Adult Age Differences in Dual Information Processes

Implications for the Role of Affective and Deliberative Processes in Older Adults' Decision Making

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ABSTRACT—*Age differences in affective/experiential and deliberative processes have important theoretical implications for judgment and decision theory and important pragmatic implications for older-adult decision making. Age-related declines in the efficiency of deliberative processes predict poorer-quality decisions as we age. However, age-related adaptive processes, including motivated selectivity in the use of deliberative capacity, an increased focus on emotional goals, and greater experience, predict better or worse decisions for older adults depending on the situation. The aim of the current review is to examine adult age differences in affective and deliberative information processes in order to understand their potential impact on judgments and decisions. We review evidence for the role of these dual processes in judgment and decision making and then review two representative life-span perspectives (based on aging-related changes to cognitive or motivational processes) on the interplay between these processes. We present relevant predictions for older-adult decisions and make note of contradictions and gaps that currently exist in the literature. Finally, we review the sparse evidence about age differences in decision making and how theories and findings regarding dual processes could be applied to decision theory and decision aiding. In particular, we focus on prospect theory (Kahneman & Tversky, 1979) and how prospect theory and theories regarding age differences in information processing can inform one another.*

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The problems and challenges of aging, long an important societal concern, are looming ever larger as persons over 65 years of age make up an increasing proportion of the world's population. According to a United Nations Population Division (2002) report, by 2050 the number of older persons (60 years and older) will surpass the number of younger persons (under age 15) for the first time in history. The fastest growing age group in the world is the oldest old (age 80 and older). As the potential demands of this growing population place increasing strain on already-limited supports and resources, understanding the effects of aging on the maintenance of independent functioning and facilitating such functioning become critical. Judgment and decision-making processes are particularly relevant in this regard, given their importance in everyday life. The relevance of these processes increases when one considers that, relative to younger adults, older adults have fewer opportunities to compensate for poor-quality judgments and decisions, because they have less time and physical resiliency to recover from the "normal" ups and downs of everyday decision outcomes.

Recent social trends create a need for maintaining strong decision-making capabilities for a greater number of years (Peters, Finucane, MacGregor, & Slovic, 2000). Advances in areas such as sanitation and modern medicine allow people to live longer than ever before and to enjoy more years beyond retirement. In addition, American society places a strong value on independence and self-determinacy. This self-determinacy means, for example, that older adults are being asked to share in decisions about their health and finances rather than rely on the paternalism of their physicians and the federal government. Finally, the trend toward geographically dispersed families means that older individuals may have limited access to knowledgeable and supportive family members. As a result of these trends, responsibility for sound judgment and good decision making rests more on the individual than it has in the past.

Understanding the psychological processes that underlie the judgments and decisions of older adults can help in identifying areas in which older adults may be most vulnerable as well as areas in which older adults may continue to exhibit high levels of competence. This information, in turn, can guide efforts to help people face the challenges of aging.

AIM OF THE CURRENT ARTICLE

The psychological study of decision making examines the mechanisms that underlie people's choices, preferences, and judgments, and attempts to discover how to improve decision-making processes.[1] Decision research developed out of economic theory and, as a result of this rationalistic origin, has concentrated mostly on consequentialist explanations for how people make decisions and form judgments. More recent research (conducted primarily with younger adults) has highlighted the importance of affective and emotional processes in decision making. The interplay between these two processes is fundamental to older-adult decisions (i.e., decisions of the head vs. those of the heart, such as deciding whether to give financial help to one's adult child or choosing when and if to stop driving or move into a nursing home). Understanding this interplay is important for furthering theoretical understanding of the information processing underlying choices and for designing methods by which prescriptive advice might be offered to older adults to improve their decisions in important arenas (e.g., financial or medical-treatment decisions). Historically and more recently, studies of judgment and decision making involving older-adult subjects have been quite sparse. For the most part, researchers have neglected to adequately recognize the importance of sound judgment and decision processes in later life and have mainly focused on how younger adults (usually college sophomores) judge and decide. Some recent reviews, however, have begun to examine the limited research on decision making and aging (Mather, 2006; Peters et al., 2000; Sanfey & Hastie, 1999; Yates & Patalano, 1999).

The aim of the current review is to examine adult age differences in affective and deliberative information processes in order to understand their potential impact on judgments and decisions. We review evidence for the role of these dual processes in judgment and decision making and then review two representative life-span perspectives on the interplay between these processes, making relevant predictions for older-adult decisions and noting contradictions and gaps that currently exist in the literature. Finally, we review the sparse evidence about age differences in decision making and how theories and findings regarding dual processes could be applied to decision theory and decision aiding. In particular, we focus on prospect theory (Kahneman & Tversky, 1979) and how prospect theory and theories regarding age differences in information processing can inform one another.

The conceptual model we use to guide our review is based on three general propositions about aging and the impact of dual processes on decisions. First, aging is accompanied by declines in the efficiency of controlled processing mechanisms associated with deliberation (e.g., explicit learning and memory; Salthouse, 2006). This deliberative decline may lead to the relative enhancement of more implicit and automatic forms of knowledge (e.g., affect) in decisions. Second, the processing and use of affective knowledge in both routine and nonroutine decisions may become more important with age, reflecting aging-related changes in social goals. Some research suggests that there is a specific emphasis on attention to positive information in later life (i.e., the positivity effect; Mather & Carstensen, 2005). Third, experience in the use of affective knowledge grows as people age so that they may become more "expert" in its use and may be more likely to rely on it. These propositions combine to suggest that reliance on affect will increase as people age, or at least increase relatively over reliance on more deliberative abilities that require greater conscious effort or do not help meet social goals (e.g., Carstensen & Turk-Charles, 1994; Hess, Waters, & Bolstad, 2000; Labouvie-Vief, 1999). This shift may reflect an adaptive response to age-related changes in cognitive skills, life experiences, or processing goals that promote well-being (Diener & Suh, 1997).

If aging influences either affective or deliberative information processing, older adults may be especially susceptible to various biases, leaving them potentially vulnerable to scams and deceptive advertising. But another subject of interest in the study of judgment and decision making is the extent to which changes in these processes might also improve decision making in later life and moderate biases in judgment. It is possible that older adults will be more effective decision makers in situations in which past experience provides appropriate guidance or in which greater deliberation would otherwise hinder decision making (see Dijksterhuis, Bos, Nordgren, & van Baaren, 2006, for an interesting—and controversial—argument).

AFFECT AND DELIBERATION IN DECISION MAKING

Information in decision making appears to be processed using two different modes of thinking: affective/experiential and

[1]Space does not allow us to pursue all of the important topics in decision-making research that could be examined in older adults. Judgments and decisions are influenced by many factors. Social and political attitudes or worldviews, for example, have been shown to influence risk perceptions (Peters & Slovic, 1996). Cultural backgrounds may influence the propensity to take risks as well as risk attitudes and decision-making strategies (Weber & Hsee, 2000). Other important work has been done, using younger adults as subjects, on the use of narratives and other display formats in communicating information (e.g., Sanfey & Hastie, 1996; Satterfield, Slovic, & Gregory, 2000), on the impact of reasons on choice (e.g., Shafir, Simonson, & Tversky, 1993), and on the status-quo effect (Thaler, 1980). Errors of omission versus commission have been examined (e.g., Ritov & Baron, 1990), as have protected values (e.g., Baron & Spranca, 1997) and how trade-offs influence choice (Luce, Bettman, & Payne, 1997; Payne, Bettman, & Johnson, 1992). A small number of studies have examined individual differences in decision making (e.g., Lopes, 1987; Peters & Slovic, 2000; Peters et al., 2006), a topic that may be even more relevant in older adults.

deliberative (Epstein, 1994; Loewenstein, Weber, Hsee, & Welch, 2001; Reyna, 2004; Sloman, 1996; these modes are also called System 1 and 2, respectively—see Kahneman, 2003; Stanovich & West, 2002). Both modes of thought are important to forming decisions. The experiential mode produces thoughts and feelings in a relatively effortless and spontaneous manner. The operations of this mode are implicit, intuitive, automatic, associative, and fast. This system is based on affective (emotional) feelings. As shown in a number of studies, affect provides information about the goodness or badness of an option that might warrant further consideration and can directly motivate a behavioral tendency in choice processes (Damasio, 1994; Osgood, Suci, & Tannenbaum, 1957). Marketers, who well understand the power of affect, typically aim their ads to evoke an experiential mode of information processing. The deliberative mode, in contrast, is conscious, analytical, reason-based, verbal, and relatively slow. It is the deliberative mode of thinking that is more flexible and provides effortful control over more spontaneous experiential processes. Kahneman (2003) suggests that one of the functions of the deliberative system is to monitor the quality of the affective/experiential system's information processing and its impact on behavior. Both modes of thinking are important, and some researchers claim that good choices are most likely to emerge when affective and deliberative modes work in concert and when decision makers think as well as feel their way through judgments and decisions (e.g., Damasio, 1994).

In this article, we focus mostly on the role of affect in experiential processing. Affect can be relevant to the decision at hand (e.g., one's feelings about circuses have been learned through repeated experiences), in which case it is termed *integral affect*. Integral affect is defined as positive and negative feelings toward an external stimulus (e.g., a consumer product). Integral affect may become associated with an object through careful thought but also through experiential processes such as conditioning (Staats & Staats, 1958), familiarity (Zajonc, 1980), priming (Murphy & Zajonc, 1993), and mood misattribution (Schwarz & Clore, 1983). Affect can also be irrelevant to a decision but influence the decision nonetheless (e.g., the effect of a temporary mood state or the likeability of a lawmaker on a decision about a proposed law); this affect is termed *incidental affect*.

