ABSTRACT

LECLERC, CHRISTINA MARIE. Age-Related Differences in the Influence of Affect on Judgment Processes: Selectivity versus Selective Preservation? (Under the direction of Thomas M. Hess.)

Research has indicated that aging is associated with declines in executive functioning, as well as with significant neuronal loss in associated brain regions. Interestingly, research has also indicated relatively less age-related decline in regions of the brain linked to affective processing, and no significant age differences in performance on tasks assessing affective functioning. Given that older adults experience executive declines, it may be that the selective preservation of affective processing structures in the brain results in a greater reliance on affective processing systems compared to younger adults. This shift in reliance on affective processing may be reflected in increased dependence on less resource-demanding, automatic processing mechanisms, as well as maintenance in performance on tasks dependent on processing of affective information. The current work is an attempt to examine the relative influence of deliberative versus affective processes of younger (ages 18-30, \( M = 18.6 \)) and older (ages 63-73, \( M = 71.8 \)) adults using a social judgment task. Participants read a series of descriptions that varied in the number of positive and negative traits they contained. A subset of these traits was relevant to performance in a particular occupation. Participants were required to either make an overall impression judgment (based on all traits) or a job-related judgment (based only on the relevant subset of traits). Results indicate that all participants were able to distinguish between relevant and irrelevant attributes and made more accurate general impression ratings than job effectiveness ratings. The hypothesized lower
levels of performance in older adults in the job judgment condition due to the presumed involvement of executive processes in distinguishing between relevant and irrelevant traits was not supported in spite of lower observed levels of functioning of older adults on a variety of executive functioning tasks. Social judgment abilities appear to be relatively well preserved in healthy older adults. It may be that social judgment tasks are unique in that performance on these tasks draws from relatively well preserved brain systems, or is maintained as a result of greater social expertise, permitting older adults to exhibit continued high levels of functioning.
AGE-RELATED DIFFERENCES IN THE INFLUENCE OF AFFECT ON JUDGMENT PROCESSES: SELECTIVITY VERSUS SELECTIVE PRESERVATION?

by

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A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy

PSYCHOLOGY

Raleigh, North Carolina

2006

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DEDICATION

This dissertation is dedicated to the three most important people in my life: my husband Tim, and my parents Ron and Rachel Bolduc. Without their constant support I could have never dreamed of the achievements I have already made. Thank you to my parents for constantly providing such wonderful examples of success and for allowing me the freedom to choose the path in life that leads to my own happiness, and more importantly, the encouragement to stay on that path. I cannot begin to tell you how much I appreciate that I have always had such patient and supportive people by my side as I grew. Thank you to my husband for providing the daily support and encouragement needed to complete this long journey. I always know no matter what road I travel, I will have you there along side of me cheering me on. Thank you so much!
BIOGRAPHY

Christina Leclerc was born in Biddeford, Maine and spent the majority of her early life in Winslow, Maine where she began high school. At the age of 15, she moved with her family to Saco, Maine where she graduated from Thornton Academy in 1997. After high school, she attended Stonehill College in North Easton, Massachusetts, graduating magna cum laude in 2001 with a B.A. in psychology. Later that year she enrolled in a combined M.S. and Ph.D. program in developmental psychology at North Carolina State University in Raleigh, North Carolina. In June of 2002 she was married to Timothy Leclerc, a staff sergeant in the U.S. Army stationed at Fort Bragg, North Carolina. In May of 2003, Christina received her M.S. in developmental psychology. Her thesis focused on the use of diagnostic information in older adults’ social judgment processes. After completing coursework, Christina successfully completed her preliminary exams and progressed to doctoral candidate in November of 2004. Her dissertation is an age comparison of the use of emotional information in making everyday decisions. Christina completed her dissertation and received her Ph.D. in developmental psychology in August of 2006. After completion of her graduate program, she returned to New England where she began a postdoctoral fellowship with Dr. Elizabeth Kensinger at Boston College in the Cognitive and Affective Neurosciences Laboratory in July of 2006.
ACKNOWLEDGEMENTS

I would like to thank the faculty in the developmental psychology program for fostering such a productive environment in which to learn, conduct research, and share accomplishments. Many thanks to my fellow graduate students in the program and across the department for helping to maintain such a friendly and supportive environment and providing such great memories that I will keep with me always. Thanks to Shevaun Neupert for helping me to make my way through the more complex statistical analyses, her help allowed me to present the best results possible. Finally, I would like to thank my committee members Jason Allaire, Christopher Mayhorn, and Lynne Baker-Ward, as well as my committee chair and advisor, Thomas Hess for encouraging me and providing valuable feedback as I made my way through the program.
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Introduction

The current research is intended to examine the relative influence of deliberative versus affective processes of younger and older adults in judgment and decision-making processes. Previous research and theory has suggested that age differences exist in the emphasis on affective information as a result of attempts to increase the positive, emotionally rewarding stimuli in one’s environment. Although supportive data regarding this motivational perspective have been obtained (Carstensen, 1993; Carstensen, Fung, & Turk-Charles, 2003; Carstensen, Isaacowitz, & Charles, 1999; Carstensen & Turk-Charles, 1994), an alternative explanation for the observed aging-related shift in the emphasis on affective information has received less attention. Specifically, the observed age differences in emphasis on affective information may not be a reflection of chronic goals, but rather may be based more in underlying biological changes within the aging brain (MacPherson, Phillips, Della Sala, 2002; Mittenberg, Seidenburg, O'Leary, DiGiulio, 1989; Moscovitch, & Winocur, 1995). The purpose of this research is to examine the hypothesis that age-related variations in the focus on affective information reflect selective preservation of affective systems and the simultaneous decline in deliberative systems presumably bound in the differential decline of cortical structures underlying these two systems.

Review of the Literature

Previous research has often blurred the line between the definitions of emotion and affect. Ochsner (2006) suggests that these two words are often used interchangeably to represent a “valenced feeling state that may be accompanied by
changes in physiology and behavior.” A distinction does, however, exist between the meanings of emotion and affect. The term emotion refers to a coherent set of behavioral, physiological, and experiential responses associated with a discrete cause that allow an organism to adapt to changes in their environment (Cacioppo & Berntson, 1999; Lazarus, 1991). Traditionally, emotions are thought to have a specific trigger, or a start point, a set path or course of effect on the organism, and a distinct ending point. Affect, on the other hand is thought of as a multipurpose term that is used to describe not only the previously discussed emotions, but also enduring moods that lack concrete eliciting stimuli and are usually less diffuse in nature. Throughout the context of this research, the term affect will be used to specifically mean emotion, to the exclusion of mood. Although mood research is gaining interest in the context of age-related changes (e.g., Mienaltowski & Blanchard-Fields, 2005), it is not the focus of this research.

In order to gain a better understanding of how these affective processes differentially influence younger and older adults’ cognitive processes, it is important to first gain a better understanding of the distinction between deliberative and affective processes. I will then move to a discussion of the roles of deliberative and affective systems in judgment and decision-making and age-related variations in the influence of each of these systems on these processes in adulthood. Neurobiological mechanisms for the differential impact of deliberative and affective processing systems across the life span will then be discussed. Finally, ideas derived from research in these areas will be used to interpret the limited previous
research that has targeted aging-related changes in the influence of affect on judgment and decision-making processes.

**Deliberative versus Affective Processes in Choice Tasks**

According to Epstein (1994), when making a decision, two interrelated approaches are used to process information. The cognitive or deliberative system is characterized by conscious, analytical, reason-based, verbal, and relatively slow processing, whereas the experiential or affective system is intuitive, automatic, associative, and fast. Although Epstein discusses these mechanisms separately, each with unique characteristics, he is careful not to suggest that the two systems work completely independently. In order to gain a better understanding of decision-making and judgment processes in aging, it is important that we first gain a basic understanding of the separate mechanisms that create the foundation of this relationship. I will begin by detailing the roles of deliberative versus affective systems in judgment and decision-making. This review will be followed by a description of the relationship between age and these two systems. Finally, I will develop hypotheses based on the information presented.

**Deliberative Processes in Judgment and Decision-making**

The first aspect of Epstein’s (1994) model of decision processes is the deliberative mode. This system is assumed to process information more slowly, systematically, and rationally than the affective system. The deliberative system can handle complex and unfamiliar tasks, but is unable to produce rapid, off-the-cuff responses that are often required in everyday decision and judgment situations. According to Epstein, the cognitive aspect of his cognitive-experiential model is
characterized by (a) analytic processing as opposed to the holistic processing of the affective system, (b) logical, reason-oriented thought lines (e.g., What is sensible in this situation?), and (c) logical connections between these thoughts. Additionally, he suggests that behavior is mediated by conscious evaluations of events, with thoughts and actions requiring justification via logic and concrete evidence.

Unlike the affective system, processing within the deliberative system occurs consciously, allowing the individual to manipulate the process and outcome. As such, these complex deliberative abilities are dependent on an individual’s ability to perceive, hold, and manipulate information in memory as well as the speed with which the individual processes the information.

*Affective Processes in Judgment and Decision-making*

Epstein’s experiential mode is based in heightened affective states which are viewed as providing important information regarding whether something requires further attention. In a similar view to that of Epstein, Simon (1967) suggests that negative affect signals to an individual that a situation demands more detailed analysis. Simon’s view also indicates that emotions direct attention to important events. He argues that emotions serve as “cognitive interrupts” that tell an individual what is important, thus facilitating prioritization of processing resources. According to Simon’s view, emotions serve three vital purposes. Emotions allow individuals to produce adaptive responses to changing environments. They may also incorporate factors such as moral or aesthetic values that people have difficulty articulating and which, perhaps as a result, tend to receive little weight in deliberative decision-
making. Finally, emotions often provide the motivation necessary to implement a chosen course of action.

Affect can not only be viewed as a guide for judgments and decisions (Peters & Slovic, 1996, 2000), it may also be viewed as a crucial piece of data needed for the selection of the information most important in making a choice. Damasio (1994) has suggested that emotions provide useful information about the desirability of different courses of action. This function is highlighted in his somatic marker hypothesis, which suggests that thought is mainly composed of images that provide perceptual and symbolic representations of the environment. Based on a lifetime of experience and learning, these images become “marked” by positive and negative feelings that are linked to somatic or bodily states. When a negative somatic marker is linked to a given image from a situation or future outcome, it serves as an avoidance warning. In contrast, a positive marker associated with an image serves as an approach incentive towards an event or outcome. Damasio’s research (e.g., Damasio, 1994; Damasio, Tranel, Damasio, 1990; Bechara, Tranel, Damasio, 2002; Bechara, Damasio, Tranel, Anderson, 1998; Bechara, Damasio, Damasio, Anderson, 1994) has indicated that these somatic markers increase the accuracy and efficiency of the decision-making process, and their absence in patients who have ventromedial prefrontal cortex (VMPFC) - an area associated with emotional processing – lesions is associated with decrements in decision-making ability in many situations. As a result of Damasio’s extensive research, the substantial impact of affect on choices becomes apparent. According to Damasio (1994), individuals are not always aware of, or able to control, the influence of affect on their judgments
and decisions. Based on this work, it is evident that performance on judgment and decision-making tasks depends on the ability to maintain the affective processing systems. It is important to note that research has also indicated that, in some cases, deliberative thought processes can result in less optimal decision outcomes than if the individual had made a more spontaneous decision, presumably based more on affective information (Dijksterhuis, 2004).

Combined, these theoretical views suggest that affective and deliberative processes represent two connected mechanisms through which decisions and judgments are made. As a means for understanding potential age differences in decision-making processes, I now turn to an examination of the impact of aging on processing systems.

