

# At the Intersection of Emotion and Cognition

## Aging and the Positivity Effect

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**ABSTRACT**—*Divergent trajectories characterize the aging mind: Processing capacity declines, while judgment, knowledge, and emotion regulation are relatively spared. We maintain that these different developmental trajectories have implications for emotion–cognition interactions. Following an overview of our theoretical position, we review empirical studies indicating that (a) older adults evidence superior cognitive performance for emotional relative to non-emotional information, (b) age differences are most evident when the emotional content is positively as opposed to negatively valenced, and (c) differences can be accounted for by changes in motivation posited in socioemotional selectivity theory.*

**KEYWORDS**—*aging; emotion; cognition; memory; attention*

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One of the most interesting discoveries in basic social science in recent years is that human aging, long thought to be characterized by intractable and steady decline, is a more complex and more malleable process than was initially presumed. Arguably even more interesting than the weaknesses are the relative strengths that older people display, making clear the potential resource that the growing older population offers. Findings provide remarkably convergent evidence that self-regulation, especially of emotional functioning, is spared from age-related decline, if not enhanced with age (Charles & Carstensen, 2004).

This pattern stands in contrast to the one characterizing many aspects of cognitive aging. A substantial body of literature documents age-related declines in abilities and processes that are effortful, deliberative, and resource-intensive. Processing speed declines with age, as do working memory (the short-term maintenance and manipulation of information), free and cued recall from long-term memory, source memory (memory for the source

or context of information rather than the information itself), selective attention, effortful divided attention, mental imagery, as well as reasoning and problem solving. The fact that gains in emotional functioning occur against a backdrop of well-documented declines in effortful cognitive processing raises intriguing questions about potential developmental changes in domains that draw heavily on both emotional and cognitive processes. In fact, these opposing trajectories map perfectly onto the two core sets of strategies centrally involved in decision and judgment: intuition, which involves relatively fast automatic processing that often draws on emotion; and deliberative reasoning, which is relatively slow, controlled, and effortful (Kahneman, 2003). Given the critical role that these strategies play in daily life, age-related changes in basic cognitive and emotional functions may have important consequences in the lives of older adults. Yet, with few exceptions, researchers of aging have studied either emotional or cognitive processing and not both. To the extent that functioning is maintained in one domain and degraded in another, abilities preserved in one area could be recruited to bolster other, weakened areas. Thus, although emotion–cognition interaction issues are important for all of psychology, they are especially important for the study of aging.

The work we describe below is grounded in socioemotional selectivity theory, a life-span theory of how time horizons shape human motivation (Carstensen, Isaacowitz, & Charles, 1999). We first describe the theory and then return to issues concerning the intersection of emotion and cognition.

### SOCIOEMOTIONAL SELECTIVITY THEORY

According to socioemotional selectivity theory, goals are always set in temporal contexts. When people perceive time as expansive, as they typically do in youth, they tend to focus on preparing for the future. They value novelty and invest time and energy in acquiring information and expanding their horizons. In contrast, when people perceive boundaries on their time they direct attention to emotionally meaningful aspects of life, such as the

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desire to lead a meaningful life, to have emotionally intimate social relationships, and to feel socially interconnected.

Because old age heralds a natural ending, socioemotional selectivity theory predicts age-related changes in motivation. Importantly, however, the theory does not hold age itself as causal; similar changes in motivation are observed in younger people suffering from life-threatening illnesses (e.g., Carstensen & Fredrickson, 1998). However, because of the strong association of advanced age and mortality, age differences in motivation emerge.

Socioemotional selectivity theory posits that people place increasing value on emotionally meaningful goals as they get older, and invest more cognitive and social resources in obtaining them. This shift in motivation toward emotional goals promotes emotion regulation (control over the emotions that an individual experiences and expresses). To the extent that people are motivated to prioritize goal-relevant information, attention to and memory for emotional information is expected to vary by age.

### MOTIVATION, EMOTION, AND COGNITION

Plasticity in cognitive performance has been well documented. Until recently, however, the degree to which motivation systematically influences cognitive performance in the elderly was not fully appreciated. Recent findings—from a number of research laboratories—demand qualifications about the degree and the specificity of age-related memory decline. Hasher and her colleagues, for example, found that memory performance in older and younger adults was equivalent when testing instructions stressed “learning” instead of “memory,” suggesting that the former instruction motivated older adults whereas the latter did not (Rahhal, Hasher, & Colcombe, 2001); and despite considerable evidence for age-related deficits in source memory, older people performed significantly better when questions about the source of the information to be remembered concerned emotionally significant characteristics of people than when questions concerned the gender of the person (Rahhal, May, & Hasher, 2002). Although alternative explanations for this difference remain—for example, there may be differential atrophy in neural substrates involved in emotional and non-emotional processing—experimental findings suggest that motivation is an important factor.