Integral Affect

In research with brain-damaged patients, Bechara, Damasio, and colleagues (Bechara, Damasio, Damasio, & Anderson, 1994; Bechara, Damasio, Tranel, & Damasio, 1997; Bechara, Tranel, Damasio, & Damasio, 1996; Damasio, 1994) linked the learning of integral affect to better decision making. Patients with bilateral damage to the ventromedial prefrontal cortices experienced normal affective reactions to gains and losses they received from decks of cards in a task called the Iowa Gambling Task. In this task, subjects choose among decks of cards about which they initially know nothing; the decks vary in the amounts and frequencies of gains and losses and in overall expected value, and subjects learn about the decks as they choose cards and receive feedback after each choice. Unlike normal controls, however, patients with ventromedial prefrontal cortex damage were unable to use their otherwise normal affective reactions to learn an integral affective response linked to each deck (Bechara and colleagues call such an integral affective response a "somatic marker"). Among non-brain-damaged control subjects, affective reactions to actual gains and losses in each deck appeared to drive the learning of an anticipatory affective response (an integral affective response or somatic marker) that subsequently guided choices. Bechara and colleagues concluded that this anticipatory affective response must drive choice because the patients had abnormal anticipatory affective capabilities but normal cognitive capabilities. Peters and Slovic (2000) demonstrated, using a modified Iowa Gambling Task, that college students high in negative reactivity learned to choose fewer high-loss options whereas those high in positive reactivity learned to choose more high-gain options—supporting the idea that affective reactions are used in the decision-making process.

This reliance on affect may be learned over the life span as a particularly effective means of making decisions. Reyna (2004), for example, argues that information processing in this system is more advanced, relative to the deliberative system. In support of this idea, she provides evidence that people process less information and process it more qualitatively as development progresses both from childhood to adulthood and from less expertise to more.

Decision makers rely on affective meaning to guide judgments and decisions in everyday life (Slovic, Finucane, Peters, & MacGregor, 2002). According to the "affect heuristic," all of the images in a person's mind are tagged or marked to varying degrees with affect. The "affect pool" contains all positive and negative markers that are consciously or unconsciously associated with the images. Using this overall, readily available affective impression can be easier and more efficient than weighing the pros and cons of a situation or retrieving relevant examples from memory. This may be especially true when the required judgment or decision is complex or when mental resources are limited, as in conditions of time pressure (Finucane, Alhakami, Slovic, & Johnson, 2000). Decision makers rely on integral affect in at least four ways in the decision-making process (Peters, 2006; Peters, Lipkus, & Diefenbach, 2006). First, affect can act as information (as a substitute for other, sometimes more relevant information; Kahneman, 2003) in judgments such as life satisfaction (Schwarz & Clore, 1983). Second, it can act as a common currency allowing people to integrate multiple pieces of information more effectively than when it is absent. Third, it can act as a spotlight focusing people's attention on different information (e.g., numerical cues), which may then be used in judgments instead of the affect itself. Fourth, affect can motivate people to take some action or process information.

Incidental Affect Including Mood

A substantial body of research suggests that affect incidental or unrelated to the target or option under consideration (e.g., a positive or negative mood or an affective prime) can have systematic effects on many everyday judgments and decisions that are similar to three of the four functions of integral affect just mentioned (Forgas, 1995; Schwarz, 2001). First, current mood may act as a spotlight influencing the content of people's thoughts in a mood-congruent manner (Bower, 1981; Wright & Bower, 1992). For instance, participants who are in a positive mood may more easily recall positive memories, whereas participants in a negative mood may more easily recall negative memories (Forgas, 1995; but see Fiedler, 2001). Second, positive and negative moods may act as a motivator of behavioral predispositions, motives for action, and information processing (Luce, Bettman, & Payne, 1997; Raghunathan & Pham, 1999). For instance, happy individuals tend to process information in a less elaborated and systematic manner than do people in a negative mood, but happy people will process information more systematically if it helps them maintain their positive mood (Isen, 2000). Happy people also tend to be more creative and efficient in their decisions, and they may avoid negative events and outcomes in order to maintain their positive mood state (Forgas, 1995; Isen, 2000; Mano, 1992). Finally, the mood-as-information view assumes that when people make evaluative judgments about an object or situation they do not consult all available information but instead rely on their affective reactions (Clore et al., 2001; Schwarz, 2001). For example, people ask themselves "how do I like the object?" and, while doing so, monitor their own feelings. Current mood may then be attributed—or misattributed—as affect integral to the target and used as information in the judgment.

The Balance Between Affect and Deliberation in Decision Processes

Affect, whether integral or incidental to the decision target, appears to have a profound effect—both deep and subtle—on judgments and choices. Decision makers are not necessarily aware of, or able to control, its influence on thoughts or behaviors.

Although affective and deliberative processes in decision making are interdependent, they also appear to be separable (e.g., Epstein, 1994; Petty & Wegener, 1999; Zajonc, 1980). The implicit assumption that good decision making is a conscious, deliberative process has been one of the field's most enduring themes, but in some contexts deliberation about reasons for choice appears to distract decision makers from fully considering their feelings and to have a negative effect on decision processes (e.g., Wilson, Dunn, Kraft, & Lisle, 1989). Research has also demonstrated that affect may have a relatively greater influence when deliberative capacity is lower, suggesting that, at least in some cases, these two modes are not separate but instead exist on a single continuum (Hammond, 1996; Kruglanski et al., 2003; Peters & Slovic, 2007). Shiv and Fedorikhin (1999), for example, demonstrated that decision makers were more likely to choose an affect-rich option (and make a decision of the heart) when deliberative capacity was diminished by cognitive load. Finucane et al. (2000) also found that the inverse relation between risks and benefits (linked to affect by Alhakami & Slovic, 1994) was enhanced under time pressure. Reducing the time for deliberation appeared to increase the use of affect and the affect heuristic. In subsequent sections, we link this balance between affect and deliberation to age differences in information processing and decision making.

The Construction of Preferences

The construction of preferences occurs with input from both the affective and deliberative systems. How individuals make decisions (what decision strategies they select to use) and what they choose is highly contingent on the properties of the decision problem and on characteristics of the individual decision maker at the moment of the decision (cognitive and affective abilities, stable personality traits, more ephemeral moods). In the next section, we review evidence for age differences in these dual processes, and we describe two life-span perspectives related to how older versus younger adults might process information in decisions.

AGE DIFFERENCES IN DUAL INFORMATION PROCESSES

Human decision making is a complex phenomenon involving dual affective and deliberative processes. Examining adult age differences within the context of known aging-related phenomena may assist in identifying dissociations among different processes[2] and provide information about decision making in older adults that may ultimately lead to better decision aids for them. Age differences have been demonstrated in both deliberative and affective information processes.

Age-Related Deficits in the Deliberative System

Several lines of research suggest age-related declines in the controlled processes of the deliberative system. First, because older adults process information less quickly than younger adults do (e.g., Salthouse, 1992, 1994), their deliberative abilities may suffer due to less efficient processing of perceived information. Salthouse (1996) has hypothesized that the products of older adults' early processing may be lost by the time later processing occurs and/or that later processing might not occur because early processing required so much time. Second, the evidence indicates age-related deficits in explicit[3] memory

[2]A similar age-difference approach in the memory literature, for example, has provided evidence for separate implicit and explicit memory systems (Cohen, 1996).

[3]In explicit tasks, "the subject is directly queried about the to-be-remembered material, and remembering is accompanied by a feeling of conscious awareness on the part of the subject" (Willingham, 1998, p. 577).

and learning (Cohen, 1996; Kausler, 1990; Salthouse, McGuthry, & Hambrick, 1999). Third, Hasher and Zacks (1988) argue that aging is associated with a decrease in the ability to inhibit false and irrelevant information. Fourth, there is evidence suggesting that, compared with younger adults, older adults may be less consciously aware of factors that influence their judgments and decisions (Lopatto et al., 1998), that they are less accurate in estimating absolute numeric frequencies (Mutter & Goedert, 1997), that they are more overconfident in their judgments (Crawford & Stankov, 1996; but Kovalchik, Camerer, Grether, Plott, & Allman, 2005, found less overconfidence among older adults), and that they are less able than younger adults to control the impact of automatic processing on their judgments (Hess, McGee, Woodburn, & Bolstad, 1998; Hess et al., 2000). Finally, working memory and executive functions (e.g., the control and regulation of cognition) associated with the prefrontal cortex deteriorate with normal aging (e.g., Amieva, Phillips, & Della Sala, 2003). If good decisions depend on deliberation, such findings suggest that judgments and decisions will suffer as we age.

Minimal Age Differences in Implicit Tasks

The results suggesting decline in deliberative processes are balanced by findings in implicit learning and memory. In implicit (as opposed to explicit) tasks, subjective awareness is not necessary. "Subjects are not directly queried; rather, they are simply asked to perform a task, and learning is inferred from task performance" (Willingham, 1998, p. 577). Automatic information-processing abilities such as implicit memory and learning appear to be largely spared by age (see Zacks, Hasher, & Li, 2000). For example, Salthouse et al. (1999) reviewed evidence of the lack of age differences in the implicit sequence learning of a 10-element pattern (large age differences did exist for explicit learning). In general, older adults appear to perform less well than do younger adults on tasks demanding greater deliberation (explicit tasks), but there appear to be few, if any, age differences in tasks thought to tap into more implicit processes.[4] Recent meta-analyses of the aging-and-memory literature support this conclusion by showing substantially smaller age effects associated with implicit memory than with explicit memory (e.g., La Voie & Light, 1994; Light, Prull, La Voie, & Healy, 2000).