**Age Differences in Deliberative and Affective Processes**

Aging appears to have different effects on the deliberative and affective processing systems. As such, each will be discussed as a separate entity, although I am careful to point out that neither process can be entirely separated from the other in functional terms within the context of decision processes. Typically, past research on decision-making has focused primarily on the deliberative processing system. Interestingly, it is these deliberative processes that are most affected by age (i.e., perceiving and holding information in working memory, processing information quickly to make a rapid decision).

It is increasingly evident that affect is important in guiding decision-making. Research has increasingly focused on the role of affect, including its adaptive and sometimes maladaptive consequences (e.g., Slovic, Peters, Finucane, &
MacGregor, 2005). Unfortunately, the bulk of this work has focused on younger adults, leaving numerous questions regarding the relationship between aging and affective processes in decision-making. Are older adults’ decisions based to a greater degree than younger adults’ on selective processing of affective information? Is there selective preservation of cortical systems underlying decision-making processes, and if so, how does this selectivity affect older adults’ performance? Do older adults depend more on experience—and the associated affective consequences—in making decisions? Given the importance of effective decision-making to independence and adaptation, it is imperative that we understand the effects of aging on this process. Based on past research, we know a great deal about aging effects on deliberative systems (i.e., executive functions) that may underlie decision-making; less, however, is known about changes in affective systems. The present study contributes to filling this void by investigating age differences in both deliberative and affective processes as well as in the role of affect in judgment and decision-making processes, with particular emphasis on distinguishing between perspectives based in selective preservation of cortical systems versus selective processing perspectives.

**Age Differences in Deliberative Processes**

As indicated previously, deliberative processing systems are reflected in the efficiency of cognitive processes such as working memory and information processing speed. These processes are also of importance to efficient decision-making and judgment abilities (Weber, Goldstein, & Busermeyer, 1991; Weber, Goldstein, & Barlas, 1995). Recent research and theory on cognitive aging has
increasingly emphasized changes in specific deliberative abilities, such as executive functions, as a primary determinant of cognitive change, replacing more general resource-capacity views. Particular focus has been given to the three major types of control processes that make up basic executive functions: task switching, updating and monitoring of working memory, and inhibiting irrelevant information (Miyake, Friedman, Emerson, Witzki, & Howerter, 2000). The first process, inhibitory control, represents resistance to interference (e.g., Hasher & Zacks, 1988; Hasher, Zacks, & May, 1999). Past research indicates that older adults have more trouble inhibiting intrusive thoughts and information, leading to limited functional working memory capacity and reductions in available cognitive resources (Hasher & Zacks, 1988). A second process, the ability to coordinate multiple distinct tasks or various separate processing streams, has also been found to be affected by the aging process (e.g., Hartley & Little, 1999; McDowd & Shaw, 2000; Mayr & Kliegl, 1993; Verhaeghen, Kliegl, & Mayr, 1997). Divided attention has a greater negative effect on older adults’ performance than on that of younger adults (Whiting, 2003). Further research has indicated that age-related deficits in coordinating multiple tasks cannot be explained simply in terms of age-related slowing in processing speed (Verhaeghen, Kliegl, & Mayr, 1997; Verhaeghen, Steitz, Sliwinski, & Cerella, 2003). More recently, a third age-sensitive control process has emerged: task switching (e.g., Mayr & Kliegl, 2003). Research in this area has demonstrated increased performance costs associated with age, in that switching from one task to another requires significantly more time and effort for older adults than for their younger counterparts (Kray & Lindenberger, 2000).
Deficits in executive functions may lead to a number of possible outcomes in relation to judgment and decision-making. Declines in executive functions may cause older adults to access less information or choose more heuristic strategies, such as satisficing in order to reduce the demands on their limited resource capacity. Alternatively, declines in regions of the brain that support executive functions may also make access to new information difficult and may prevent older adults from making connections between information received and previous experience. Finally, it may also be the case that older adults' decision-making strategies require more processing time in order to overcome past experience with or knowledge about a given domain.

Together, this research indicates an overall reduction in deliberative processing abilities with age, presumably due to changes in the frontal lobes of the brain (e.g., Daigneault, Braun, & Whitaker, 1992; Mittenberg, Seidenberg, O’Leary, & DiGiulio, 1989; Moscovitch & Winocur, 1995; Perfect, 1997; Phillips & Della Sala, 1998; Raz, 2000; Raz, Gunning-Dixon, Head, Dupuis, & Acker, 1998; West, 1996). Given the importance of such abilities in the decision-making process, aging may negatively impact the ability to effectively make judgments and decisions.

Age Differences in Affective Processes

In comparison to the large number of studies that have examined age-related differences in deliberative processing abilities, relatively few studies have examined such differences in systems relating to affective processing. This limited literature has generally focused on age differences in emotion regulation and memory for emotional stimuli. Such studies have found that older adults experience less
negative affect than younger adults in both cross-sectional and longitudinal studies (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Charles, Reynolds, & Gatz, 2001; Gross, Carstensen, Pasupathi, Tsai, Skorpen, & Hsu, 1997; Mroczek, 2001). The majority of this research has involved the examination of the influence of affect on memory, but the results have been inconsistent. Some studies have shown that memory for emotional information is similar across both younger and older adults (Yoder & Elias, 1987; Kensinger, Brierley, Medford, Growdon, & Corkin, 2002). Additional research has indicated that whereas older adults remember less information overall and significantly less neutral information than younger adults, both younger and older adults recall equivalent percentages of emotional information (Denburg, Buchanan, Tranel, & Adolphs, 2003; Carstensen, Fung, & Turk-Charles, 2003; Carstensen & Turk-Charles, 1994).

A recent study indicated that whereas both younger and older adults recognize a greater percentage of positive and negative stimuli compared to neutral stimuli, this effect seems to be weakened in older adults as demonstrated by fewer “remember” as opposed to “know” responses in older adults (Combalin, D‘Argembeau, Van der Linden, & Aldenhoff, 2004). These authors suggest that perhaps older adults, being more likely to focus on their feelings when viewing emotional images, will suffer from impaired memory for the contextual information associated with these images. Additional research (Mather, 2000) examining age differences in source monitoring ability indicated that when asked to focus on their feelings about an event, younger adults relied on schematic knowledge to a greater degree than older adults. Additionally, across conditions (i.e., non-emotional focus
and emotional self-focus) older adults showed more schema reliance than did younger adults. What this pattern of results suggests is that both emotional focus and age-related changes in the reliance on schemas increase when making source judgments about a previously-experienced event. Research examining memory for perceptual (e.g., who said each statement) versus conceptual (e.g., was the person telling the truth or a lie, and was the person good or evil) source information found differing patterns of age differences based on the type of source memory required (Rahhal, May, & Hasher, 2002). Large age differences were present when participants were asked to make a decision regarding who said each statement; however, when decisions were affectively-related (i.e., judgment of the safety of an item), age differences nearly disappeared. This research suggests not only that the type of information presented can influence age-related patterns of performance for source-conveyed information, but also that affective processing appears to be preserved even in later life.

Finally, other research has more clearly demonstrated age-related emotional biases in memory (Kennedy, Mather, & Carstensen, 2004; Charles, Mather, & Carstensen, 2003; Kensing & Corkin, 2003), with older adults remembering significantly greater proportions of positive as opposed to neutral and negative information, reflecting an age-related positivity effect. As individuals age, they recall fewer emotionally negative images compared to neutral and positive images (Charles et al., 2003). Charles and her colleagues have suggested that less effective recall of negative images compared to both neutral and positive ones is a result of older adults being more likely than younger adults to be motivated to attend
to positive information and to reappraise or suppress negative information as a means of regulating emotional states. Additional research has indicated that an increased focus on emotion is associated with an increase in the recollection of positive autobiographical memories (Kennedy et al., 2004). These researchers hypothesized that based on tenets of Socioemotional Selectivity Theory (SST), older adults are more motivated than younger adults to remember their past in an emotionally positive light and that older adults’ positivity bias in memory is reflective of their motivation to regulate their emotional experiences.

If older adults remember less neutral information, and relatively equal amounts of emotional information compared to younger adults, the decisions of older adults may be more likely than younger adults to be influenced by affective information. The apparent increase in salience of affective information with age may be interpreted in light of SST (Carstensen, 1993), which suggests that this late-life increase in the salience of emotional information is a result of a shift in chronic motivational goals. With increasing age, individuals become more likely to perceive limitations on time remaining. This perception leads to restructuring of the motivational goal hierarchy, resulting in increased motivation to pursue emotional goals and the rewards of close social relationships, and a decrease in the knowledge acquisition aspects of social relationships valued by younger adults. Additionally, SST suggests that as goals shift more towards emotional rewards, later life is characterized by greater selectivity in the objects or information emphasized, suggesting that older adults are paying greater attention to the output of such affective processing systems.
SST does not appear to explain all of the findings in the literature, however, with some results appearing to directly contradict predictions based on this framework (e.g., Kensinger, Piguet, Krendl, & Corkin, 2005; Denburg et al., 2003). This inconsistency may stem from differences in methodologies across studies. Studies that require participants to attend to each affectively laden stimulus specifically find few age differences (e.g., Denburg et al., 2003). Results of this work have demonstrated that older adults perform better on memory tasks requiring only a general description of the stimuli to be recalled, whereas they display significant memory performance decrements when asked to recall details of the stimuli. According to these researchers, general descriptions provided by older adults center around the central affective content of the stimulus, whereas the peripheral details that are often not affective in nature are not recalled by older adult participants. Additional research has examined the influences of manipulations on encoding instructions on memory for both emotional and neutral information. Generally, when individuals encounter a complex visual scene including both emotional and neutral information, memory for the emotional content (i.e., central details) is usually enhanced, whereas memory for peripheral (nonemotional) details is reduced (see reviews by Buchanan & Adolphs, 2002; Hamann, 2001). When encoding instructions are manipulated, however, age differences in memory performance are altered (Kensinger et al., 2005). When no specific instructions accompany an encoding task (i.e., incidental encoding), both younger and older adults focus attention on the emotional aspects of the scene. When given intentional encoding instructions, however, younger adults no longer display this same effect; instead
they are equally likely to recall peripheral details of emotional and neutral stimuli. Older adults, in contrast, continue to show reduced memory for the peripheral elements of the emotional compared with the neutral scenes, even with the intentional encoding instructions.

Kensinger and her colleagues suggest that if aging does indeed influence motivational goals and the attentional focus on negative information (e.g., Carstensen et al., 2000), it could be hypothesized that older adults will not display increased memory for central versus peripheral details in a negatively valenced scene. More specifically, older adults, in their attempts to emphasize emotionally rewarding aspects of their environment, would be less likely to focus on negative compared to neutral details in a stimulus scene, and will therefore be more likely to recall neutral versus negative peripheral details contained in the scene. Alternatively, Kensinger and her colleagues also hypothesize that older adults might show attentional patterns similar to that of younger adults given that attentional focus on emotional information is likely mediated by the amygdala. Previous research has indicated minimal age-related changes in the amygdala across the life span (see Mather, 2003), leaving open the possibility that if amygdalar functions underlie observed emotional effects, older adults and younger adults will likely display similar patterns of focus toward emotional information.

In comparison to deliberative processing mechanisms, affective processing systems have been found to suffer relatively little age-related loss in efficiency (e.g., MacPherson, Phillips, & Della Sala, 2002, Chow & Cummings, 2000). Thus, older adults enjoy preserved (or enhanced) emotion regulation, effects of affect on
memory, and attention toward emotional goals. As a result of the differential rates of decline within the deliberative and affective processing systems, it is reasonable to predict that affective information should be more influential for older adults’ decision-making and judgment processes.

