies are necessary to clearly understand developmental trajectories in emotion regulation. Researchers need to examine response-focused regulation styles and include maintenance, exacerbation, and attenuation of emotional experience in their investigations. For example, attenuated physiological reactivity may paradoxically aid in the down-regulation of negative emotions (e.g., Levenson, 2000), but this attenuated arousal may pose a disadvantage to older adults if they need to increase positive emotions.

In addition to understanding age differences in both downregulation and up-regulation in emotional experience, researchers must face a number of methodological issues that could potentially confound age differences. First, the arousal of emotional stimuli is important to consider when examining age differences (Wurm et al., 2004), as is the complexity of emotional stimuli (Charles, 2005). Second, age differences in both emotional experience and emotion regulation may vary for discrete emotions. For example, no large study to date has reported increases in levels of anger with age, but several studies find age differences related to increases in reports of sadness (e.g., Gatz, Kasl-Godley, & Karel, 1996). In addition, cognitive tasks have revealed age similarities for some emotional stimuli but age differences in others. For example, older adults performed worse than younger adults on a facial recognition task for the emotions of anger and sadness but equally well when recognizing expressions of fear (Phillips, MacLean, & Allen, 2002). A third methodological issue that frequently arises in lifespan developmental research is the issue of cohort effects. Cross-sectional research points to potentially interesting suggestions of developmental phenomena, but only longitudinal research can confirm developmental processes postulated by socioemotional selectivity theory.

Besides making methodological refinements to existing paradigms, new innovations and findings provide a framework on which to launch future research programs in the area of emotion and aging. For example, functional imaging studies of brain activity have allowed researchers to examine the relations between cognition and brain activation and how experience shapes this relationship. Studies in cognitive neuroscience have the potential to disentangle normative and nonnormal biological-related decline as well as changes that occur as a result of motivational strivings. Understanding these processes will provide further insight into how changes in cognitive appraisals alter the processing of emotional stimuli and how these associations are related to age. A second innovation that will shape the future of psychological science is the growing area of health psychology and new techniques allowing for convenient and affordable assessments of cardiovascular, neuroendocrine, and immunological responses in the laboratory and in daily life. With these studies of physiological stability and reactivity,
researchers will be able to examine how cognitions and behaviors are related to the physiological arousal and reactivity accompanying emotional experience.

Finally, psychologists have long recognized the importance of the environment in shaping behavior (see review by Hess, 2005), but relatively few studies have recognized the importance of context when interpreting age differences. Although notable exceptions exist, such as studies examining age differences in social cognition (e.g., Blanchard-Fields et al., 2004; Hess, 2005) and in health-related contexts (e.g., Consedine & Magai, 2006), further studies are needed to understand how similar behaviors or cognitions may have different outcomes according to age-specific contexts. For example, passive emotion regulation strategies may be compensatory strategies in some situations but optimal solutions in others (e.g., Folkman & Moskowitz, 2000). In addition, even when situations are controlled in the laboratory, perceptions are guided by experiences, and these experiences may alter the meaning and interpretation of emotional stimuli. A picture of an operation, for example, may elicit more sadness in older adults but more disgust among younger adults (e.g., Kunzman et al., 2005). The death of a parent is often speculation for a college student and a reality for an older adult. To this end, the study of emotions and aging is a study of how people’s cognitions and behaviors shape, and are shaped by, the interplay between physiological processes and the environment across the lifespan. As a result, researchers need to be sensitive to these changing dynamics.

In conclusion, emotions mobilize people to action. They arouse physiological systems, direct attention, and motivate people to action. Emotions are critical for successful adaptation across the lifespan, but developmental processes alter multiple facets of emotional experience, including cognitive appraisals, behavioral responses, physiological reactivity, and environmental context. Research in emotion and aging has revealed that shifts in cognitive processes can offset physiological declines, such that even though biological functioning peaks relatively early in life, emotional experience remains vital and well maintained into late adulthood.

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