Processing of Affective and Emotional Information Across the Life Span

As just noted, aging appears to have a negative effect on deliberative processes while sparing more implicit or automatic functions. Thus, aspects of deliberative processing (e.g., speed of processing, performance on explicit tasks) decline with age just as the green color fades from the leaves of trees in autumn. As a result, age differences should appear in judgments and decisions requiring deliberation. The role of affect is somewhat less clear. Changes in affective information processing in later life may be reflective of developmental trends in both explicit and implicit processes. For example, the encoding of affective information may be relatively well preserved, whereas the ability to selectively attend to and process such information may be influenced by effortful emotion-regulation strategies. If affect is simply well preserved, it may be like the orange and yellow colors of fall leaves. These colors "appear" strongly as the green fades; in actuality, the orange and yellow colors are mostly unchanged from earlier in the season but are no longer hidden by the green. Just as orange and yellow colors are resilient to the changing season, affect may be resilient to the aging process such that no age differences will emerge on tasks that primarily involve affect. However, decisions of older adults would be influenced more than those of younger adults on tasks involving both affect and deliberation, because affect may become relatively more influential as deliberative abilities decline. See the upper half of Figure 1 for a simplified illustration of this resiliency hypothesis. A second possibility, consistent with motivational perspectives we will review, is that affect's influence on judgments and decisions may increase with age and a motivation to selectively process affective information (this simplified enhancement hypothesis is shown in the lower half of Fig. 1). The hypothesized enhancement process would be analogous to the

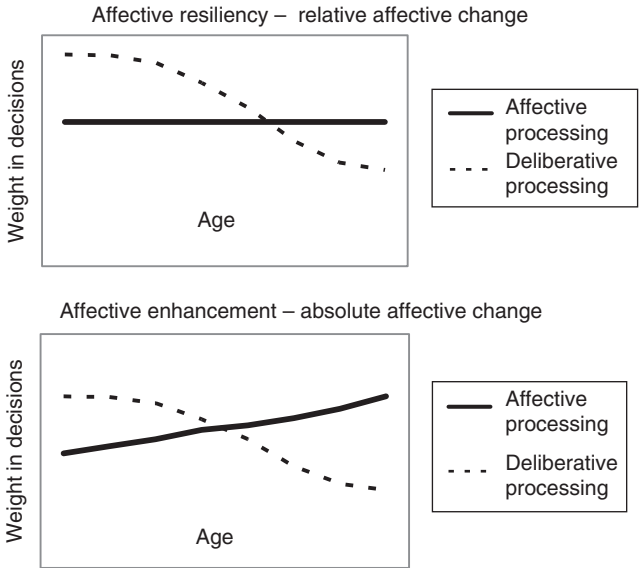

Fig. 1. Resiliency and enhancement in the weight of affective and deliberative processing in decisions across the life span. Adapted from "Affective Processes in Decision Making by Older Adults," by E. Peters and D. Västfjäll, 2005, paper presented at the National Research Council Workshop on Decision Making by Older Adults, Washington, DC. Copyright 2005, National Academy of Sciences. Adapted with permission of the National Academies Press, Washington, D.C.

[4]Older adults have been shown to condition less readily than younger adults using the eyeblink paradigm, however. This is surprising because conditioning has long been considered one of the simplest and most automatic forms of learning. It may be that conditioning is a more complex form of learning than previously thought (Powell, 1999) or that the specific eyeblink paradigm used involves nonaffective processes that show age-related declines (Kausler, 1994; Woodruff-Pak, Jaeger, Gorman, & Wesnes, 1999). Eyeblink conditioning also may be a qualitatively different form of conditioning than affective conditioning (Baeyens, De Houwer, Vansteenwegen, & Eelen, 1998; Field & Davey, 1998).

red color that develops from the increased glucose in autumn tree leaves.

The examination of aging and affective influences on performance in a variety of cognitive domains (e.g., memory, judgment processes, decision making) is still in its infancy. But two dominant perspectives on this relationship, each focusing on different types of mechanisms, can be identified in this literature. The first is a motivational perspective that is focused on aging-related chronic activation of emotion-regulation goals and an associated motivation to process affective information, as typified in socioemotional selectivity theory (Carstensen, 1993, 2006). The second perspective is more cognitive in nature and focuses on the impact of changing cognitive skills on the relative influence of affective processes on performance. This perspective is typified by theories such as Labouvie-Vief's (2003, 2005) dynamic integration theory and by neuropsychological approaches that focus on the differential impact of aging on normative changes in cortical systems underlying affective and deliberative processes.

Motivational Perspectives

The most influential perspective regarding aging, affect, and motivation is socioemotional selectivity theory (Carstensen, 2006). This theory posits that changes in time perspective result in emotional goals becoming increasingly important as the end of life nears, which in turn results in greater monitoring of affective information. Because older adults are, by virtue of age, closer to the end of life, age should be associated with an increased importance of emotional goals; increased attention to emotional content; and either an increased focus on positive information and/or a decreased focus on negative information, in order to optimize emotional experience. These latter predictions have potentially great relevance to the impact of affect and emotions in judgment and decision making.

Recent empirical work has shown that aging is associated with an increase in attention to emotional content. For example, Carstensen and Turk-Charles (1994) had adults in four different age groups (20–29, 35–45, 53–67, and 70–83) read and recall stories containing both neutral and emotion-laden content. Examination of the data revealed a linear decline across the four age groups in recall of neutral content with age but revealed stability in recall of emotional content. Thus, older adults recalled relatively more emotional content than neutral content, supporting the researchers' contention that there was a shift in the nature of the memory representation toward disproportionate retention of emotional information. In a related study, Fung and Carstensen (2003) found that, relative to younger adults, older adults exhibited greater preference and superior memory for emotional advertisements than for nonemotional ones.

Socioemotional selectivity theory, however, also predicts a specific focus on positive information in later life as older adults seek to optimize emotional experience. Some evidence consistent with this expectation can be seen in age differences in mood states. Older adults tend to be in more positive and less negative mood states compared to younger adults (Mroczek, 2001). Several behavioral studies of memory are also consistent with this expectation. For example, Charles, Mather, and Carstensen (2003) found that overall picture recall declined with age but that older adults recalled a greater proportion of positive images than negative images, whereas young and middle-aged adults recalled similar amounts of each. Mather and Carstensen (2003) found that, relative to younger adults, older adults exhibited disproportionate attentional and memory biases in favor of faces depicting positive emotions over those depicting negative emotions. In a somewhat different context, Mather and Johnson (2000) examined source memory for positive and negative features of selected and unselected options in a decision task (e.g., choosing between job candidates). They found that older adults were more likely than young adults to have accurate memory for positive over negative features of the selected options and negative over positive features of the unselected options, even when overall level of memory performance was controlled. Importantly, younger adults were found to exhibit a similar bias when asked to focus on the emotional content of their choices. Finally, a recent functional magnetic resonance imaging study by Mather et al. (2004) found that older adults (compared to younger adults) had disproportionately greater activation in the amygdala in response to positive versus negative information. Although it would be useful to see this result replicated, this study provides some evidence at the neural level for the differences in processing styles evident in behavioral data. Together, these findings suggest a motivational shift in processing rather than a deliberative deficiency.

Interestingly, the positivity effect is not always observed, even in studies using similar stimuli and tasks to those just described. Specifically, the age-related positivity effect in memory appears to occur primarily in situations in which participants are not required to attend to all stimuli. When participants are required to process each piece of information presented to them, no age differences emerge in the impact of valence on memory (e.g., Comblain, D'Argembeau, Van der Linden, & Aldenhoff, 2004; Denburg, Buchanan, Tranel, & Adolphs, 2003; Kensinger, Brierly, Medford, Growdon, & Corkin, 2002). Such findings are not necessarily inconsistent with socioemotional selectivity theory and in fact could be viewed as consistent with a motivational explanation of the positivity effect. That is, when left to their own devices, older adults engage in strategic behaviors promoting positive affect. Additional support for the strategic basis of the positivity effect comes from a recent study by Mather and Knight (2005), who found that older adults who had more cognitive resources (due to better performance on tasks requiring cognitive control in one study and due to not being distracted by a divided attention task in a second study) remembered relatively more positive than negative pictures compared to those with fewer cognitive resources; younger adults showed no such effect. Thus, the positivity effect in

memory appears to be driven by effortful, resource-demanding regulatory functions. An interesting implication of these data, however, is that some of the cognitive sequelae of socioemotional selectivity theory may not be a general aspect of aging but may be more characteristic of high-functioning older adults.

Cognitive Perspectives

An alternative perspective on aging is that affective processes take on increased importance as deliberative functions decline in later life. One basis for this perspective is research suggesting that cortical structures associated with processing affect (e.g., the amygdala, the ventromedial prefrontal cortex) undergo less normative change with aging than those areas underlying executive or deliberative functions (e.g., the dorsolateral prefrontal cortex; Bechara, 2005; Chow & Cummings, 2000; Good et al., 2001). This relative-preservation view is supported by neuropsychological data demonstrating that adult age differences in performance are minimal on those tasks thought to be supported by affective-processing systems (e.g., Kensinger et al., 2002; MacPherson, Phillips, & Della Sala, 2002). These data contrast with the normative decline consistently observed on tasks associated with executive functions (for a review, see West, 1996).

This relative-preservation view would suggest that maintenance of basic mechanisms associated with processing affect should not lead to qualitative age differences (e.g., positivity effects). Thus, for example, researchers have shown that when participants are required to actively attend to emotional and neutral stimuli, younger and older adults exhibit similar patterns of memory for positive, negative, and neutral stimuli (Denburg et al., 2003; Kensinger et al., 2002). The relative-preservation view would not necessarily negate the possibility of qualitative differences arising in cognitively later stages of processing.

In contrast, Labouvie-Vief's (2003) dynamic integration theory of adult development suggests that qualitative differences in the processing of affect across ages may be based in aging-related changes in the dynamic balance between processes of affect optimization (of happiness) and affect differentiation (the ability to tolerate negativity in order to maintain objective representations). Her theory predicts a positivity bias based on age-related limitations in cognitive resources that result in an adaptive shift to less resource-demanding positive affect (Gross et al., 1997) rather than a motivational change as suggested by socioemotional selectivity theory. Negative emotions (e.g., anger, frustration) are energy and resource consuming (Mroczek & Kolarz, 1998), and older adults' declining cognitive resources may lead to a gating out of negative information and other sources of negative emotion. The results of the previously reviewed memory studies by Mather and Knight (2005) directly contradict this hypothesis, however.