Recently, psychologists have begun to question how cognition or deliberative processes might be theoretically or empirically separated from affective processing systems. The focus of the present research is on this distinction between deliberative and affective processing systems, and more specifically between the major theoretical views that exist in this area. Two major perspectives may be used to explain the age-related differences in the processing of affective information throughout the decision-making process. The first, that of selectivity or selective processing, postulates that older adults selectively process affective information to a greater extent than younger adults when making a decision due to changes in chronic goals. The second, and the focus of the current research, is based in the selective preservation of processing systems. This view hypothesizes that aging-related differences occurring in the processing of affective information are explained by relative preservation of cortical structures associated with affective processing and simultaneous declines in those supporting more deliberative processes. This imbalance in system efficacy may be associated with the fact that affective information, especially in later life, becomes more influential within the decision-making process. The present research aims to better understand the differential impact of affective processing systems on both younger and older adults’ decision-making and judgment performance.
Neurobiological Evidence of Age-Related Changes in Systems Underlying Decision-Making Processes

Recent neurobiological research appears to provide evidence suggestive of differential age-related declines in regions of the brain associated with deliberative as compared to affective processing mechanisms, perhaps providing neurobiological evidence in support of the selective preservation viewpoint. Neuropsychological research has consistently reported age-related declines in performance on tasks assessing functioning in brain regions associated with executive functions (reviewed by West, 1996) and little concurrent decline in affective processing systems (Kensinger et al., 2002).

Research has indicated that the frontal cortex is a heterogeneous region in terms of cognitive and behavioral influences (e.g., West, 1996; 2000). The two regions of specific focus for this research are the dorsolateral prefrontal cortex (DLPFC) and the ventromedial prefrontal cortex (VMPFC). Both regions are located within the frontal lobes, an area of the brain associated with higher-order cognition.

MacPherson, Phillips, and Della Sala (2002) noted consistent decline with age in tasks dependent on DLPFC functioning and associated with executive functions. More direct neurobiological research has concluded that the frontal lobes of the brain are affected by the process of normal aging both earlier than other brain regions, and at a more rapid pace (Daigneault & Braun, 1993; Mittenberg, Seidenburg, O’Leary & DiGiulio, 1989; Moscovitch & Winocur, 1995; Parkin, 1997; Raz, 1996; Shimamura, 1994; West, 1996). According to past research, the DLPFC is thought to receive projections from the primary sensory and motor regions of the
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brain (Adolphs, Tranel, Bechara, Damasio, & Damasio, 1996). This research has indicated that the DLPFC supports executive functions and working memory as well as other higher integrated processes such as planning, decision-making, and central executive processes devoted to the control and regulation of cognition (Petrides & Milner, 1982). This region is also thought to filter between task-relevant and task-irrelevant information (e.g., Shimamura, 2000). It is also now abundantly clear that the prefrontal cortex, more specifically regions such as the DLPFC, suffers disproportionately greater decline, as measured by both neuronal loss and estimated volume, due to the normal aging process than other regions of the brain, such as the VMPFC (Chow & Cummings, 2000).

The VMPFC is believed to be involved in the processing of emotions and the regulation of social behavior (Rolls, 1996). Neurobiological research has indicated that the VMPFC receives projections from higher-level functioning systems, such as the limbic system, as opposed to the more primary projections associated with the DLPFC (Adolphs et al., 1996). Researchers have demonstrated little age-related decline on tasks dependent on the VMPFC regions (Kensinger et al., 2002). Direct neurobiological evidence has indicated the relative preservation of the VMPFC regions with age (reviewed by Chow & Cummings, 2000; Mather, 2003). Based on these findings, it seems plausible that functional links to and from this region are relatively preserved across the lifespan.

Given that relatively little decline is observed in regions associated with emotional processing when compared with those regions associated with executive functions, it can be hypothesized that older adults may rely to a greater degree on
affective processing systems as a form of brain-level compensation for their diminished efficiency in functioning in age-affected regions (Cabeza, 2001). This perspective can be viewed as a passive process involving a shift from less efficient to more effective processing systems. Age-related maintenance of judgment and decision-making processes exist in spite of declines in regions of the brain associated with executive processing, even in advancing age, via the use of preserved, more efficient affective processing systems. The present research aims to test the hypothesis that there are 1) aging-related declines in the efficiency of executive functions, 2) that there is a simultaneous preservation of affective processing systems with age, and 3) age-related decreases observed in executive functions will in part account for age-related differences in decision-making and judgment performance.

In sum, this research suggests that with relative preservation of affective processing mechanisms and a simultaneous decline in efficacy of the deliberative processing system, affective processes may passively compensate for behavioral-level declines in deliberative functions in later life. Based on this biological foundation, the next step towards understanding the age-related influences of affect on decision-making and judgment processes is to integrate all of the previous areas of research, as well as review the limited literature that has directly investigated the age differences in the influence of affect of judgment and decision-making processes.
Age-Related Changes in Decision-Making and Judgments

As noted previously, the existing cognitive aging literature suggests numerous age-related deficits associated with executive functions. These findings might lead us to expect that judgment and decision-making abilities will also decline as a natural part of the aging process, given their seeming dependence on such skills. It is also important to note, however, that the majority of older adults appear to function effectively in everyday life. This suggests that their ability to make decisions may remain intact in spite of these aging-related deficits (e.g., Denney, Pearce, & Palmer, 1982; Denney & Pearce, 1989; Hartley, 1989; Marsiske & Willis, 1995). In some cases, these abilities have been found to be even better with advancing age (e.g., Cornelius & Caspi, 1987). This may suggest that other factors, such as experience and affect, which are maintained into later life, play an important role in supporting such abilities.

As stated previously, one of the major points of emphasis for this research is to examine age differences in the roles of affective and deliberative systems within judgment and decision-making processes. Based on research suggesting differential decline across cortical regions, it can be expected that behavioral or cognitive differences would exist as well between younger and older decision makers. Behavioral research has begun to examine the differences in decision-making and judgment processes that occur as part of the normal aging process. It is expected, based on the neurobiological work examining age differences in executive functioning mechanisms, older adults will experience limitations in processing when
making decisions and will, as a result, display an increased emphasis on affective information.

In a study examining age-related differences in the influence of executive functions on decision-making processes, both younger and older adults were asked to examine information about a number of hypothetical political candidates, and to then decide which of the presented candidates they would vote for (Riggle & Johnson, 1996). The focus of the study was to examine the patterns of information search and type of processing strategies used by individuals when making their decisions. Results of the study indicated that older participants not only examined fewer pieces of evidence, they also took more time to complete the decision-making task and to examine each piece of information. Johnson and Drungle (2000) indicated that older adults took almost twice as long in viewing the decision-related information. Less time was taken to review information with which older adults were very familiar (i.e., pain relievers), however, suggesting that personal experience with decision scenarios may increase the efficiency of information review. What research by Johnson and her colleagues suggests is that perhaps taking more time to complete the task and reviewing fewer pieces of information may be a function of the slowing in activation of information in working memory and declines in processing speed found in aging. It may also reflect a form of satisficing whereby older adults conserve resources by making decisions that are “good enough.”

Klaczynski and Robinson (2000) investigated whether older and middle-aged adults are more or less biased by their theoretical convictions than are younger adults. They found that older and middle-aged adults were more prone than
younger adults to uncritically accept evidence favorable to their positions and to dismiss, often with arguments based on principles of scientific inquiry, evidence that depicted their beliefs as inaccurate or that portrayed the groups they favored negatively. The researchers hypothesize that older adults may be more biased by their beliefs than younger adults because they have more difficulty suppressing interfering cognitions (decreasing ability to inhibit irrelevant information) and only expend the effort required to inhibit interference when their beliefs are being threatened. The authors also suggest that because long-held beliefs have served older adults well (or have not caused harm) in the past, they are more resistant to change in comparison to newly developed beliefs. Because older adults' beliefs have been held longer and have been more deeply integrated into their self-concepts, they may in turn, be treated more as truths supporting their identities than as working, testable hypotheses.

Klaczynski and Robinson also suggest that declines in working memory abilities may make older adults more likely than younger adults to rely on heuristic processing strategies (e.g., Johnson, 1990), making them susceptible to framing effects. When options are phrased negatively, participants are generally more risk seeking, whereas when options are framed positively, participants are likely to be risk averse. Additional research indicates, however, that framing effects can be reduced when participants engage in detailed processing of the stimuli (e.g., Sieck & Yates, 1997; Takemura, 1993), such as providing rationale for a selection. A study by Malloy and colleagues examined the influence of treatment descriptions on medical decision-making (Malloy, Wigton, Meeske, & Tape, 1992). They presented
older adults with descriptions of life-sustaining treatment interventions described positively, negatively, or exactly as worded in widely-used medical directives. Results indicated that individuals were less likely to choose the intervention when it was worded negatively compared to when it was described positively or in the neutrally worded directive widely used in the medical field. Interestingly, most participants (77%) changed their minds at least once when responding to different descriptions in three clinical scenarios. These results mirror additional work examining age-related differences in the framing effect. Recent work has indicated that older adults are more susceptible than younger adults to framing (choices systematically altered based on the language used to formulated the decision options) (Kim, Goldstein, Hasher, & Zacks, 2005), but only under circumstances where no justification is required for their choice. When justification is required, framing effects were eliminated.

Results of this work can be interpreted in light of both of the previously discussed perspectives. What is important to note is that neither perspective can be exclusively supported in light of the highly inconsistent nature of the collection of studies. Studies supporting the selective preservation view found differing patterns of information processing for younger versus older adults. When older adults were asked to freely process available information, they were more likely than younger adults to process affective information at the expense of systematically analyzing all of the available information. Processing all of the available information would place strain on older adults’ less efficient deliberative processing mechanisms, providing further support for the selective preservation view. Interestingly, results of other
work in this area can be used to support the selectivity perspective. When older adults are specifically instructed to pay attention and systematically analyze decision options (i.e., provide justification for their choices), they are able to refocus their attention and utilize deliberative processes allowing them to overcome the focus on strictly affective aspects of the decision information. In other words, when goals of processing are altered to emphasize the less affective perspective of the available information, age differences are reduced. This follows the theoretical line of SST in that older adults simply prefer to process the affective information in a given situation; however, when specifically instructed to attend to all available information, older adults are able to use their executive processing systems to make decisions based on all information. At present, both of these perspectives are supported by the existing research. The present research is aimed at providing further evidence that it is indeed a differential decline in systems that drives the emphasis on affective information observed in older adults.

Overall, these studies suggest that older adults process decision-related information differently than younger adults. These results do not inherently indicate that older adults’ decisions are worse than those of younger adults. Given the strong existing evidence of age-related declines in working memory, older adults may be more likely than younger adults to depend on affective processing systems in a decision-making context because they have no other efficient processing system available. To lay a better foundation for this hypothesis, we must, however, first understand the more basic differences in systems that exist between younger and older decision makers. Based on research examining deliberative processing
abilities, one would expect significant declines in decision-making and judgment mechanisms with age. Rarely, however, does such a simple explanation provide all of the answers to such a complex question.