We postulated that if people increasingly prioritize emotion regulation as they get older, their cognitive processing of emotional material may remain relatively intact compared to their processing of other types of material. There was some indication in the literature that this was so. In studies of memory for real and imagined events, for example, Johnson and colleagues had reported that older people recalled relatively more information about their own thoughts and feelings than about perceptual and contextual details (Hashtroudi, Johnson, & Chrosniak, 1990).

Our research team began to systematically test hypotheses about age differences in memory for and attention to emotional material. Our initial studies drew on the memory and persuasion literatures, which show clearly that people are more likely to

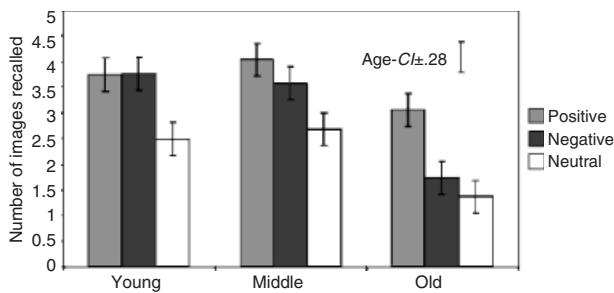
remember and be persuaded by messages that are relevant to their goals. Given evidence that goals increasingly favor emotionally relevant matters with age, we reasoned that advertisements promising emotionally meaningful rewards would be more effective with older people than those that promise to increase knowledge or expand horizons (Fung & Carstensen, 2003). Relative to younger people, older people remembered emotional slogans—and the products they touted—better than other types of slogans. For example, in a camera ad, the slogan used to invoke emotionally meaningful goals read, “Capture those special moments”; the version used to invoke information-seeking goals read, “Capture the unexplored world.” We also showed participants both the emotion-slanted and information acquisition-slanted versions of the same advertisement and asked them to indicate their preferred version. Some were simply asked to indicate the one they liked best. Others were presented with the following instruction and then asked to indicate their preference: “Imagine that you just got a call from your physician who told you about a new medical advance that virtually insures you will live about 20 years longer than you expected in relatively good health. Please look at these ads and tell us which one you prefer.” In the time-expanded condition, age differences were eliminated.

### THE POSITIVITY EFFECT

We had predicted that memory for emotional information would be better than memory for non-emotional information in older people. However, socioemotional selectivity theory was equivocal on the question of whether it would make a difference if emotional information were positive or negative. Studies have found that younger adults have a tendency to process negative information more thoroughly than positive information and to weigh negative information more heavily in impression formation, memory, and decision making (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Reasoning from socioemotional selectivity theory, there are two ways (at least) that emotional goals might influence older adults’ attention and memory. The first possibility is that all information relevant to their emotional goals is made more salient. This “emotionally relevant” focus would bias attention and memory in favor of both positive and negative information. The second possibility is that information that furthers emotional satisfaction is favored exclusively. This “emotionally gratifying” focus would bias attention and memory in favor of material that optimizes emotion regulation (i.e., positive material) even if there are costs to focusing only on such material.

We conducted two studies in which younger (ages 18–29), middle-aged (ages 41–53), and older adults (ages 65–85) viewed positive, negative, and neutral images on a computer screen and were subsequently tested for recognition and recall memory (Charles, Mather, & Carstensen, 2003).<sup>1</sup> In the first study, the

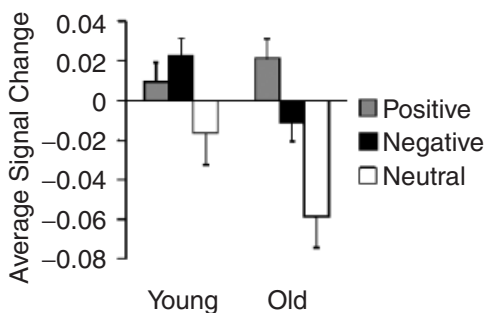
<sup>1</sup>Images were from the International Affective Picture System, which contains over 700 images including positive images of babies and animals, negative images of mutilations and bugs, and neutral images of cups and mushrooms.



**Fig. 1.** Number of positive, negative, and neutral images recalled for younger adults, middle-aged adults, and older adults. From Charles, Mather, and Carstensen (2003).

ratio of positive to negative material accurately recalled by participants increased with age, despite an overall deficit in performance with age (see Fig. 1). A second study was conducted using essentially the same images and procedures but in which event-related functional magnetic resonance imaging was used to examine activation in the amygdala (a brain area integrally involved in the processing of emotion) while participants viewed the images (Mather et al., 2004). Behavioral findings replicated findings from the first study: In older adults, memory for positive images was relatively better than for negative images. Interestingly, whereas amygdala activation in younger and older adults was greater for both positive and negative images than for neutral images, older adults showed significantly greater activation for positive images than for negative ones (see Fig. 2). This finding suggests that positive and negative stimuli are differentially processed at a basic neural level, suggesting that this age-related preference for positive information occurs in attentional as well as memorial processes.