Also based on dynamic integration theory, Wurm, Labouvie-Vief, Aycock, Rebucal, and Koch (2004) propose that this same cognitive decline can be used to explain an age-related increase in the disruptive influence of emotionally arousing stimuli and thus increased attention to emotional content and other automated processes. They found that older adults (but not younger adults) showed a larger Stroop effect for emotion words higher in arousal. In other words, older adults took longer to name the color of high-arousal emotion words than they did to name the color of low-arousal emotion words; younger adults showed no such arousal effect. The age effect was similar for both positive and negative words, and the researchers suggested that this may be due to a task design that required significantly more cognitive resources compared to previous studies that found a positivity effect. Consistent with Wurm et al., a general influence of affect or arousal may be demonstrated among older adults with fewer cognitive resources and in situations of high cognitive demand. In addition, in some decision situations stronger-intensity affect and emotions may act more like a cognitive load on older adults than they do on younger adults (Labouvie-Vief, 2005). Additional research is needed to clarify theoretical propositions linking affect, arousal, and cognitive resources in information processes important to decision making (e.g., memory, attention).

In sum, research suggests that aging is associated with a greater focus on emotional content and on positive over negative information, although this latter effect appears to be moderated by acute situational goals and available cognitive resources. These processes are consistent with the selective-optimization-with-compensation model of P.B. Baltes and colleagues (e.g., Baltes & Baltes, 1990), which postulates that the developmentally relevant goal of efficient use of processing resources results in older adults optimizing their best skills, in this case the processing of emotional information. A reasonable hypothesis at this point is that basic mechanisms underlying the processing of affect are relatively unchanged with age but that variations may emerge at later stages of processing as goal-based factors (e.g., time perspective) or availability of cognitive resources influence the manner in which positive versus negative information is handled.

PREDICTIONS FROM LIFE-SPAN THEORIES AND SOME RESULTS FOR AGE DIFFERENCES IN THE IMPACT OF DUAL PROCESSES ON JUDGMENTS AND DECISIONS

The research literature on age differences in judgment and decision-making processes is sparse but growing rapidly. Based on the evidence thus far, it is expected that deliberative processing will show weaker effects on the judgments and decisions of older adults compared to those of younger adults whereas affective processes will have a stronger (or relatively stronger) influence. As a result, older adults may produce different decisions than younger adults. We predict that older adults' decisions will appear better than those of younger adults in some cases and worse in other cases. For example, research demonstrating a

variety of age-related cognitive deficits (e.g., in speed of processing and working memory; Salthouse, 1996) leads us to believe that judgment and decision-making capabilities may decline as an inevitable course of the aging process. Older adults might also be easier prey for marketers using strongly affective appeals or misleading information (Hess et al., 2000; Jacoby, 1999). However, the vast majority of older adults appear to function effectively and independently in everyday life, and many of the most influential and demanding positions in our society are held by late-middle-aged and older adults, suggesting that their ability to make decisions remains intact despite other declines (Carstensen, 2001; Salthouse, 1990). If affect is critical to everyday choice processes, as suggested by Damasio (1994), and if older adults rely more on affect, then they may make better choices in some complex situations despite analytic declines. Blanchard-Fields (1998; Blanchard-Fields, Brannan, & Camp, 1987) has speculated that affect is involved in age-related improvements in wisdom and problem solving. Age comparisons are fertile ground for examining how differences in the roles of affect and deliberation can influence decisions. For simplicity, we discuss these processes as more independent than they likely are in reality, but we also point to theories and findings that suggest their interdependence. Research related to prospect theory (e.g., framing effects) is discussed later, in the section concerning decisions by description. We also focus primarily on decisions that involve relatively low levels of arousal or affect.

Impact of Deliberative Decline on Judgments and Decisions

Several studies have identified biases on judgment processes that increase with age and were linked with deliberative processes such as working memory. For example, Mutter (2000) and Mutter and Pliske (1994) examined the impact of illusory correlation on performance. (In an illusory correlation, people perceive that two variables covary consistently with their prior expectations even though no actual relation exists.) They found that older adults' judgments were more influenced by prior expectancies than were those of younger adults, particularly under distraction conditions. Older adults were also less likely to correct their judgments when accurate information regarding the co-occurrence of events was made salient. Interestingly, Mutter found that age differences were more evident for memory-based judgments than for on-line judgments, suggesting that age differences in illusory-correlation biases may be based in part on the declining ability to encode and retrieve veridical information from episodic memory. Such a conclusion is bolstered by other research (Mutter & Pliske, 1996; Mutter & Williams, 2004) that examined age differences in the ability to detect covariation between two events when there were no strong prior expectancies regarding contingencies between the events. In this research, aging-related declines in the ability to accurately judge covariation were eliminated when performance was adjusted to take into account memory errors. The researchers also found that older adults tended to use simpler strategies in constructing judgments than did younger adults and that younger adults used simpler strategies when the task demands were increased relative to situations with fewer cognitive demands. Finally, age differences were greater when accurate performance depended upon construction of a rule rather than just retrieval of cue–outcome associations. In another example, Chasseigne and colleagues found that older adults performed as well as young adults in probability-learning tasks when the cues had a direct relation with the criterion but performed less well when the cues had a more complex inverse or multiplicative relation with the criterion (Chasseigne, Grau, Mullet, & Cama, 1999; Chasseigne, Lafon, & Mullet, 2002; Chasseigne, Mullet, & Stewart, 1997). Such findings suggest that some declines in judgments and decisions in later adulthood may be tied to reductions in cognitive resources.

Research by Chen (2002, 2004; Chen & Blanchard-Fields, 2000) has also suggested that aging-related declines in deliberative processes negatively impact judgment processes. In these studies, participants were presented with information about an individual, some of which was identified as true and some as false (and thus to be ignored); they were then asked to make judgments based upon this information. Chen found that the judgments of older adults were more likely to be influenced by the false information than were those of younger adults. In addition, younger adults in a divided-attention condition performed similarly to older adults under full attention. These findings suggest that older adults may have more difficulty controlling attention and monitoring the accuracy of information in memory, which in turn makes judgments more prone to error based upon irrelevant information. In a related study, Mutter, Lindsey, and Pliske (1995) found that older adults were as likely as younger adults to use objective credibility evidence when it confirmed what they already believed but were less likely to do so when the evidence was disconfirming. They suggested that increasing age enhances the natural tendency to believe rather than disbelieve (cf. Gilbert, 1991).

Seemingly consistent with such findings, evidence exists that, when making decisions, older adults use less complex strategies and consider fewer pieces of information than younger adults do. In a series of studies, Johnson and her colleagues (Johnson, 1990, 1993; Johnson & Drungle, 2000; Riggle & Johnson, 1996) examined decision-making strategies by different-aged adults using an information matrix that contained specific features (shown in rows) for different product choices (shown in columns). Participants were allowed to view only one cell of the matrix at a time, but they could view as many cells as they wished for as long as necessary before making a product decision. A relatively consistent finding in this research, across different types of products (e.g., cars, apartments, over-the-counter drugs), was that older adults spent a longer time studying each cell but sampled fewer pieces of information than did younger adults before making their decisions. Similar results were obtained by Streufert,

Pogash, Piasecki, and Post (1990) in a study of decision making in managers and by Hershey, Walsh, Read, and Chulef (1990) in a financial-planning task. There is also some evidence that older adults use less systematic strategies (e.g., sampling many features within one product rather than comparing the same feature across products), but this pattern was observed in only one study (M.M.S. Johnson, 1990).

Given that comprehension and adherence in medical treatment is of great functional importance to older adults, efforts to aid their comprehension and decisions have focused in part, therefore, on how to support age-related declines in the efficiency of deliberative processes (Hibbard & Peters, 2003). Medication instructions that were well organized, explicit, and compatible with preexisting schemas about the task improved memory and were preferred over other formats, suggesting that they could improve medication adherence (Park, Willis, Morrow, Diehl, & Gaines, 1994). The use of external memory supports such as organizational charts and medication organizers have also been shown to be beneficial to older adults' adherence behaviors (Park, Morrell, Frieske, Blackburn, & Birchmore, 1991; Park, Morrell, Frieske, & Kincaid, 1992). Older adults demonstrate effective use of memory aids. They appear to spontaneously use them to summarize or check information at the end of information search, as if to verify forgotten information, whereas younger adults appear to use these same aids in the middle of a search, as if for planning rather than memory purposes (M.M.S. Johnson, 1997).

In sum, the pattern of observed performance in these studies appears to be consistent with what might be expected with a decline in deliberative processes with aging. In fact, research has demonstrated that younger adults adopt a strategy similar to that observed in older adults when task demands are increased. It may be that information load interacting with limited cognitive resources in later adulthood results in the adoption of strategies that minimize demands on deliberative processes. For example, in order to conserve resources, older adults may adopt a strategy of eliminating alternatives as soon as possible (Riggle & Johnson, 1996). Thus, as soon as an undesirable piece of information about a product is encountered, the alternative is eliminated from further consideration. Alternatively, a satisficing strategy, in which information about a specific product is examined until a sufficient amount of information has been deemed acceptable, might be employed. Consistent with such an explanation, Chen and Sun (2003) found that both older and younger adults adopted satisficing strategies in a simulated real-world task (i.e., maximizing profit at a yard sale), but the strategy adopted by older adults was less memory demanding than that adopted by younger adults. Sorce (1995) recommends that marketing strategies should attempt to segment older consumers in order to customize products and information to compensate for their cognitive decline.

There are several findings from these studies, however, that might temper interpretation of the observed age differences in terms of declining resources. First, age differences in decision outcomes were rarely observed in these studies. Thus, even though older adults tended to sample less information and to do so occasionally in a less systematic fashion than younger adults, the chosen option did not vary with age. Second, it was also found that experience-based factors moderated searches. For example, in examining decisions about over-the-counter drugs, M.M.S. Johnson and Drungle (2000) found that older adults were more likely to focus on active ingredients than were younger adults and were also more systematic in their information searches, presumably reflecting their greater experience with using these drugs. Stephens and Johnson (2000) also found that older adults were more likely to focus on side effects and drug interactions than were young adults. Such information is of obvious relevance to older adults, who are more likely than the young to be taking multiple prescription drugs at any one time.