Aging and the Influence of Affect on Decision-Making and Judgment

Zajonc (1980) was one of the first researchers to argue for the importance of affect in decision-making. In his work, Zajonc postulated that affective reactions to stimuli are often the very first reactions, and these reactions occur automatically and later guide information processing and judgment. Only a small portion of the decision-making research has included affect as one of the variables of interest. The majority of past aging work examining the relationship between emotion and cognition has examined the previously discussed learning of and memory for emotional and neutral stimuli. This research has indicated an increased influence of affect with age, although not a completely consistent influence, on performance relative to deliberative processing mechanisms (Damasio, 1994; Kennedy, Mather, & Carstensen, 2004; Charles, Mather, & Carstensen, 2003; Kensinger & Corkin, 2003), as well as evidence towards an age-related decrease in deliberative processing abilities (e.g., Hess, Pullen, & McGee, 1996; Hess, Rosenberg, & Waters, 2000; Salthouse, 1994; 1996; Salthouse & Meinz, 1995; Salthouse, Atkinson, & Berish, 2003). Together, these results may provide further evidence for the selective preservation of affective processing systems and a simultaneous decline in deliberative processing abilities, leading to an age-related increase in the emphasis on affective information when processing information for a decision.
There are a number of potential reasons for the observed age-related increase in the influence of affect on cognition. First, due to their greater experience with affective information across the lifespan, older adults may be more adept in using this type of information in the context of a choice task. Age may be associated with more experience with affective information, which could be associated with the accumulation of more affective markers. When presented with real-world decision-making and judgment tasks, it is important to be able to immediately locate the best option, or at least the one that is “good enough” in a given situation (Yates & Patalano, 1999). Experience gained over the lifespan may allow older adults to more efficiently locate the best option in a judgment task. It is proposed that somatic markers normally help constrain the decision-making space by making the space more manageable for deliberative processing, and permitting individuals to make judgments and decisions efficiently and quickly (Damasio, 1994). Greater experience gained across the lifespan may allow older adults, or “experts,” to use more automatic processing (i.e., affective processing systems) in completing a task (i.e., Myles-Worsley, Johnston, & Simons, 1988).

A second perspective, based on Carstensen’s (1993) SST, suggests that the increased influence of affect on processing systems is a result of a more general change in chronic motivational goals or an increasing level of emotional maturity (Carstensen, Isaacowitz, & Charles, 1999). As suggested by SST, shifts in chronic motivational goals away from knowledge-seeking toward goals that provide greater emotional rewards may be associated with older adults consciously adapting the strategies they use to come to judgments or decisions (away from deliberative
towards affective). According to these researchers, shifts in goals towards a greater influence of affective information reflect a conscious change, or what can be viewed as a shift in preference. As a result of the increased salience of affect within older adults, it can be hypothesized that decision and judgment processes of older adults may be influenced to a greater degree by affective information than those processes of younger adults.

A final perspective suggests that aging differentially influences cortical structures, leading to the observed increases in the influence of affective information on cognition that occurs in later adulthood. This perspective postulates that older adults exhibit an increased reliance on affective processing modes because the neural systems supporting these processes are maintained while the neural mechanisms underlying deliberative processing undergo age-related declines. According to this view, older adults do not merely prefer affective processing mechanisms in the context of a choice task. Rather, the affective systems become primary processing mechanisms because they remain relatively efficient in the face of decrements in other systems and may be the main source of information on which to base decisions. To the extent that such information is useful and important in a specific context, decision-making and judgment capacities may be relatively unaffected—and in some cases, be improved—with age. Obviously, it is also true that decision-making may suffer if affect results in biased responses or if deliberative processes are necessary for acquiring and evaluating information.


**Present Research**

The just-reviewed literature suggests that there is selective preservation of brain systems related to affective processing, which in turn may lead to relative preservation of functions associated with processing of affective information. Most judgment and decision-making tasks rely on both deliberative and affective processes. It may be that the selective preservation of affective processing structures in the brain with aging will result in greater reliance on affective processing systems relative to deliberative processing systems. This passive and unconscious shift in reliance on affective processing systems may be reflected in increased emphasis on affective information when making judgments and decisions. Alternatively, the selective processing view posits that the focus on affective information represents a preference rather than a consequence of brain aging, suggesting that individuals should still be able to process information in other ways as well.

In the present research, the relative influence of deliberative versus affective processes of older and younger adults was examined using a social judgment task. Social judgments are often quite complex due to the variety of information sources, differences in types of information available, as well as variations in the complexity of the relationships between all of the available information. The task required participants to view a variety of target descriptions made up of either 6 or 12 trait attributes. Half of the attributes related to the target’s general competence, whereas the remaining half related to the target’s suitability for a specific occupation. Within each category of attributes, the valence of these two sets of attributes was varied.
systematically and independently so that the net valence of the traits varied across descriptions, and the net valence of traits within categories was uncorrelated across categories.

Participants were asked to make one of two types of judgments for each target description. They were asked to either rate their general impression of the target individual or make a judgment of how suitable the target individual would be to perform a specified occupation. When participants were asked to make a general impression judgment, simply processing the associated affective content of the traits would be sufficient to process the information effectively. If participants were asked to make a judgment about the target individual’s suitability to perform a specified occupation well, deliberative functions would be important for the individual to discriminate between relevant and irrelevant information and to selectively base judgments on only the former. Given that younger adults were expected to have efficient deliberative and affective systems, it is expected that they will be able to effectively rate the target individuals in both conditions. In contrast, if aging is associated with declines in deliberative processing and relative preservation of affective processing, older adults would be expected to do well in general impression condition—where performance relies on affective mechanisms—but relatively poorly in the job condition—where performance is partially dependent on deliberative functions. These differences between age groups in performance efficiency in the job condition should also increase with the complexity of the task. In addition, it was expected that older adults would make suitability ratings based primarily on the
overall affective content of the target descriptions due to difficulties in selectively processing relevant and irrelevant attributes.

In order to further test for a selective preservation view of affect, an additional sample of younger adults, who performed the task with a memory load, was also included. According to the preservation perspective, age differences are reflective of aging-related reductions in executive functions. If true, then the performance of younger adults should mimic that of older adults if they are required to perform a secondary task—which has been shown to deplete available cognitive resources—during the social judgment task. More specifically, younger adults under a divided attention manipulation should exhibit declines in the ability to process nonaffective information in circumstances where this information would benefit performance levels.

Finally, the impact of individual differences in deliberative functions, as assessed by measures of executive functioning was also investigated. This construct was assessed using measures of task switching, inhibition, and working memory capacity. Individuals with performance deficits on these measures (i.e., older adults or low functioning younger adults) may be prevented from properly processing information related to judgments and decisions. Declines in the ability to inhibit information, deficits in the ability to efficiently switch tasks, and decreased working memory capacity were hypothesized to be related to a decrease in the ability to control the impact of automatic processing on judgment (Hess, Waters, & Bolstad, 2000), which may again result in decreased ability to process nonaffective information. Support for a selective preservation view would be provided if older
adults were observed to emphasize affective information to a greater degree than younger adults when making a decision, and they were also found to have diminished executive functioning abilities that account for age effects in performance.

**Statement of the Problem**

The field of cognitive aging has primarily focused on cognitive or deliberative level implications of the normative aging process on judgment and decision-making abilities. Little research, however, has attempted to examine the influence of affective information on these abilities. Judgments and decisions made in everyday life involve influences from various sources including, facts and information, previous experience and biases, opinions from others, and emotions (i.e., gut responses). Real life judgments, especially those related to social perceptions are hard to view as being void of affective content. Therefore, it appears to be particularly important to understand the changes in the influence of affective information on judgments and decisions as a function of increasing age. The current research will attempt to more specifically examine age-related changes in the influence of affective information on judgment and decision-making processes.

**Specific Aims**

*Aim 1: Examine age differences in the use of affective information.*

*Hypothesis 1.* Neurobiological research indicates differential decline in cognitive versus affective regions throughout the brain, suggesting a passive, unconscious shift in reliance on less resource-demanding, automatic processing mechanisms and a concurrent shift in emphasis on affective information when
making judgments and decisions given that these systems are maintained throughout normal aging. Based on the selective preservation view, we would expect to observe declines in performance on tasks requiring deliberative processing given that these systems are thought to be most greatly affected by the biological aging process. In contrast, performance on tasks that depend on affective information should be maintained with age.

**Aim 2.** To further identify underlying mechanisms of the observed age-related differences in the influence of affective information on judgment processes.

*Hypothesis 2a.* Age differences will be apparent in judgment performance. More specifically, younger adults given a divided attention task will perform at similar levels to older adults, experiencing declines in available cognitive resources and deliberative abilities, resulting in an increased reliance on automatic affective processing systems.

*Hypothesis 2b.* Age differences in decision-making ability as a result of declines in cognitive resources or deliberative processing mechanisms will be exacerbated under conditions of high complexity (i.e., increased information quantity).

**Aim 3.** Examine the impact of individual differences in executive functioning ability on the influence of affective information on judgment processes.

*Hypothesis 3.* Individuals with lower levels of executive abilities may have difficulty properly processing information related to judgments and decisions, resulting in decreased performance levels on a decision-making task. Declines in the ability to inhibit information, deficits in the ability to effectively switch tasks, and
decreased working memory capacity are thought to be related to a decrease in the ability to control the impact of automatic processing on judgment (Hess, Waters, & Bolstad, 2000), resulting in an emphasis of automatic affective processing systems.

**Method**

**Participants**

Young adults consisted of 57 females and 60 males who were recruited from introductory psychology classes at North Carolina State University and received credit towards completion of a class assignment. The mean age of participants in this group was 18.6 years (range: 17-28, SD: 1.34). Older adults were recruited from the Raleigh community and surrounding areas through newspaper advertisements and received $20.00 in return for their participation. The older adult group consisted of 30 females and 30 males with a mean age of years 71.8 (range: 63-83, SD: 4.17), and consisted of 16% minority individuals.

**Design**

The main purpose of the experiment was to compare age-related differences in ratings on a social judgment task. A 3 (Group [young vs. older vs. young divided attention]) x 2 (Task [impression vs. job judgment]) x 2 (Complexity [6 attributes vs. 12 attributes]) design was used. Group was a between participants variable, whereas both task and complexity were within subjects variables. The young adult participants were randomly assigned to two groups, one with and one without a simultaneous divided attention task. Individual difference measures, including performance on three types of executive functioning tasks, and emotion regulation strategy were also examined as predictors of ratings. Dependent variables
measured were mean study time for each behavioral attribute, the overall rating provided for each target person, and individual attribute ratings provided as a manipulation check.

Materials

Target Descriptions. Target descriptions consisted of 6 or 12 attributes. The attributes across descriptions all spoke to either the target individuals' general competence or their potential competence in a specified job field. For example, some attributes simply provided positive or negative information about the target individual’s general competence, whereas other attributes provided positive or negative information about the target’s ability to perform specific job-related functions.

To insure that attributes were viewed in similar ways by both younger and older adults, I obtained ratings prior to the study proper from two independent groups of young adults (ages 18-24, $M=20.6$, 12 females, 9 males), who were recruited from introductory psychology classes at North Carolina State University, and older adults (ages 60-85, $M=69.4$, 14 females, 7 males). These individuals were asked to fill out a norming survey that contained a list of trait attributes for each of 5 (i.e., Doctor, Professor, Banker, Manager, Judge) different occupations. Attributes were chosen to represent both negative and positive competence-related traits. A diverse sample of attributes that were thought to vary in their representativeness with respect to each of the five occupations was chosen based on the a priori perception of myself and a few of my colleagues. Participants were asked to rate the valence of and the extent to which each attribute was relevant to the specified
occupation on a 7-point Likert scale, with 1 = very negative or not at all job-related and 7 = very positive or very job-related.

The ratings obtained were then standardized for each participant on each scale (job-relatedness, valence) to control for individual differences in the use of the rating scale, with the mean job-relatedness score and mean valence calculated for each attribute using these standardized ratings. These scores were averaged within age groups for each attribute, resulting in age-group specific normative scores on these two dimensions. These scores were used in selecting positive and negative attributes for both conditions for inclusion in the target descriptions for the full study. In order to ensure that the trait representativeness and valence of the stimulus attributes were perceived in the same manner across age groups, only those attributes for which there were no significant age-group differences in either rating were considered for use in the study. Traits were chosen that were clearly relevant or irrelevant and clearly positive or negative. The resulting attributes with their corresponding valence and relevance ratings are presented in Appendix A.