Older people, at a subconscious or conscious level, may not attend to negative images because they are not motivated to do so. In the work described previously, participants viewed individual images one at a time on the computer screen. In another study, we examined attention to pairs of images (Mather & Carstensen, 2003). We employed a dot-probe experimental paradigm, in



**Fig. 2.** Activation in the amygdala (a brain area involved in emotion processing) for younger and older adults while viewing positive, negative, and neutral images. Signal change indicates activation in the region during the task. From Mather et al. (2004).

which pairs of faces (one neutral and one showing positive or negative emotion) are presented to participants on a computer screen simultaneously for 1000 ms, followed by a small grey dot that appears in the location where one of the photographs has been; we measured the speed at which participants identified which picture had the dot behind it. We observed that younger people responded to the dot probes for positive and negative trials equally fast. Older adults, however, were significantly faster when the dot appeared behind the positive face than when it appeared behind the negative face, indicating that when a neutral face was paired with a positive face, they were attending to the positive face, and that when a neutral face was paired with a negative face, they attended to the neutral face. This finding provides further evidence for the increased favoring of positive over negative material with age, even at the level of attention processing.

In one of our most recent investigations, we tested working memory for emotional images in older and younger adults (Mikels, Larkin, Reuter-Lorenz, & Carstensen, 2005). A comparison condition tested working memory for visual information. We found that older adults performed significantly poorer than younger adults on the visual working memory task. However, no age deficit emerged in working memory for emotional images. Moreover, whereas younger adults showed superior working memory for negative relative to positive emotional stimuli, older adults exhibited superior working memory for positive relative to negative emotional stimuli.

Our research team also examined the role of age and motivation in a study of autobiographical memory (Kennedy, Mather, & Carstensen, 2004). There is evidence in the literature that people remember their personal pasts more positively over time, but virtually all of the studies suffer from the inability to corroborate memories to assess accuracy. In a recent study, we were able to capitalize on a large data set collected from an order of Catholic nuns in 1987. At that time, the nuns had completed a questionnaire about physical and emotional well-being; in 2001, we had the Sisters complete the questionnaire as they remembered completing it originally. We created two quasi-experimental conditions. In one condition (emotion focus), participants were initially instructed to focus on their emotional states as they answered the questions and were periodically reminded to focus on their emotions while filling out the questionnaire. In another condition (information focus), participants were initially instructed to be as accurate as possible and then were periodically reminded to be accurate while completing the questionnaire. Findings showed that both the oldest participants and younger participants who were focused on emotional states showed a tendency to remember the past more positively than they originally reported, whereas participants focused on accuracy (whether old or young) tended to remember the past more negatively than originally reported. The differences by experimental condition make age-related neural changes an unlikely reason for the age-related positivity effect.

Although memory and attention are rarely conceptualized as self-regulatory processes, the events, people, and places that individuals attend to, hold in mind, and remember clearly influence their well-being. Memory itself is not simply “retrieval” but an elaborative process in which current goals influence constructions of the past. It appears that age-related motivational changes do not simply lead older people to prioritize emotionally meaningful goals (good or bad) but, more specifically, to prioritize the maintenance of emotional equilibrium. Older people appear to attend to, hold in mind, and remember emotionally positive information more than they do negative and neutral information.

### FUTURE DIRECTIONS

The societal importance of understanding the nature of developmental changes in later life grows as the American population undergoes an unprecedented age redistribution. Cognitive functioning is integral to effective living. To date, most of the literature on cognitive aging documents areas of deterioration in functioning. Identifying areas of preserved functioning along with areas of deterioration can help to identify ways to compensate for losses. Relatively well-preserved memory for emotional material, especially positive emotional material, appears to represent one such area. Whereas negative material appears to be especially salient in youth, a shift evident in middle age and extending into old age appears to occur such that positive material is increasingly favored. We call this developmental pattern the *positivity effect*.

According to socioemotional selectivity theory, the focus on positive material to the exclusion of negative material operates in the service of emotional well-being. It is possible to speculate that the positivity effect may contribute to age differences in psychopathology. Depression and anxiety are far more prevalent in younger adults than in older adults. However, in keeping with basic principles of life-span theory, both gains and losses typically accompany any developmental change. One can easily imagine situations in which attending to positive information more than to negative information and remembering positive information better than negative information could have unfortunate consequences. For example, when decisions require that people consider negative as well as positive options, a preference for positive information could lead to poor-quality decisions (Löckenhoff & Carstensen, 2004).

Of course, many questions remain. It is possible that a reliance on feelings instead of memory for details results in better decision quality in older adults. Alternatively, because focusing on one's emotions for to-be-remembered information impairs memory for the source of that information, reliance on emotions could reduce the quality of decisions. Considerable knowledge about the aging mind has amassed in the past three decades. We suspect that the next frontier in aging research will extend beyond documentation

of decline and growth and begin to identify ways both processes work in concert.

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### Recommended Reading

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