Selectivity and Motivated Use of Deliberative Processes

Older adults also may adapt to real or perceived declines in cognitive resources by becoming increasingly selective about where they spend effort (Hess, 2000). That is, the costs associated with resource-demanding deliberative processing result in older adults being more judicious than younger adults in their allocation of resources. Hess has further hypothesized that this aging-related resource conservation should be most apparent in situations of low relevance or meaningfulness to the individual, with fewer age differences as relevance and meaningfulness increase. The impact of this heightened selectivity on the involvement of deliberative and affective processes can be seen in three sets of studies.

An initial study examined performance in an impression-formation task. In this research, Hess, Rosenberg, and Waters (2001) found that older adults used more deliberative processing when a target was perceived to be personally relevant and also when the emphasis on accuracy of judgments was high. Importantly for a selectivity perspective, the impact of relevance and accuracy on performance increased with age. In a subsequent set of studies, Hess, Germain, Rosenberg, Leclerc, and Hodges (2005) examined the extent to which attitudes toward proposed legislation were influenced by irrelevant affective information (i.e., the likeability of the lawmaker proposing the legislation). When the personal relevance of the legislation was low, older adults exhibited attitudes that were consistent with how much they liked the lawmaker, whereas younger adults' attitudes were unaffected by this information. In contrast, when the legislation was rated high in personal relevance, neither the younger or older adults were influenced by the irrelevant affective information. Related findings were reported by Chen (2004), who observed that increasing personal accountability had a disproportionate benefit on older adults' source memory relative to the effects on younger adults' performance.

These three sets of findings suggest that aging is associated with increased selectivity in engagement of deliberative processes and that older adults' selective engagement is dependent on the availability of and motivation to use limited cognitive resources. Situations may occur in which older adults are capable of completing cognitive tasks but lack the motivation to do so.

Motivation is a central component of many models of social-information processing (e.g., Fiske & Neuberg, 1990; Petty & Cacioppo, 1986), with the implication being that the more motivated individuals are to process information, the more effort they are willing to put forth. Motivation to achieve accuracy has been associated with a number of variables that have also been linked with age-related variations. Susceptibility to extraneous information (Thompson, Roman, Moskowitz, Chaiken, & Bargh, 1994; Zacks & Hasher, 1994), stereotyping (Neuberg, 1989), and attributional biases (Blanchard-Fields & Abeles, 1996; Follett & Hess, 2002; Tetlock, 1985) all have been linked to both aging (e.g., increased vulnerability to extraneous information) and motivation (e.g., decreased vulnerability to extraneous information). These common associations between cognitive aging and motivation, combined with research on Carstensen's (2006) socioemotional selectivity theory, suggest that motivation is likely to be a key factor in the judgments and decisions of older adults.

Implications of Age-Related Changes in the Role of Affect on Decisions

A relative preference for positive information or increased use of affective information has marked implications for judgments and decision making. Older adults who focus relatively more on positive information may process gain-versus-loss information in decisions differently than their younger counterparts who do not share this same focus. As a result, losses may not loom as large for older adults as they have been demonstrated to do for younger adults (Kahneman & Tversky, 1979). Older adults may be more likely to be in positive moods, states that have been associated with greater engagement in schema-based processing and less specific, bottom-up processing (e.g., Fiedler, 2001). These age differences in the experience of incidental affect may be misattributed to aging-related deficits in deliberative processes.

Alternatively, older adults may focus relatively more on affective information overall (both positive and negative information). Several effects on judgments and decisions might be observed if this is the case. First, losses may loom equally large or larger for older adults than for younger adults if both positive and negative information are accentuated. In addition, more affective sources of information such as anecdotal or hedonic (not utilitarian) information may receive greater weight (Dhar & Wertenbroch, 2000; Strange & Leung, 1999). Consistent with this, Blanchard-Fields finds that older adults focus more than younger adults on emotional aspects of everyday problems (Blanchard-Fields, Chen, & Norris, 1997). Finally, incidental sources of affect (positive and negative moods; positive and negative primes) may influence older adults' judgments and decisions more than those of younger adults. An interesting study by Caruso and Shafir (2006) demonstrated that merely considering one's feelings has an impact on choices. Younger-adult participants asked to consider their mood were more likely to choose a mood-relevant movie (a silly comedy) over a more highly rated dramatic movie than were participants who had not thought about their feelings. Socioemotional selectivity theory suggests that older adults' feelings are more salient and accessible than are younger adults' feelings, leading to the prediction that older adults overall may rely more on emotional information when making choices. Thus, older adults should make relatively more choices that are mood relevant. This possibility remains to be tested.

The disproportionate focus on emotional, and particularly positive, information by older adults may be adaptive because this information is less resource demanding. Older adults also use an antecedent coping style that requires low energy rather than the response coping style that requires higher energy (Carstensen, Gross, & Fung, 1997). This strategy allows older adults to construct their environment in ways that minimize negative emotions by selecting social partners carefully, managing interactions such that conflicts are avoided, and using psychological processes such as cognitive reappraisal (Charles & Carstensen, 1999).

In the section that follows, we categorize types of judgment and decision tasks and analyze the results of available age-difference studies with respect to whether the studies demonstrated increases, decreases, or no changes in the weights of positive information, negative information, or both positive and negative information relative to neutral information in judgments and decisions. We then examine whether the available evidence is more consistent with cognitive decline, motivational changes, or neither. We find that the literature contains interesting hypotheses about age differences in many types of decision tasks but contains no relevant published studies to support these hypotheses.

Decisions by Experience

In some decisions, descriptive information important to making the decision (e.g., weather forecasts, prescription-drug risks) is available; such decisions are called decisions by description. In other decisions—decisions by experience—summary descriptions of options are not available and, for information about the different options, people have to rely on their own past encounters with those options (e.g., decisions about who to collaborate with or be friends with, driving decisions). Aging-related changes might be different in choices learned from experience than in choices made among options that are merely described. A.D. Fisk and Rogers (2000), for example, reviewed evidence that decisions in well-learned environments

(e.g., driving) are preserved with age. Other studies have demonstrated more consistent decisions for older adults compared to younger adults, particularly in domains where both groups have expertise (Kim & Hasher, 2005; Tentori, Osherson, Hasher, & May, 2001). In an experiment with younger adults, Weber, Shafir, and Blaise (2004) hypothesized and found that the encoding and use of outcome and likelihood information were different when decision options were merely described (as is common in most studies of judgment and decision making) versus when options were learned through experience. Decisions by experience have been linked to affective processes. One of a large number of dual-process theorists, Seymour Epstein (1994) has observed:

> The experiential system is assumed to be intimately associated with the experience of affect, . . . which refer[s] to subtle feelings of which people are often unaware. When a person responds to an emotionally significant event . . . the experiential system automatically searches its memory banks for related events, including their emotional accompaniments . . . If the activated feelings are pleasant, they motivate actions and thoughts anticipated to reproduce the feelings. If the feelings are unpleasant, they motivate actions and thoughts anticipated to avoid the feelings. (p. 716)

We should expect, therefore, to find older adults influenced more than younger adults by experienced affective events as opposed to those that are described. This hypothesized greater effect, however, should depend on the recency of experience, with older adults being influenced relatively more by recent events (Hertwig, Barron, Weber, & Erev, 2004). We expect that, compared to younger adults, older adults will overweight affective events in decisions by description. And we expect that, in decisions by experience, older adults will overweight frequent affective events even more than in decisions by description but will underweight infrequent events more than younger adults will.

Life-span theories predict that, in the absence of infrequent events, there will be either a relative overweighting of positive information (in which case positive options will be learned faster and negative options will be learned slower, and therefore both positive and negative options will be chosen more often) or an overweighting of emotional information in general, leading to superior learning about and decisions among affectively charged stimuli. Hess, Pullen, and McGee (1996) examined adult age differences in the ability to learn about a prototypical group member from descriptions of group members and nonmembers. Despite the claim by J.E. Fisk and Warr (1998) that "it is well established that older people tend to learn more slowly than do younger ones" (p.112), older adults performed better than younger adults in abstracting a prototype based on affective information, providing support for an overweighting of emotional information. Hess et al. (1996) argued that the greater controlled-processing abilities of younger adults interfered with their ability to abstract the affective information.

These findings suggest that in choice tasks that involve learning through experience, emotional information should be more salient to older adults, thus improving their ability to abstract and use it in their choices despite cognitive declines. Evidence in favor of such an explanation comes from studies examining performance in the Iowa Gambling Task and other similar tasks (Damasio, 1994), in which age differences are often observed to be absent (e.g., Kovalchik et al., 2005; MacPherson et al., 2002). Performance in this task appears to be based more on implicit processes, because normal adults can make good choices prior to conscious awareness of what the good and bad choices are. Denberg, Tranel, and Bechara (2005) found, however, that a subset of older adults made particularly poor choices, but none of the cognitive measures used could explain the difference between older adults who made good choices and those who made bad choices. In addition, individuals with superior memory and IQ did not show better knowledge of what the good and bad choices were (Damasio, 1994). Prior research (Peters, 1998; Peters & Slovic, 2000) also showed that performance on this task is based in part on affective processes, by demonstrating that scores on self-report measures of affective reactivity were associated with choices made by college-student participants in the original and modified versions of the task. Wood, Busemeyer, Koling, Cox, and Davis (2005) found that older and younger adults performed equally well on the original version of the gambling task. Using a cognitive model for this task that provides a theoretical decomposition of performance into learning, motivational, and response components, they found, however, that younger adults relied more on memory processes whereas older adults relied more on an accurate representation of gains and losses in the task. This suggests that the relative preservation of affective processes in older adults enables them to compensate for losses in deliberative processes. Finally, older adults, once they have learned a payoff structure, appear to perform less well than younger adults do if that payoff structure changes unexpectedly, at least when abstract gains and losses are used (Mell et al., 2005).

This same Iowa Gambling Task-type task can be used to examine the negativity bias. Wood et al. (2005) examined model parameters from their theoretical decomposition and concluded that older adults, unlike the younger college students, did not show a negativity bias. Because gains and losses are confounded in the original Iowa Gambling Task, Wood et al. could not base their conclusion on actual choices and depended instead on the theoretical model parameters.