Based on the results of the norming sample, 64 target descriptions were created, containing either 6 or 12 attributes. Six-attribute descriptions were created by crossing every possible combination of positive and negative general attributes with every possible combination of positive and negative job-specific attributes. This resulted in 16 descriptions of varying overall valence and job-specific valence (see Appendix B). Importantly, the correlation between these two values is zero. Within each description, all attributes related to general competence, but only half of these were considered relevant for one of the jobs used in the study. Twelve-attribute
descriptions were created in an analogous manner: by simply doubling the number of attributes of each type and valence for each of the descriptions that contain six attributes. In this manner, both 6- and 12-item descriptions contained similar properties (in terms of ratios of positive to negative traits) and varied only in the amount of material presented before asking for a rating. Attributes were systematically rotated through descriptions such that each attribute appears equally as often as part of a set of six attributes and as a part of a set of 12 attributes. Additionally, each target description was presented twice to each participant, once followed by a job-specific rating scale and once followed by a general impression rating scale.

*Emotion Regulation Questionnaire.* The Emotion Regulation Questionnaire (Gross & John, 2003) was used to assess the extent to which participants engaged in cognitive reappraisal and expressive suppression. This measure consists of 10 statements. Each item is accompanied by a scale ranging from 1 to 7 (1 = strongly disagree, 2 = disagree, 3 = mostly disagree, 4 = neutral, 5 = mostly agree, 6 = agree, 7 = strongly agree). Higher responses to items 1, 3, 5, 7, 8, and 10 (e.g., “I control my emotions by changing the way I think about the situation I’m in”) indicate higher levels of cognitive reappraisal strategies of emotion regulation, whereas higher responses on items 2, 4, 6, and 9 (e.g., “I control my emotions by not expressing them.”) indicate higher levels of expressive suppression strategies of emotion regulation. Gross and John (2003) reported that the measure shows moderately high internal reliability ($\alpha$s ranging from .68 to .82).
Executive Functioning Measures. In order to assess executive functions, participants were also asked to complete a subset of the tasks used by Miyake and his colleagues (2000). All tasks were presented in computer format to reduce data entry and experimenter errors. One task was used to assess each of the three major types of executive functions: task switching, updating, and inhibition.

The Plus-Minus task (adapted from Jersild, 1927 and Spector & Biederman, 1976) was used to assess task-switching ability. This task consists of three lists of 30 two-digit numbers (the numbers 10–99 pre-randomized without replacement), with the numbers in each list being presented one at a time on the computer screen. For the first list, the participants were instructed to add 3 to each number and enter their number using the keyboard. For the second list, they were instructed to subtract 3 from each number. Finally, on the third list, the participants were required to alternate between adding 3 to and subtracting 3 from the numbers (i.e., add 3 to the first number, subtract 3 from the second number, and so on). The participants were instructed to complete each list quickly and accurately, and list completion times were recorded automatically as programmed by the experimental software. The cost of shifting between the operations of addition and subtraction was then calculated as the difference between the time to complete the alternating list and the average of the times to complete the addition and subtraction lists, and this shift cost served as the dependent measure.

A 64-card computerized version of the Wisconsin Card Sort Task (Heaton, 2000) was used to assess the ability to update and monitor working memory representations. The task required participants to match a series of target cards...
presented individually in the middle of the screen with any one of four reference cards shown near the top of the screen. Participants were read the following instructions prior to beginning the task:

*This test is a little unusual because I am not allowed to tell you very much about how to do it. You will be asked to match each of the cards that appear here (point to the first response card at the bottom center of the screen) to one of these four Key cards (point to each of the stimulus cards at the top of the screen). Using the mouse, point to the Key card that you believe matches this card. Once you have made a choice, press either the left or right mouse button to make your selection. The computer will place your card under the Key card that you select, and a new card will appear at the bottom of the screen. If you wish to change your answer before the card stops moving, immediately click on the Key card or anywhere on the screen a second time. You will then be permitted to select again. However, you may not change your answer after the card stops moving. If this happens, don’t try to click on the Key card a second time; just go on to the next item. I cannot tell you how to match the cards, but the computer screen will show you each time whether you are right (correct) or wrong (incorrect). If you are wrong, simply try to match the next card correctly, and then continue matching the cards correctly until the test is over. There is no time limit on this test. If you don’t have any questions, you may begin.*

Each target card remained on the screen until a response was given. Following each response, participants received visual feedback (i.e., RIGHT or WRONG appeared below the sorted target card). The category (e.g., “color”) stayed the same until the participant correctly performed eight consecutive sorts, at which point the sorting criterion changed (e.g., to “number”). The participants were not explicitly told that the sorting criterion would change. The main dependent measure was the number of classical perseverative errors, which was the number of times participants failed to change sorting principles when the category changed and kept sorting the cards according to the previous, no longer correct sorting principle.
Finally, the traditional Stroop task (Stroop, 1935) was presented to participants in order to assess the ability to inhibit irrelevant information. In this task, participants were instructed to verbally name the color of a stimulus as quickly as possible in each trial, with RTs measured by keyboard entry. The task included 50 trials with a string of asterisks printed in one of four colors (red, green, blue, or yellow), 50 trials with a color word printed in a different color (e.g., BLUE printed in red color), and 50 trials with a color word printed in the same color (e.g., BLUE in blue color), with the different trial types mixed (i.e., nonblocked). The dependent measure was the RT difference between the trials in which the word and the color were incongruent and the trials that consisted of asterisks.

**Background Measures.** In addition to the previous tasks, participants also completed a short demographic questionnaire, an assessment of Personal Need for Structure (PNS) (Thompson, Naccarato, & Parker, 1992), and the SF-36 Health Survey (Ware, 1993). Participants also completed Salthouse and Coon’s (1994) letter and pattern comparison tasks to assess processing speed, the Weschsler Adult Intelligence Scale – III (Weschsler, 1997) Letter-Number Sequencing subtest to assess working memory, and the Vocabulary test from the Kit of Factor Referenced Tests (Ekstrom, French, Harman, Derman, 1976). These measures were used to characterize the sample, as well as to identify any possible confounds that might compromise the results.

**Procedure**

Younger adults were randomly assigned to one of two groups. Half of the younger adults, as well as the entire sample of older adults, were asked to complete
only the social judgment task. The remaining younger adults were required to simultaneously perform a secondary distractor task, in the form of a digit memory task similar to that used in previous research (e.g., Logie et al., 2004), in addition to the social judgment task. The digit memory task required participants to view a list of 5 digits presented on the computer screen prior to the presentation of a given target description. Immediately after completing the rating scale associated with the target description, the participants were asked to enter the digit sequence using the keyboard. Testing was completed on an individual basis. Packets containing the background questionnaire, the PNS scale, the health survey, and the ERQ were mailed home to the older participants a number of days prior to their test session. Younger adults were asked to fill out the previously mentioned background information after the remainder of the procedure had been completed.

For the main task, participants were told that they would be completing a judgment task in which they would be asked to make ratings about target individuals based on limited information. Prior to the start of the study, participants were presented with the complete list of trait attributes included in the study proper. They were asked to rate each attribute on the extent to which each was relevant to one of the specified occupations chosen for inclusion in the study proper. In addition, participants were also asked to rate their general impression of each attribute in terms of valence. These ratings were made on a 7-point Likert scale, with 1 = very negative, or not at all job-related and 7 = very positive, or very job-related. This task not only served as a manipulation check for the appropriateness of each attribute on measures of valence and job-relatedness, but it also served to get participants
thinking about the attributes in the manner that they should in the social judgment
task (i.e., general impression or job suitability).

The main portion of the experiment began with the presentation of the full
target descriptions. Participants were asked to read and rate a series of target
descriptions that contained either 6 or 12 attributes. Participants were instructed
that the information about each target would be displayed one attribute at-a-time on
the computer screen, and that each description would contain traits that characterize
a fictitious target individual. The computer automatically recorded reading times for
each attribute as participants were making their way through the social judgment
task. Participants were told prior to the presentation of each target description which
rating they would be asked to make later (general impression for the affective
condition vs. job suitability for the job specific condition). Participants were told to
read each piece of information on the screen, making sure they understood it before
moving on to the next attribute. Participants controlled the pace of reading by
pressing the space bar. They were also reminded that these ratings were meant to
be based on a first impression and they should not spend an excessive amount of
time examining any one attribute. After all the information about a specific target
person had been viewed, participants were asked to make judgments about the
target individual’s characteristics based on the information they had read using the
appropriate rating scale based on the task condition. The affective scale asked
participants to rate their general impression of the target individual (i.e., 1 = very
unfavorable to 7 = very favorable), whereas the job-specific scale asked participants
to rate their opinion of the target’s suitability for a specified job (i.e., doctor, car
salesman, etc.) (i.e., 1 = very unfavorable to 7 = very favorable). Responses were entered using a keyboard with seven clearly marked buttons. Four practice trials were given to ensure that participants understood the procedure.

Target descriptions were presented in counterbalanced sequences, to which equal numbers of participants from each age group were randomly assigned. Participants were not allowed to look back at the original attributes while making their ratings. All target descriptions were presented twice, once in the general impression condition and once in job condition. Participants were encouraged to work at their own pace until all target descriptions sets were completed. Following the main portion of the experiment, participants were asked to complete the various unrelated background measures and the previously mentioned measures that assessed executive functioning abilities. After completing these final measures, participants were debriefed, compensated, and dismissed.

**Results**

Three types of data relevant to the primary task were obtained from each participant: ratings of valence and relevance to a specified job as a manipulation check for each attribute, reading times for individual attributes, and ratings for each target description based on specified condition (general impression vs. job specific). It is important to note that throughout these analyses, I have used “younger adults” to refer to those younger participants in the control (i.e., full attention) condition. Younger adults who were also asked to simultaneously perform a divided attention (DA) cognitive load task will be referred to as “DA younger adults.” The alpha level for all statistical tests in this report was set at .05.
Participant Characteristics

Prior to conducting the main analyses, one-way analyses of variance (ANOVA) were performed in order to compare the age groups on the background measures that were collected. These analyses revealed relationships that are typical of aging (see Table 1). Specifically, the younger adult group had significantly lower levels of education compared to the older adult group, reflecting their current student status as undergraduate student as well as the relatively high levels of education in the older group. Younger adults did not perform as well as the older adults on the vocabulary test. Older adults completed fewer correct sequences on the WAIS task than did the younger adults. A composite measure of processing speed was obtained by standardizing and then averaging the scores on the pattern and letter comparison tasks. Examination of the resulting scores indicated that younger adults had higher processing speeds than their older adult counterparts. In terms of health measures, younger adults reported better physical health than their older adult counterparts, as reflected in the general physical health section of the SF-36 Health Survey, but older adults reported better mental health than their younger adult counterparts, as reflected in the general mental health section of the same measure. The same set of analyses was conducted between the two younger adult groups to ensure they were comparable. No significant differences were found between the younger groups on any of the previously mentioned measures (ps>.32). Also included in the additional measures in this research were a number of tests of executive functioning. Age differences on these measures were examined using one-way ANOVAs and are also presented in Table 1.
According to these analyses, older adults made significantly more perseverative errors on the Wisconsin Card Sort Test compared to the younger adults, reflecting the fact that older adults experience greater difficulty updating and monitoring their working memory compared to younger adults. Additionally, older adults experienced greater interference on the Stroop task, as measured by mean reaction time differences between control and incongruent trials. As an additional examination of these data, responses were re-scored such that a measure of facilitation and interference were calculated. Facilitation scores were calculated by dividing mean RT for control trials by mean RT for congruent trials to produce a proportion score. Similarly, interference scores were calculated by dividing mean RT for the incongruent trials by the mean RT for the control condition, again producing a proportion score. It was thought that the calculation of both facilitation and interference values would control for any age-related slowing that might mask actual results of interest in this measure. These results were examined using a one-way ANOVA, revealing identical results to those of the original method of scoring (see Table 2). The original method of scoring and that used previously by Miyake and his colleagues, which involved calculating a difference score for control versus incongruent trials, was therefore used in all further analyses. For the Stroop task, only correct responses were included in the analyses. In addition, response times that were three standard deviations above or below the response time for each participant were eliminated. This resulted in the exclusion of 3.2% of the data for younger adults (both control and divided attention conditions) and 3.7% of the data for older adults.
Table 1