Decisions by Description and Prospect Theory

In the present section we introduce the best-known descriptive theory of decision making under uncertainty, prospect theory (Kahneman & Tversky, 1979); examine how older adults might differ from younger adults in the shapes of prospect theory's value function and decision-weight function; and make predictions about what age differences would result.

Descriptive theories of decision making were developed to better model the limitations of decision makers (e.g., Simon's bounded rationality, 1955) and of situations (e.g., information is often missing or incomplete). Daniel Kahneman shared the 2002 Nobel Prize in Economics primarily for prospect theory. The theory predicts that the processing of information about probabilities and consequences does not follow normative economic theory but is driven by perceptual and attentional mechanisms common to all individuals. The theory captures "behavioral patterns in human decision making better than traditional economic theory" (Nilsson, in his presentation speech for the 2002 Nobel Prize) and provides a more behaviorally rich model for the complexity of real-life decision problems.

Prospect theory predicts that decision options (or prospects) are evaluated in terms of subjective values and likelihoods. Then those two types of information are integrated to make a choice. One of the primary contributions of prospect theory is the probability-weighting function (see Fig. 2) that describes people as overweighting small probabilities (rare events such as winning the lottery) and underweighting large probabilities (common events). A "certainty effect" is predicted also: People would much rather eliminate a risk (e.g., from $p = .05$ to $p = 0.00$) than reduce it by the same amount (e.g., from $p = .10$ to $p = 0.05$), and they would prefer to be certain about getting some benefit (e.g., from $p = .90$ to $p = 1.00$) than to increase their chances of getting it by the same amount (e.g., from $p = .80$ to $p = .90$).

Another contribution of prospect theory, the value function, concerns how individuals perceive the value of a potential outcome. The value function illustrates diminishing marginal consequences for both gains and losses (e.g., a gain of $100 is more significant to a college student than it is to Bill Gates). It also predicts that evaluations of potential outcomes are based on a modifiable reference point, so that outcomes above and below the reference point are viewed as gains (i.e., benefits) and losses (i.e., costs), respectively. For example, if a woman thought her medication would cost $40 per month (her reference point), outcomes below this point, such as $20 per month, will be viewed as a gain and outcomes above this point will be viewed as a loss. Moreover, losses loom larger than the equivalent gains (e.g., a loss of $500 hurts more than a gain of $500 feels good). Preferences then depend on how they are framed: When possible outcomes are framed in terms of gains, most decision makers are risk averse (they avoid options with higher payoffs but with lower probabilities of occurrence), because the incremental gain offered by an uncertain prospect is not worth much more due to diminishing marginal returns. For the same reason, when possible outcomes are framed in terms of losses, then most decision makers are risk seeking (they choose the more uncertain options with higher potential losses), because the additional potential loss does not hurt much more. These predictions are illustrated in the S-shaped value function that is concave in the domain of gains and convex (and steeper) in the domain of losses (see Fig. 3).

Although prospect theory is assumed to generalize to all individuals, the model has primarily been tested with younger adults; systematic studies have not been conducted with older adults, to the best of our knowledge. In addition, prospect theory in its original formulation ignored the potential role of dual-process theories. Growing recognition of the importance of dual-process theories (e.g., Kahneman, 2003) and life-span changes in these dual processes, combined with the lack of tests of prospect theory with older adults, raises the question of whether prospect theory generalizes to older adults or needs to be modified; empirical tests with older adults should help to expand the theory. At the same time, examining age differences in prospect-theory functions should help to illuminate the nature of particular age effects that cannot be clearly predicted from

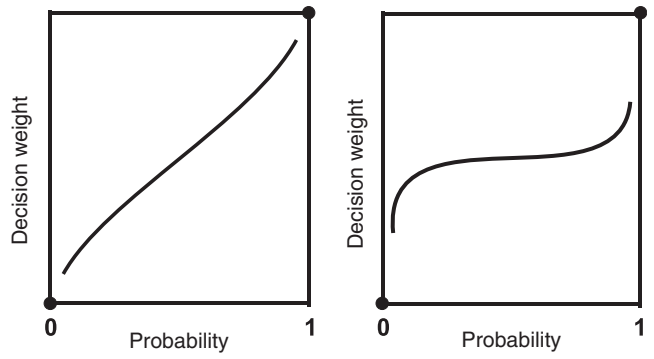

Fig. 2. Probability-weighting functions for affect-poor (left) and affect-rich (right) stimuli. When stimuli are affectively poor, valuation is thought to depend more on calculation; in such cases there is a relatively linear relationship between the decision weight (i.e., the subjective perception of probability) and actual probability, which may better reflect the decision processes of younger adults. When stimuli are affectively rich (as in the right graph), valuation is done primarily by feeling, and people are more likely to underweight highly probable occurrences and overweight improbable ones; this may better reflect the decision processes of older adults.

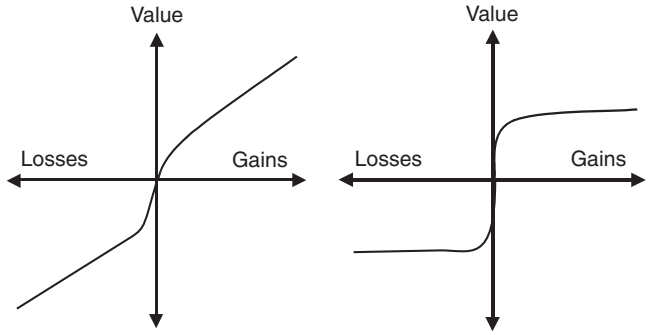

Fig. 3. Value functions for affect-poor (left) and affect-rich (right) stimuli. When stimuli are affect poor, valuation is primarily done by calculation; in such cases, the valuation of gains and losses is somewhat, though not fully, proportional to their magnitude; this may be more similar to the valuation processes of younger adults. When stimuli are affect rich, valuation is primarily by feeling, and people will value at least small losses and gains more; this may be more similar to the valuation processes of older adults.

current older-adult theory (e.g., is there a general age-related increase in the weight accorded affective information or a more specific increase in the weight for positive affective information?).

Of course, prospect theory emphasizes cognitive representations, but recent research has demonstrated that affect plays a prominent role in risky choice and that an affective component underlies observed features of the value and weighting functions. In the present article, we have reviewed two age differences in affective information processing (a general age-related increase in the salience of affective versus nonaffective information and a specific increase in the salience of positive information) that have implications for decisions as described by prospect theory.

Probability. Recent decision research has demonstrated a neglect of probabilities for affective outcomes (Rottenstreich & Hsee, 2001). Affect-rich prospects were more valuable at low probability levels but their value did not increase much with added probability, whereas the values of affect-poor prospects increased greatly with an increase in probability. This finding suggests that the shape of the probability-weighting function should be different and steeper when information is evaluated predominantly by deliberation (as with affect-poor outcomes) than when it is evaluated predominantly by feeling (affect-rich outcomes; see Fig. 2). If age differences exist such that older adults weight positive outcomes more, negative outcomes less, or all affective outcomes more, then in such individuals we may observe greater probability neglect for positive outcomes, less probability neglect for negative outcomes, or more probability neglect for all affective outcomes, respectively.

Older and younger adults appear to learn and respond to probabilistic information equally well (Chasseigne et al., 1999; Sanford, Griew, & O'Donnell, 1972). Research on cautiousness and stereotypy that have involved actual rewards for behaviors have shown no significant age differences in cautiousness (i.e., younger and older adults showed similar risk taking throughout the task) or in overall performance (i.e., rewards gained). For example, Okun and Elias (1977) had older and younger adults participate in a vocabulary task that involved varying degrees of risk, with a payoff structure that varied either directly or inversely with risk. In contrast to prior research using constant payoff structures, the results of this study did not indicate that older adults were more cautious than young adults. Both age groups were equally sensitive to the payoff structure and overall expected value. Similar results were found in a more recent study in which both older and younger adults took fewer risks as the level of risk increased when playing the card game "21" (Dror, Katona, & Mungur, 1998). Deakin, Aitken, Robbins, and Sahakian (2004) found that older adults (compared to younger adults) bet less when the likelihood of winning was higher and the likelihood of losing was lower in the Decision-Gamble Task (Rogers et al., 1999). The Deakin et al. results are consistent with greater probability neglect of affective outcomes among older adults, but the bulk of the research points toward no age differences in reactions to probability as the result of gains and losses. With the exception of Okun and Elias (1977), however, real rewards and losses were not used in these studies, and thus the experienced outcomes may have all been relatively nonaffective.

Rottenstreich and Hsee (2001) argue that the underweighting of larger probabilities may be due to avoidance of anticipated regret. As deliberation is required to think about regret and avoid it, we hypothesize that older adults (with lower deliberative capacity) and younger adults under cognitive load will not show the underweighting of large probabilities; instead, the entire weighting function will be shifted upwards. This upward shift would be more consistent with the emotion literature and the speculation that emotion produces an automatic readiness to act that leaves the decision maker sensitive to the possibility of an emotional event occurring but relatively insensitive to its precise likelihood (e.g., your partner cheating on you; Frijda, 1988). This prediction would also be consistent with declines in the experience of negative affect with age (and, therefore, perhaps declines in the extent to which anticipated regrets come to mind;[5] Mroczek, 2001).