*Participant Characteristics*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Younger</th>
<th>Older</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.56 (1.09)</td>
<td>15.63 (2.66)</td>
<td>117.89</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>SF-36:Phys. Health</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>51.08 (6.32)</td>
<td>44.20 (8.51)</td>
<td>35.47</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>SF-36:Ment. Health</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>47.05 (11.21)</td>
<td>56.24 (7.12)</td>
<td>31.84</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.50 (3.96)</td>
<td>30.33 (3.06)</td>
<td>69.16</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Letter/Pattern Comp</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.510 (0.70)</td>
<td>-0.978 (0.72)</td>
<td>176.76</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Letter-Number Seq.</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.16 (3.04)</td>
<td>10.79 (3.14)</td>
<td>23.96</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>WCST</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.17 (3.26)</td>
<td>10.53 (8.12)</td>
<td>15.30</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Plus-Minus</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>463 (296)</td>
<td>553 (450)</td>
<td>2.57</td>
<td>0.111</td>
</tr>
<tr>
<td>ERQ: Suppression</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.29 (1.02)</td>
<td>2.38 (1.12)</td>
<td>0.26</td>
<td>0.613</td>
</tr>
<tr>
<td>ERQ: Reappraisal</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.92 (0.88)</td>
<td>3.70 (0.91)</td>
<td>2.50</td>
<td>0.116</td>
</tr>
<tr>
<td>Stroop</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>93 (82)</td>
<td>298 (309)</td>
<td>45.38</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Note:* Means presented, SD in parentheses. WAIS-III Letter-Number Sequencing scores could range from 0 – 21. Speed values were z-scores. Vocabulary scores could range from 0 – 36. Scores on the SF-36 were t-scores. Number of perseverative errors reported for the WCST. ERQ subscales could range from 1 to 7. Plus-Minus and Stroop values are in milliseconds (ms).
The Plus-Minus task was also included as a measure of executive functioning. Performance was examined by calculating a difference score comparing the average amount of time to complete a one task list (i.e., addition and subtraction separately) to the amount of time to complete a list of items where participants were asked to switch back and forth between the two previously presented tasks. Responses that were incorrect were not included in the analyses, resulting in the exclusion of 1.8% of the data for younger adults and 2.0% for the older adults. There were no age differences on this measure, supporting previous research that indicates no age-related slowing in the ability to switch between two tasks (Verhaeghen & Basak, 2005).

Finally, the emotion regulation questionnaire was used to assess participants’ method of emotional regulation (cognitive reappraisal vs. expressive suppression). Examination of these data indicate no age-related differences on either of the two subscales, suggesting that for this sample neither the young adults nor the older

Table 2

Comparison of Stroop Scoring Method

<table>
<thead>
<tr>
<th>Method</th>
<th>Young</th>
<th>Older</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitation</td>
<td>1.00</td>
<td>0.94</td>
<td>5.52</td>
<td>.005</td>
</tr>
<tr>
<td>Interference</td>
<td>2.14</td>
<td>2.33</td>
<td>13.91</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note: Means presented. No differences were observed between younger adult groups.
adults displayed differences in suppression or reappraisal as an emotion regulation strategy.

**Manipulation Check**

Target attribute ratings were examined as a manipulation check to ensure that participants were interpreting the job-relevance and valence of the attributes in the manner I intended when the target descriptions were constructed. Traits should be rated based on valence and relevance according to the categories built into the stimuli. Mean ratings for traits in each Valence x Relevance category were calculated and compared using two 3 x 2 x 2 (Group x Valence x Relevance) ANOVAs, one for each rating type (i.e., valence ratings & relevance ratings). For the valence rating analyses, no significant group differences were found. The Group X Valence interaction was marginally significant, $F(2,175)=3.01, p = .052, \eta = .03$, with the effect being mainly driven by a slightly greater differentiation between positive and negative items as rated by the older adult group (Younger - $M_{pos}=5.58$, $M_{neg}=2.72$; DA Young - $M_{pos}=5.71$, $M_{neg}=2.71$; Older - $M_{pos}=5.72$, $M_{neg}=2.49$). A significant main effect of valence was observed, $F(1,175)=2294.41, p < .001, \eta = .93$ with positive attributes being rated more positively than negative attributes. No significant effect of relevance was found, but the Valence x Relevance interaction was significant, $F(1,175)=369.85, p < .001, \eta = .68$. This interaction indicated that, across age groups, participants rated the valences of relevant positive and irrelevant negative items higher than the valences of irrelevant positive and relevant negative items ($Ms$: Positive Relevant=5.99, Positive Irrelevant=5.35, Negative Relevant=2.34, and Negative Irrelevant=2.94). Although peculiar, this effect was not
moderated by group, indicating that all participants in the main study sample viewed the stimuli similarly.

Ratings of the relevance of each of the stimulus attributes was also examined using four 3 x 2 x 2 (Group x Valence x Relevance) ANOVAs, one for each occupation used in the study (i.e., doctor, professor, manager, judge). Results were almost identical across the four occupations (Table 3). Across all three groups, participants rated positive words as significantly more relevant than negative words, although the mean difference between valences was relatively small (.58). Additionally, participants also rated relevant words significantly higher than irrelevant words, with an average rating difference between relevance of 2.45 rating points. This indicates that participants in the norming sample and those in the main study sample viewed the relevance of the attributes to specific jobs similarly. Finally, across all occupations, significant Valence x Relevance interactions were observed (see Table 3). These interactions consistently reflected a larger rating difference between relevant and irrelevant items for positive items than negative items.

Although the preceding analyses suggested that participants were viewing the attributes in the general manner intended, there were some nonsystematic differences across levels of valence and relevance. With this in mind, the decision was made to recategorize the words based on participant-specific valence and relevance ratings collected in the manipulation check portion of the experiment. These new categorizations were then used in all of the following analyses. Note that for both the study time and the social judgment rating data, analyses were conducted with both the original categorizations and with the new ideographic
categorizations. The results of the ideographic analyses were cleaner and told a better story of what patterns existed in the data. Although a degree of experimental

Table 3

**Manipulation Check – Relevance ANOVAs**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Negative</th>
<th>Positive</th>
<th>$F$</th>
<th>$p(\eta)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor: Valence</td>
<td>4.25 (0.08)</td>
<td>4.68 (0.04)</td>
<td>23.66</td>
<td>&lt;.001(.12)</td>
</tr>
<tr>
<td>Professor: Valence</td>
<td>4.14 (0.07)</td>
<td>4.72 (0.05)</td>
<td>44.96</td>
<td>&lt;.001(.20)</td>
</tr>
<tr>
<td>Manager: Valence</td>
<td>4.11 (0.08)</td>
<td>4.75 (0.04)</td>
<td>63.56</td>
<td>&lt;.001(.27)</td>
</tr>
<tr>
<td>Judge: Valence</td>
<td>4.20 (0.08)</td>
<td>4.87 (0.04)</td>
<td>58.71</td>
<td>&lt;.001(.25)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effect</th>
<th>Irrelevant</th>
<th>Relevant</th>
<th>$F$</th>
<th>$p(\eta)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor: Relevance</td>
<td>3.16 (0.6)</td>
<td>5.77 (0.07)</td>
<td>948.39</td>
<td>&lt;.001(.84)</td>
</tr>
<tr>
<td>Professor: Relevance</td>
<td>3.33 (0.06)</td>
<td>5.53 (0.07)</td>
<td>588.06</td>
<td>&lt;.001(.77)</td>
</tr>
<tr>
<td>Manager: Relevance</td>
<td>3.13 (0.06)</td>
<td>5.74 (0.07)</td>
<td>759.84</td>
<td>&lt;.001(.81)</td>
</tr>
<tr>
<td>Judge: Relevance</td>
<td>3.34 (0.06)</td>
<td>5.73 (0.06)</td>
<td>937.24</td>
<td>&lt;.001(.84)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effect</th>
<th>P-R</th>
<th>P-I</th>
<th>N-R</th>
<th>N-I</th>
<th>$F$</th>
<th>$p(\eta)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor: Val x Rel</td>
<td>6.41</td>
<td>2.96</td>
<td>5.13</td>
<td>3.37</td>
<td>245.66</td>
<td>&lt;.001(.58)</td>
</tr>
<tr>
<td>Professor: Val x Rel</td>
<td>5.94</td>
<td>3.49</td>
<td>5.11</td>
<td>3.17</td>
<td>20.26</td>
<td>&lt;.001(.10)</td>
</tr>
<tr>
<td>Manager: Val x Rel</td>
<td>6.40</td>
<td>3.10</td>
<td>5.07</td>
<td>3.16</td>
<td>148.12</td>
<td>&lt;.001(.46)</td>
</tr>
<tr>
<td>Judge: Val x Rel</td>
<td>6.49</td>
<td>3.25</td>
<td>4.97</td>
<td>3.44</td>
<td>282.47</td>
<td>&lt;.001(.62)</td>
</tr>
</tbody>
</table>

*Note:* Means presented, SE in parentheses.
control was lost by using these participant produced categorizations, this should be offset by the more precise mapping of stimulus features based on each participant’s interpretation.

*Study Time*

Attributes were categorized individually for each participant such that valence and relevance ratings gathered in the manipulation check were used to re-categorize the attributes prior to use in the following study time analyses. Attributes rated with a valence of 4 or higher on the 1-7 rating scale were classified as positive; below 4 were categorized as negative. Similarly, attributes given a relevance rating of 4 or higher were classified as relevant, whereas those below 4 were categorized as irrelevant. Because relevance varied by occupation, relevance categorizations were entered separately for each occupation. Based on the valence and relevance ratings for each attribute, the stimuli were then separated into the four categories that were examined in the following analyses: positive relevant, positive irrelevant, negative relevant, negative irrelevant.

Study times for each attribute were examined in order to gain information regarding the emphasis or attention placed on each category of attribute across the experimental conditions and groups. Of primary interest was whether participants would pay differential attention to relevant and irrelevant attributes across conditions. It was expected that this would only occur in the job condition, where this distinction was important. Study times for individual attributes that fell three standard deviations above or below the mean study time of all attributes for each participant were excluded from further analysis. This resulted in the exclusion of 2.0% of the data for
younger adults in the control group, 3.0% of the data for DA younger adults, and 1.8% of the data for older adults.

Mean study times based on the remaining data were then examined using two 3 x 2 x 2 (Group x Relevance x Length) repeated-measures ANOVAs within each judgment condition (Job vs. General Impression). In the General Impression condition, there was a significant main effect for group, $F(2,174)=56.17, p < .001, \eta=.39$, with reading times for older participants being longer than those of both the younger control and DA younger adults, reflecting aging-related slowing. There was an unexpected significant main effect of relevance, $F(1,174)=23.28, p < .001, \eta=.12$ with relevant attributes studied longer than irrelevant attributes. This was unexpected given that job-relevance should not have been a consideration in this condition. It is possible that the nature of the relevant attributes was fundamentally different that that of the irrelevant attributes. Although all attributes related in some way to the target individual’s competence, it is possible that relevant attributes were more diagnostic than were the irrelevant attributes. The Group x Relevance interaction was not significant, $F(2,174)=2.62, p=.08, \eta=.03$. Further examination of the direction of this effect revealed no evidence of the hypothesized trends in means, with all groups examining relevant traits longer than irrelevant traits.

Another 3 x 2 x 2 (Group x Relevance x Length) ANOVA was conducted within the Job Specific judgment condition. Results of this analysis again indicated a significant main effect for group, $F(2,175)=60.09, p < .001, \eta=.41$ with older adults spending longer time processing the attributes compared to the two younger adult groups. The hypothesized main effect for relevance was also significant,
Affective Influences on Decisions and Judgments

$F(1,175)=32.85, p <.001, \eta =.16$, with relevant attributes processed longer than irrelevant attributes ($M=1063$ ms vs. 1011 ms, respectively). The Group x Relevance interaction showed a marginally significant trend ($p=.085, \eta=.03$), with older adults displaying a larger study time distinction between relevant and irrelevant items compared to both the younger control and divided attention groups. This greater difference for the older adult group could be an artifact of aging-related slowing. In order to examine this possibility, these data were also examined using proportional scores, calculated by dividing raw study time values for relevant and irrelevant items by the average overall study time for all attributes. Results of these additional analyses were similar to those of the original analysis, suggesting that the original result was indeed reliable and the unexpected finding cannot be attributed to simple age-related slowing. This effect may be due to the fact that, in the context of a social judgment task, older adults are better able to identify attributes that are diagnostic (Hess & Auman, 2001; Leclerc & Hess, in press). The hypothesized Group x Length interaction was not significant ($p=.17, \eta=.02$). Participants across groups did not show any significant differences in the study time differences based on description lengths.

In order to more closely examine the nature of the study time differences between relevant and irrelevant items across conditions, an additional contrast analysis was added. Study time data was examined using a 3 x 2 x 2 (Group x Relevance x Condition) ANOVA in order to directly compare relevance study time distinctions between the two conditions. It was originally hypothesized that a greater difference in study times between relevant and irrelevant items would exist for the
job specific condition compared to the general impression condition. Results of this analysis indicate that although the interaction was not significant, $F(1,174)=2.14$, $p=.14$, $\eta=.01$, the trend was in the hypothesized direction. The difference in study times for relevant and irrelevant items ($M=1060.47$, $M=1009.39$, respectively) in the job specific condition was greater than the difference between relevant and irrelevant items ($M=1060.29$, $M=1023.59$, respectively) for the general impression condition. No significant group effects were observed in this analysis ($ps>0.15$, $\eta<.04$).

Social Judgment Task

The method used for attribute categorization for the social judgment ratings was slightly different than that used in the examination of study times. Instead of categorizing individual traits as positive or negative, I simply summed each individual’s valence ratings for the individual traits included in the descriptions in the impression judgment condition. Values of valence for the job condition were calculated by summing the valence x relevance values. Correlations between the summed valence of attributes in each target description and the rating assigned to the target were calculated for each participant across all descriptions in each condition in order to determine accuracy of ratings. This method of analysis has been used in previous studies (e.g., Hess & Follett, 1994). The higher the correlation, the stronger the correspondence between the participant’s ratings and the valence of the task-specific attributes. A 3 x 2 x 2 (Group x Description Length x Condition) ANOVA was conducted on these correlations. Results of this analysis revealed a significant main effect of condition, $F(1,175)=16.40$, $p<.001$, $\eta=.09$, with
higher correlations for the general impression condition compared to the job specific condition (Ms= .73 vs. .69, respectively). The expected significant Group x Condition interaction was only marginally significant, $F(2,175)=2.50$, $p =.08$, $\eta=.03$. As can be seen in Figure 1, all three groups displayed similar patterns of correlations, with higher correlations for the general impression condition than for the job-specific condition. More specific group-level contrasts indicated a significant main effect for condition in the younger adult control group, $F(1,65)=5.17$, $p =.03$, $\eta=.07$, and in the DA younger adult group, $F(1,50)=10.56$, $p =.002$, $\eta=.17$, with higher correlations for the general impression condition than for the job effectiveness condition. A nonsignificant main effect of condition was obtained for the older adult group, $F(1,60)=1.07$, $p =.31$, $\eta=.02$. The hypothesized Group x Condition x Description Length interaction was also nonsignificant ($p=.13$, $\eta=.02$).
Additionally, as a follow-up analysis, correlations between job effectiveness ratings and the valence of all traits in the job condition were calculated in order to examine the possibility that older adults were not discriminating between traits based on relevance, but were instead relying on all available affective information to make a social judgment. These correlations were examined using a 3 x 2 x 2 (Group x Job Rating Predictor x Description Length) ANOVA in the job condition only. Results of this follow-up analysis indicated that the anticipated Group x Description Length interaction was not significant, $F(1,175)=1.73$, $p = .18$, $\eta = .02$. All three groups had higher correlations between their ratings and the net valence of all traits in the job-specific condition for longer descriptions compared to shorter descriptions, which
might suggest that discrimination becomes more difficult with more attributes. Given
that this was such an important hypothesized interaction, a more specific contrast
was tested to compare correlations of job effectiveness ratings both with job-relevant
attributes and with all attributes within a description to identify which condition
resulted in a stronger relationship. Results of this analysis also indicated a
significant main effect of condition, $F(1,175)=4.22$, $p = .04$, $\eta = .02$. The Group x
Condition interaction for this analysis was not significant ($p = .43$, $\eta = .01$). This effect
indicated that, across groups, correlations between participants’ job effectiveness
ratings and the net valence of only the job relevant attributes within a given
description were higher than the correlations between job effectiveness ratings and
the net valence of all attributes within a description. What this interaction indicates is
that across groups, participants were able to identify the job relevant behaviors
within a description and were able to base their job effectiveness ratings on only the
relevant behaviors.

**Between and Within Person Changes in Ratings**

Social judgment ratings were also examined using a more sophisticated
analysis technique, where data is investigated hierarchically with individuals nested
within various levels of the valence manipulation. This technique allowed not only
for an examination of individual difference factors, but also served as a secondary
examination of the social judgment ratings in order to identify group differences in
patterns of ratings that might not be reflected in simple correlations (e.g., slope of
the relationship between ratings and description characteristics). Multilevel
modeling involves a simultaneous examination of both between- and within-person
changes in social judgment ratings based on the experimental manipulation of the net valence of the attributes within a description. In the current research, it was expected that the amount of weight an individual places on a given attribute is likely to vary significantly between participants. It was also expected that there would be significantly different patterns of fluctuation between participants who tend to use the full range of values available on a rating scale and those who tend to use ratings closer to the middle (i.e., neutral). This method of analysis allows for a more clear understanding of how the manipulation of the overall net valence or the net valence of only the job relevant attributes within a description affects the participants’ ratings within the individual over various valence levels, as well as across participants as valence levels fluctuate. This technique allowed for conclusions regarding both the variability within people across valence-level manipulations, as well as the differences between people (Lee & Bryk, 1989). Examining the rate of change in the dependent variables across the full range of valence manipulation levels is a more powerful and flexible approach to exploring these data compared to analysis techniques treating change in two-wave segments (Schulenberg & Maggs, 2001). Multilevel modeling also allows for missing data, and more importantly, unequal spacing of time points (Karney & Bradbury, 1997), which was a primary concern for this research given that not all participants saw descriptions at each level of overall net valence and net job relevant valence. Additionally, multilevel modeling also allows for the inclusion of between-subject covariates (i.e., gender, education), with these second level variable parameters allowed to vary randomly across participants. The addition of these level-2 variables allows for an examination of
individual differences in various abilities (i.e., working memory, task switching, updating and monitoring, inhibition), addressing the individual difference hypotheses.

Separate models were run for each condition. Only data from the two full attention groups (young control and older group) were included in these final analyses. Ratings from the DA young adult group may have been influenced by the nature of the secondary task and therefore any interindividual differences for this group would be confounded with the additional experimental manipulation. All variables were recoded with zero as their starting values in order make interpretation of these effects more meaningful. In that light, any age effects found would be reported in the output for the younger adult group (age group (YA) = 0), with the corresponding group slope coefficient representing any change in rating value based on age. In order to test for the presence of variance both within and between individuals in performance in the two task conditions, and in order to justify further, more advanced analyses of within-person variance in rating, an individual-level unconditional ANOVA model was tested examining ratings in each condition separately (i.e., general impression ratings and job effectiveness ratings). These unconditional models were constructed such that they did not include any of the level-1 or level-2 predictor variables and were simply a test of the fixed and random effect characteristics of the dependent variable rating outcomes. A separate model was run for each of the two dependent variables (i.e., general impression ratings & job effectiveness ratings). The general equations for the two level hierarchical models are as follows:

\[ \text{Level 1: } \text{DV}_{it} = \beta_{0it} + r_{it} \]
Level 2: \( \beta_{0it} = \gamma_{00} + u_{0i} \)

In these equations, \( DV_{it} \) represents the predicted outcome value on each of the dependent measures separately for a given person “i”, \( \beta_{0it} \) represents the mean rating value for a given person “i,” and \( r_{it} \) represents the fluctuation around this mean value for a given person “i”. The level-2 equation indicates that the mean rating value is a function of the average mean value \( (\gamma_{00}) \) and an associated error term around this average value \( (u_{0i}) \).

Results of these analyses can be found in Table 4. These analyses indicate that the intercept for ratings in both conditions is greater than zero, which is expected given that rating values ranged from 1 to 7. Given that these were fully unconditional models, it is important to calculate the interclass correlation values in order to understand how the variance in the data is partitioned between and within participants. In order to examine the proportion of variance in performance on the two rating variables, the variance as a result of within person differences, the within person variance value \( (\sigma^2) \) was divided by the sum of the two possible sources of variance in the two-level model: within-person, and betweenpersons \( (\sigma^2 / (\sigma^2 + \tau_{00})) \).

Similarly, the between-subjects variance was calculated by dividing the variance associated with differences between participants by the sum of the two levels of variance \( (\tau_{00} / (\sigma^2 + \tau_{00})) \). According to these calculations, \( \rho_w = .93 \) and \( \rho_b = .07 \), 93% of the variability within the data for the general impression ratings exists within persons, whereas only 7% of the variability exists between persons. For the job effectiveness ratings, 96% of the variance was accounted for by within-person differences, whereas only 4% of the variance was accounted for by between-person differences.
Table 4

Multilevel Unconditional Models

General Impression Ratings

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>S.E.</th>
<th>t Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Value, $\gamma_{00}$</td>
<td>3.78</td>
<td>0.04</td>
<td>86.88</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Variance</th>
<th>S.E.</th>
<th>z value</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $u_{0i}$</td>
<td>0.16</td>
<td>0.03</td>
<td>5.17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Level -1 Error, $r_{it}$</td>
<td>2.67</td>
<td>0.06</td>
<td>44.37</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Job Effectiveness Ratings

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>S.E.</th>
<th>t Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Initial Status, $\gamma_{00}$</td>
<td>3.63</td>
<td>0.04</td>
<td>83.72</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Variance</th>
<th>S.E.</th>
<th>z value</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $u_{0i}$</td>
<td>0.14</td>
<td>0.03</td>
<td>4.59</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Level -1 Error, $r_{it}$</td>
<td>3.21</td>
<td>0.07</td>
<td>44.37</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

These values could certainly be considered a cause for concern with such low values of between-person variation. The significant test for the variance in the intercepts for both of the rating types, however, indicates that the amount of variability existing between persons is significantly greater than zero in both cases, indicating it is appropriate to continue analysis of more advanced models including between-person predictors.
Based on the existence of significant variance in the unconditional model, a conditional model – the random coefficients regression model – was specified, which included only a valence-level parameter in the level-one equation. These models serve to examine ratings within each condition separately (i.e., general impression ratings and job effectiveness ratings) over various levels of both net overall valence of all available attributes within a description and the net valence of only the job-relevant attributes within a given description respectively. No other parameters were included at this level of analysis. These models would serve to test for significant effects of linear change over valence level in rating outcomes for both the general impression ratings and the job effectiveness ratings. These analyses also allow for the examination of the variance between persons in rating outcomes. Again, separate models were specified and run for each of the rating types separately. The model specifications are as follows:

Level 1: $DV_{it} = \beta_{0it} + \beta_{1it}(\text{Valence Level}) + r_{it}$

Level 2: $\beta_{0i} = \gamma_{00} + u_{0i}$

$\beta_{1i} = \gamma_{10} + u_{1i}$

The parameters in these equations are similar to those represented in the previous unconditional model. In this new model, $\gamma_{00}$ becomes the grand mean of the dependent variable rating when the valence-level predictor equals zero. Additionally, $\gamma_{10}$ represents the within-person relationship between the predictor variable and the dependent variable rating outcome. The additional level-two equation indicates that the rate of change in rating outcome is a function of the
estimated rate of change ($\gamma_{10}$) plus the additional error variance associated with this rate ($u_{1i}$).