Another implication of the probability-weighting function concerns the discontinuity at certainty such that a guarantee (0% or 100%) of a gain or loss is perceived as much more unlikely or likely than their possibility (1% or 99%) compared to a 1% difference anywhere else on the probability continuum. As a result, decision makers tend to be more risk seeking in choices between a certain loss and a possible loss and more risk averse when choosing between a certain gain and a possible gain. If age differences exist such that older adults weigh positive outcomes more, then they should show greater risk aversion in gains compared to younger adults. However, if they weigh negative outcomes less, less risk seeking in losses should be found, and if they weigh affective information more in general, then they should show greater risk seeking in losses and greater risk aversion in gains relative to their younger counterparts. Three relevant studies have been conducted and show inconsistent age results. Lauriola and Levin (2001) found results consistent with an emotion bias. Specifically, older adults demonstrated both greater risk aversion in gains and greater risk seeking in losses. Weber et al. (2004) did a meta-analysis of studies involving decision outcomes described to study participants (no feedback was directly experienced) and found that increasing age (age ranges were not specified in their paper) was associated with greater risk seeking (more choices of a gamble over a sure thing) in losses; they did not, however, find a link between increasing

[5]To the best of our knowledge, no systematic studies have been conducted on how the use of anticipated regret might change with aging. Because older adults appear to be less negative than younger adults (Jorm et al., 1999; Mroczek, 2001), we predict that anticipated regret will influence the decisions of older adults less than it will those of younger adults.

age and risk aversion (more choices of a sure thing over a gamble) in gains—suggesting no age-related changes in the domain of gains. Holliday (1988), however, found no age differences from 20 to 76 years old in choices between gambles and sure things for gains or losses.

Value. Robust findings with younger adults (illustrated by the S-shaped value function of prospect theory) indicate that losses tend to loom larger than gains, a negativity bias. Findings consistent with life-span theories suggest that the negativity bias in older adults may be different from that of younger adults in any of three ways.

First, the bias may be enhanced as affective information in general becomes more salient. In this case, prospect theory's value function for older adults should reflect a steeper curve near the origin[6] for both gains and losses that reflects more feeling-based processing (see the right side of Fig. 3). This modification to the parameters of prospect theory would predict that older adults would demonstrate a greater negativity bias. Alternatively, if positive information only is weighted more, then a positivity bias would be predicted. If negative information is gated out (and not experienced in order to maintain positive moods), then the shape of the value function in the domain of losses should be more linear and less of a negativity bias should exist in older adults compared to younger adults. We call these three alternatives an affective bias, a positivity bias, and a lack-of-negativity bias.

Loss aversion is used to explain the "endowment effect." In endowment-effect studies, subjects are either endowed with a good and asked the minimum amount for which they would sell it or they are asked the maximum amount for which they would be willing to buy it. Sellers tend to require much more money than buyers are willing to pay (Thaler, 1980). The effect appears to be larger when real money is involved, and it has been linked to affective processes (Lerner, Small, & Loewenstein, 2004; Peters, Slovic, & Gregory, 2003). Older adults, if they generally rely more on feelings, should exhibit a stronger endowment effect, and their prices may be influenced more by incidental affect such as moods. E.J. Johnson, Gächter, and Herrmann (2006) demonstrated greater loss aversion with increasing age in a large sample of auto buyers. Kovalchik et al. (2005) found no endowment effect for older or younger adults. The Kovalchik et al. methodology, however, appeared to maximize the amount of deliberation in the task and therefore may have minimized the role of feelings that have been found to be important to this effect (Peters et al., 2003). No other age-difference studies of loss aversion or the endowment effect could be located.

[6]We believe that greater salience of affective information will influence the slope of the value function near the origin as value increases by an equivalent amount for each quantity on the *x*-axis (with the curve still anchored at the reference point). It is not clear, however, whether age differences that influence the curvature of the function (e.g., in the rate of diminishing marginal returns) may also exist and create age differences in risk aversion.

These predictions can also be tested within the domain of framing effects, in which the same decision problem is framed or described in a positive or negative format. In a famous example, McNeil, Pauker, Sox, and Tversky (1982) elicited different medical-treatment choices by describing the likelihood of the outcome in terms of survival (a positive frame) or mortality (a negative frame). Presumably because a 90% chance of survival is less threatening than a 10% chance of death, patients and experienced physicians both chose the surgery option substantially more often in the positive/survival than in the negative/mortality frame.

If a general affective bias is evident, then the negativity bias should be enhanced and older adults should produce stronger framing effects relative to younger adults, leaving them more vulnerable to possible manipulation through intentional or nonintentional framing. In support of this interpretation, framing effects were larger for undergraduate participants low in deliberative thinking (Smith & Levin, 1997). In addition, Bennett (2001) linked larger framing effects to the addition of emotion-laden visual portrayals. Three studies concerning age differences in framing effects showed opposing results, with one finding that older adults demonstrated significantly stronger framing effects and the other two finding no age difference in the effect of frames (Kim, Goldstein, Hasher, & Zacks, 2005; Mayhorn, Fisk, & Whittle, 2002; Rönnlund, Karlsson, Laggnäs, Larsson, & Lindström, 2005). This issue deserves further attention. Although the Rönnlund et al. study had a small sample size ($n = 32$ per condition), sample sizes provided adequate power in the other two studies, and different results were found nonetheless.

Recent research has also suggested that, under some circumstances, performance in complex decisions can be better when individuals do not engage in extensive deliberation (Dijksterhuis & Nordgren, 2006). Although the validity and generalizability of the theory of unconscious thought are still open issues, the parallels between their effects and the age differences we address are intriguing. Older adults may rely more on affective and intuitive processes in their everyday decisions (a general affective bias) and to actively deliberate less in those decisions due to cognitive limitations. Whether the Dijksterhuis et al. (2006) findings are based on these same kinds of processes, however, is an open question.

Incidental Affect

A large body of research findings suggests that incidental affect (mood states, affective primes, or conditioned responses that are normatively irrelevant to a decision) influences people's evaluations, judgments, motivation and information processing (for a review, see Forgas, 1995). We predict that incidental affect may particularly influence older adults' judgments for two reasons: (a) Incidental mood states are more frequent, intense and salient among older adults (Lawton, 2001); and (b) older adults may lack the capability of discounting or correcting for the influence

of mood in judgments and decisions, a cognitive process that younger adults are capable of performing under normal conditions (Schwarz & Clore, 1983).

Priming. Hess et al. (2000) had different-aged adults make likeability judgments about a series of Japanese Kanji characters. Presentation of each of these characters was preceded by a positively or negatively valenced word that was presented either above or below the participant's perceptual threshold. Consistent with previous research by Murphy and Zajonc (1993), likeability judgments tended to be consistent with the valence of the prime word when participants were unaware of the prime word. In other words, individuals misattributed the primed affective response to the Kanji characters when they were unaware of the source. In contrast, when participants could consciously perceive the prime, only older adults exhibited priming effects. A similar finding was obtained by Hess et al. (1998) using a standard impression-formation task. Two potential explanations for such effects are that older adults are unable to control the impact of the primes on their judgments due to deficiencies in deliberative processes or that older adults choose not to expend the effort necessary to control for the impact of the primes. It may also be that aging promotes an increased focus on emotional information. The fact that later research (Hess, Germain, et al., 2005) found that motivation moderated the impact of primes on judgments, however, calls this last explanation into question. At the very least, the fact that older adults can limit the impact of affective information when motivated to do so suggests that chronic emotion-focused goals such as those proposed in socioemotional selectivity theory may not operate in all situations and may be suppressed by more salient situational goals.

Mood. Decision makers look to both internal and external cues in a situation to help them make decisions. How a decision maker feels about an option is one of those cues (Peters & Slovic, 1996; Peters et al., 2003). It is sometimes hard to distinguish, however, between feelings for an object and currently salient feeling states such as moods. Although a current mood state normatively should not impact longer-term decisions, these irrelevant sources of emotional information have been shown to influence the judgments of younger adults (e.g., mood as information; Schwarz & Clore, 1983). When in a positive mood state, decision makers will sometimes misattribute those feelings to judgments about unrelated objects and find those objects more attractive; in a negative mood state, decision makers again may misattribute those feelings and find objects less attractive (e.g., Clore & Tamir, 2002; Schwarz, 2001; Sechrist, Swim, & Mark, 2003). It has been found, for example, that on sunny days—when, presumably, buyer and seller moods are more positive—stock prices tend to be higher (Hirschleifer & Shumway, 2003). Older adults' increased reliance on affective information may make them more vulnerable to unrelated and irrelevant affective information (e.g., moods).

The effects of incidental affect, or irrelevant positive and negative mood states, on judgment and decision processes have been little examined in older adults. Based on research with younger adults and the finding that older adults tend to be in more positive and less negative mood states relative to younger adults, several effects can be predicted. First, older adults should demonstrate a mood-congruent effect, remembering more positive than negative information relative to younger adults; this prediction is supported by research on socioemotional selectivity theory (e.g., Charles et al., 2003). Knight, Maines, and Robinson (2002), however, showed only partial support of age differences in mood-congruency effects, with both younger and older adults showing mood-congruency effects on some tasks and only older adults showing them on other tasks. Ferraro, King, Ronning, Pekarski, and Risam (2003) found no age differences in mood congruency, although both younger and older adults showed the mood-congruency effect (e.g., those individuals induced to feel happy responded faster to happy words than to sad words). The Ferraro study, however, had several limitations including a small sample of older adults ($n = 25$).

Second, older adults also might process information less systematically due to their relatively greater positive moods (Isen, 2000). A recent study by Phillips, Smith, and Gilhooly (2002) showed that positive and negative mood inductions lead to greater executive-function impairment in older adults than they do in younger adults. Phillips et al. studied executive functioning through planning in the Tower-of-London task (which consists of moving discs to transform a starting arrangement into a goal arrangement). Younger and older adult participants completed the task after positive or negative mood was induced in them through a combination of film and music. A significant Age $\times$ Mood interaction was found, such that both negative and positive mood impaired performance for the older age group, whereas mood had little effect on the younger adult group. The finding that both negative and positive mood impaired performance was discussed in terms of three possible explanations: (a) Mood may act as a cognitive load; (b) positive mood may lead to impaired performance because positive affect signals that goals have been achieved, thus reducing the motivation to engage in systematic processing (Isen, 2000); and (c) emotion regulation—maintaining or attaining a positive mood decreases the attention allocated to other cognitive activities.

Finally, based on the tendency for greater positive and less negative mood among older adults, older adults should be more risk seeking in hypothetical decisions and risk averse in real decisions. We are not aware of any published studies on this topic.

THE IMPACT OF OTHER EXPERIENTIAL PROCESSES IN JUDGMENT AND DECISIONS

Other studies have emphasized the importance of experience—and associated knowledge—as a moderator of age differences in judgment and decision making and as a potential compensatory

mechanism for declines in deliberative processes. Although early research pointed toward improvements in everyday problem solving with age (Cornelius & Caspi, 1987), a recent meta-analysis of studies of everyday problem solving (Thornton & Dumke, 2005) found that age differences in everyday problem solving do exist and are likely due to age-related cognitive declines. However, young and middle-aged adults did not differ in problem solving ability, presumably because the benefits of accumulated experience outweighed cognitive decline. Although older adults (mean age of 70 years) showed worse performance, this difference was attenuated when the problem content was interpersonal rather than instrumental in focus (Blanchard-Fields, Jahnke, & Camp, 1995; Thornton & Dumke, 2005).

Older adults' knowledge and experience appear to benefit them in familiar life situations. When older adults are faced with decisions or judgments in contexts they frequently encounter, previous experience may enable them to avoid bias in decisions. Studies with younger adults, for example, reveal an asymmetric-dominance effect. Younger adults faced with trade-offs between options (e.g., option A is better on quality; option B is better on price) are more likely to choose option A when a third option C is present that A dominates (e.g., A is better than C on quality and equal to it on price) and B does not dominate (e.g., option C is better than B on quality and worse than B on price; Shafir, Simonson, & Tversky, 1993). It seems likely that older adults will also show this general effect, but no published studies exist on this to the best of our knowledge. However, Tentori et al. (2001) demonstrated that older adults were less likely than young adults to be influenced by the addition of a third option (that was dominated by only one of the original two options) when choosing between grocery-store discount cards when the minimum purchase requirement exceeded their usual expenditures. That is, older adults were less likely to let situational information (e.g., the attractiveness of a discount in comparison to other available discounts) influence their decision when its choice would require a larger minimum purchase than their usual budget. Tentori et al. argued that older adults' everyday life experience with the grocery-store context is advantageous because they have knowledge of the situational variables that may influence their judgments and can discount irrelevant information (see also Kim & Hasher, 2005, for similar results).

Older adults' life experiences such as social interactions and grocery shopping allow them to develop expertise in these areas that may benefit judgment and decision making. Certainly there are multiple areas in which expertise can be developed, depending on individuals' life circumstances. Hess and colleagues (Hess & Auman, 2001; Hess, Bolstad, Woodburn, & Auman, 1999; Hess & Pullen, 1994) have examined social expertise in relation to social inferences that older adults make about other individuals. These studies have shown that older adults are skilled at making trait inferences about individuals and that older adults pay particular attention to the diagnostic value of behaviors. Additionally, middle-aged and older adults were more sensitive than younger adults to social-context factors that determine the appropriate application of relevant knowledge concerning diagnostic information, and effective use of diagnostic information was found to be associated with self-reported social experience (Hess, Ozowski, & Leclerc, 2005). Perhaps of particular interest in these studies is that older adults did not exhibit a general bias in favor of positive information in constructing their judgments. Rather, the diagnostic value of the information—whether positive or negative—was the most influential factor in terms of differential processing. This finding suggests that older adults' expertise may counteract chronic goals in the presence of appropriate acute goals (e.g., task-specific instructions). In other words, the emotional goals associated with socioemotional selectivity theory might be viewed as the default in later life when cognitive resources are adequate, but such goals may be superseded by salient situational goals. This highlights the flexibility of the older decision maker.

In the domain of health, Meyer, Russo, and Talbot (1995) studied a group of women diagnosed with breast cancer and found that the older women behaved more like experts by seeking out less information, making decisions faster, and arriving at decision outcomes equivalent to those of younger women. A follow-up study (Meyer & Pollard, 2004) found that this effect was due to the availability of specific information about breast cancer. In other words, consistent with an expertise-based explanation, the presence of relevant declarative knowledge in the problem domain facilitated decision making in older women.

Like the Tentori et al. (2001) study, these studies support older adults' ability to use their expertise when considering contextual variables and to prevent this context from influencing judgments and decisions. It is also important to acknowledge that this apparent expertise influence on performance could also easily be misinterpreted in terms of aging-related deficits in deliberative functions. For example, the results of Meyer et al. (1995) are very similar to those of Johnson and colleagues (E.J. Johnson, Gächter, & Herrmann, 2006) cited earlier. The findings of Meyer and colleagues suggest, however, that the shorter decision times and consideration of fewer pieces of information on the part of older adults might be reflections of greater knowledge rather than heuristic-based processing resulting from reduced cognitive resources.

Age differences in judgment and decision-making processes may sometimes reflect differences learned from experience in the weight accorded to different attributes in decisions. For example, in examining choices of political candidates, Riggle and Johnson (1996) found that older adults focused more on the candidates themselves whereas younger adults appeared to focus more on issues. These researchers speculate that the shift to a more candidate-oriented focus may reflect older adults' past experiences with elections, resulting in devaluation of statements concerning stances on specific issues and attachment of

greater importance to more holistic impressions. These findings are particularly interesting given that older adults are often viewed as focusing on single issues (e.g., Social Security, Medicare). Evidence for such differences also emerges from work by Blanchard-Fields and colleagues (Blanchard-Fields & Camp, 1990; Blanchard-Fields et al., 1997; Watson & Blanchard-Fields, 1998) who have found that strategy preferences for dealing with everyday problems vary as a function of age and problem domain. This complicates determining the bases for age differences in strategy use and decision outcomes. For example, older adults' preference for more passive rather than active strategies in certain situations may be reflective more of context and experience rather than ability (e.g., cognitive-resource reductions).

CONCLUSIONS

In the present review, we examined age differences in processes related to decision making that have been well studied in younger adults but little studied in older adults. We first reviewed evidence for age-related changes in information processes; the greater quantity of research about age changes in affective and deliberative information processes allows us to draw firmer conclusions than we can for age differences in decision making. Evidence of age-related declines in deliberative processes such as working memory and speed of processing is robust, but it does not provide a complete explanation of age differences in decision making. We also conclude that age differences in implicit and affective information processes are minimal but that a positivity effect is shown in memory by older adults when cognitive resources are adequate. More research is needed to clarify the interaction of cognitive resources with the role of affective information in processes important to decision making (e.g., memory, attention). Although for simplicity we have limited the present paper to considering relatively low-intensity affect, Labouvie-Vief (2005) speculates that stronger-intensity affect and emotions will act more like a cognitive load on older adults when compared with their younger counterparts. The evidence base for this last hypothesis is not strong at this point.

In terms of decision making, robust evidence for aging-related declines in deliberative processes predict that older adults will be more likely to show some decision biases, particularly in unfamiliar or less meaningful situations. Older adults will tend to process less information in decisions more slowly and will demonstrate worse judgments and decisions than younger adults when complex or changing rules must be learned. Age-related adaptive processes, however, influence decision making in three ways. First, older adults selectively use their deliberative capacities based on their level of motivation to make decisions, so that age differences in decisions lessen when the decisions are more relevant or meaningful. Second, older adults focus relatively more than do younger adults on emotional content (and sometimes on positive content) in decisions. The quantity of evidence for this conclusion is sparse, however, particularly with real rather than abstract gains and losses. Robust evidence exists that older adults tend to be in more positive and fewer negative moods compared to younger adults. The few existing studies suggest they also show stronger mood-congruent effects and may show fewer effects of specific emotions due to greater experiences of mixed emotions (Charles, 2005). Finally, the accumulated experience and knowledge of older adults compensate in some cases for age-related declines. In this review, we focused primarily on affect and less on other experiential processes such as schemas and stereotypes, although we believe that those processes may have similar influences on judgments and decisions as people age (e.g., Hess, 1990; Mather & Johnson, 2003).

Older adults will process information in decisions differently than will younger adults. The resulting decisions sometimes will be better and other times will be worse. An understanding of these differences can help expand theory in the areas of both decision making and aging cognition. To illustrate the potential for theory development, we examined how theories of aging can inform prospect theory. They can also inform other decision theories such as time-preference theories.[7] At the same time, because conflicting predictions for judgment and decision making emerge from theories of aging (e.g., predictions about age differences in the negativity bias), tests of prospect theory in older adults may be able to expand and clarify these life-span theories. The lack of robust evidence testing aspects of prospect theory prevents us from drawing firm conclusions at this point. We hope, however, that this article catalyzes further research in this important area.

Proposals for improving people's decision-making abilities (e.g., Hammond, 1996; Keeney, 1993) are based primarily on research results from young adults. Decision making is essential to life at all ages, however, and older adults are increasingly being asked to make their own decisions about vital life issues. No longer are health and financial decisions left entirely to specialists such as the family doctor. Instead, older adults are faced with more choices and more information than they were in previous generations, at a point in their lives when their abilities to deliberate carefully about important decisions may be de-

[7]Socioemotional selectivity theory, for example, suggests that in old age, when time is perceived as limited, short-term benefits become relatively more important (Lang & Carstensen, 2002). In terms of time preferences, it implies that older adults will discount more than younger adults will. Discounting refers to how much less future money is worth now. If an individual discounts less, then they value future money relatively more and, thus, would show a relative preference for a larger later reward over a smaller immediate reward. Economic theory and results thus far are mostly consistent with this suggestion (Read & Read, 2004; Souzou & Seymour, 2003; Trostel & Taylor, 2001). A simpler explanation, though, is that older adults may perceive the likelihood of cashing in later as being lower due to shorter expected life span or shorter expected healthy life span. If steeper discounts were shown by older adults for affective options over less affective options, then we could say with more assurance that the effect was due to the emotional goals hypothesized to be chronically activated in socioemotional selectivity theory.

clining. Thus, research-based advice on how to improve older adults' decision making is essential.

Finally, understanding the balance of affective and deliberative processes in judgment and choice is fundamental to the study of decision making. Decisions often involve both the head and the heart. In addition, decision makers sometimes have experience in a decision situation and are familiar with the tradeoffs and options; other times, they are not. A better understanding of the mechanisms that underlie decision processes in our aging population should ultimately allow us to help older adults to better help themselves.

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