Results of these analyses can be found in Table 5. As can be seen, these analyses indicate that, across models, the grand means when the valence manipulation values are equal to zero are all significantly greater than zero. In order to calculate the actual rating values at each level of the valence manipulation, the value of the overall or job valence is multiplied by the slope coefficient and added to the value of the grand mean. The slope coefficient for each rating type represents the change in the dependent variable outcome ratings associated with the corresponding valence (i.e., overall or job relevant). In these data, the slope values across all models are positive and significantly different from zero, meaning that with a unit increase in either the overall valence or the net valence for a given description, the dependent variable outcome rating increases by the size of the slope coefficient associated with that model (i.e., for the general impression ratings and the overall net valence model, a 1-unit increase in overall valence will be associated with a 0.23 increase in general impression ratings). Examination of the random effects results indicates that the significance tests for all variance values are significantly different from zero. Significant variation in the intercepts and slopes remains, suggesting that there is still variation in both the intercepts and slopes that can potentially be explained by the addition of a level-2 (person-level) covariate. The covariance coefficient found in the random effects results represents the relationship between the intercept and slope for this model. More simply, this value indicates to what degree how a participant changes is related to where their starting
Table 5

Multilevel Conditional Change Model – Valence Uncentered

General Impression Ratings – Overall Valence as Predictor

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>S.E.</th>
<th>t Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $\gamma_{00}$</td>
<td>3.76</td>
<td>0.04</td>
<td>86.19</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Overall Valence, $\gamma_{10}$</td>
<td>0.23</td>
<td>0.005</td>
<td>38.95</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Random Effect

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Variance</th>
<th>S.E.</th>
<th>z value</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $u_{0i}$</td>
<td>0.20</td>
<td>0.03</td>
<td>6.57</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Slope, $u_{1i}$</td>
<td>0.003</td>
<td>0.001</td>
<td>4.87</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Covariance</td>
<td>-0.007</td>
<td>0.003</td>
<td>-2.27</td>
<td>0.023</td>
</tr>
<tr>
<td>Level -1 Error, $r_{it}$</td>
<td>1.30</td>
<td>0.03</td>
<td>43.64</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Job Effectiveness Ratings – Job Valence as Predictor

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>S.E.</th>
<th>t Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $\gamma_{00}$</td>
<td>3.45</td>
<td>0.04</td>
<td>81.90</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Job Valence, $\gamma_{10}$</td>
<td>0.33</td>
<td>0.01</td>
<td>33.43</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Random Effect

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Variance</th>
<th>S.E.</th>
<th>z value</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $u_{0i}$</td>
<td>0.16</td>
<td>0.03</td>
<td>5.53</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Slope, $u_{1i}$</td>
<td>0.005</td>
<td>0.002</td>
<td>3.54</td>
<td>0.0002</td>
</tr>
<tr>
<td>Covariance</td>
<td>-0.005</td>
<td>0.005</td>
<td>-1.01</td>
<td>0.3133</td>
</tr>
<tr>
<td>Level -1 Error, $r_{it}$</td>
<td>2.08</td>
<td>0.05</td>
<td>43.61</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
value falls. Ideally, these values should be minimal (i.e., nonsignificantly different from zero). Overall, these results support the hypotheses that as more positive attributes are added to a description, the higher the rating will be for that description.

Inclusion of the valence manipulation as a predictor variable had a significant effect on the amount of variance explained in both of the models (i.e., general impression ratings with overall valence as a predictor, and job effectiveness ratings with job relevant valence as a predictor). The percentage of explainable within-person variation accounted for as a result of the addition of the valence manipulation for each model is calculated by subtracting the conditional (from the current model) within-person variance from the unconditional (from the fully unconditional model) within-person variance and dividing this value by the unconditional variance \( \frac{(\sigma_{\text{uncond.}}^2 - \sigma_{\text{cond.}}^2)}{\sigma_{\text{uncond.}}^2} \). For the general impression model with overall valence as a predictor, the addition of the valence manipulation predictor explained 51% of the explainable – which was 93% of the total variation – within-persons variance. This calculation resulted in 35% of the available 96% of the variation within persons-being explained in the job effectiveness model with job relevant valence as a predictor.

In the next step of the analyses, two conditional models were specified in order to estimate the effects of age group on each of the dependent variable rating outcomes. For clarity, no other predictors were included in these models. The valence manipulation predictor tested in the previous models was also removed for these models. It was added back into the upcoming models examining the effects of both level-1 and level-2 predictors. Each of the dependent rating outcomes was
tested in separate models that examined the hypothesis that there is, on average, a relationship between age group and dependent outcome ratings. Given that the major hypotheses of the current research revolve around an examination of aging-related differences, it is of vital importance to confirm that there is a significant relationship between age and outcome. The models were specified as follows:

Level 1: \( DV_{it} = \beta_{0it} + r_{it} \)

Level 2: \( \beta_{0i} = \gamma_{00} + \gamma_{01}(\text{Age Group}) + u_{0i} \)

The only difference between this and the previous model in terms of parameters is the subtraction of the level-1 predictors and the addition of the \( \gamma_{01}(\text{Age Group}) \) parameter, which represents the between person differences in the dependent variable rating outcomes as a function of age group. Additionally, the \( u_{0i} \) represents the residual between-person variability in the level of the ratings after accounting for age group.

Results of these analyses indicate that there are indeed between-person differences in the rating outcomes. This finding represents a between-groups significant main effect of age, which follows the previously reported analyses examining rating data. For the model estimating general impression ratings as a function of age group, the addition of age group as a level-2 predictor accounted for 19% of the explainable variance (7% of the total variance) between persons in general impression ratings, and, 21% of the explainable variance (4% of the total variance) between-person for job effectiveness ratings. More specifically, this indicates that for both general impression and job effectiveness ratings, there is a significant amount of between-person variability in rating values and that the addition
of age into the model accounted for/explained 19% and 21% of the existing between
person variability in the general impression and job effectiveness ratings
respectively. These results suggest that age is indeed a viable variable to be tested
in further, more complex models in the hopes of explaining greater amounts of
between-group variation.

In order to attempt to account for more significant amounts of variance within
each of the dependent variable models, models were run in attempt to control for all
available between-person differences (e.g., processing speed, education, self-
reported health, task switching ability, ability to update and monitor working memory,
ability to ignore irrelevant information, etc.). The models were specified as follows:

\[ \text{Level 1: } DV_{it} = \beta_{0it} + \beta_{1it}(\text{Valence Level}) + r_{it} \]

\[ \text{Level 2: } \beta_{0i} = \gamma_{00} + \gamma_{01}(\text{Age Group}) + \gamma_{02}(\text{Education}) + \gamma_{03}(\text{WCST - Updating}) + \gamma_{04}(\text{WAIS - Working Memory}) + \gamma_{05}(\text{Stroop - Interference}) + \gamma_{06}(\text{Plus-Minus – Task Switching}) + \gamma_{07}(\text{ERQ – Supression}) + \gamma_{08}(\text{ERQ – Reappraisal}) + \gamma_{09}(\text{Processing Speed}) + \gamma_{10}(\text{Vocab}) + u_{0i} \]

\[ \beta_{1i} = \gamma_{10} + \gamma_{11}(\text{Age Group}) + \gamma_{12}(\text{Education}) + \gamma_{13}(\text{WCST - Updating}) + \gamma_{14}(\text{WAIS - Working Memory}) + \gamma_{15}(\text{Stroop - Interference}) + \gamma_{16}(\text{Plus-Minus – Task Switching}) + \gamma_{17}(\text{ERQ – Supression}) + \gamma_{18}(\text{ERQ – Reappraisal}) + \gamma_{19}(\text{Processing Speed}) + \gamma_{110}(\text{Vocab}) + u_{1i} \]
The parameters specified in this model are simple extensions of the two previous models presented. These models were run in order to examine the influence of the additional individual-level measures included in this study and based on the results of these models, more specific smaller models were run in order to examine only those items that significantly influenced the outcomes in these full models.

Analyses of these models resulted in both main effect and interaction parameter estimates similar to those obtained in repeated-measures ANOVA. For each model, only the main effects and interactions that reached or approached significance levels were kept and reentered into a more limited model within each condition. For the general impression condition, the variables re-entered into the more parsimonious model were age group – even though it did not approach significance – as it was a critical variable in the hypotheses of this research, WAIS – Working Memory, and Vocabulary. Additionally, because WCST – Updating, Plus-Minus – Task Switching, and ERQ Reappraisal interacted significantly with the valence manipulation, they were also maintained in the secondary model for the general impression condition. For the job-specific condition with the net valence of only the job relevant attributes as a predictor, the variables maintained either due to a significant main effect or a significant interaction with the job valence manipulation were as follows: age group, WAIS – Working Memory, ERQ Reappraisal, and Vocabulary. These two models were not used to draw conclusions about the meaning of the data, but were instead used to select the variables that were most likely to be related to variation in the dependent variables.
Results of these final, limited models are presented in Tables 6 and 7.

Table 6

Multilevel Limited Conditional Full Models – Valence Uncentered

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>S.E.</th>
<th>t Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $\gamma_{00}$</td>
<td>4.53</td>
<td>0.37</td>
<td>12.19</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age Group, $\gamma_{01}$</td>
<td>-0.14</td>
<td>0.11</td>
<td>-1.32</td>
<td>0.190</td>
</tr>
<tr>
<td>WCST – Updating, $\gamma_{03}$</td>
<td>-0.006</td>
<td>0.007</td>
<td>-0.89</td>
<td>0.374</td>
</tr>
<tr>
<td>WAIS – Working Memory, $\gamma_{04}$</td>
<td>0.031</td>
<td>0.01</td>
<td>2.32</td>
<td>0.022</td>
</tr>
<tr>
<td>Plus-Minus – Switching, $\gamma_{06}$</td>
<td>0.0002</td>
<td>0.0001</td>
<td>1.65</td>
<td>0.102</td>
</tr>
<tr>
<td>ERQ – Reappraisal, $\gamma_{08}$</td>
<td>-0.084</td>
<td>0.049</td>
<td>-1.73</td>
<td>0.086</td>
</tr>
<tr>
<td>Vocab, $\gamma_{010}$</td>
<td>-0.023</td>
<td>0.011</td>
<td>-2.11</td>
<td>0.037</td>
</tr>
<tr>
<td>Overall Valence, $\gamma_{10}$</td>
<td>-0.052</td>
<td>0.05</td>
<td>-1.13</td>
<td>0.260</td>
</tr>
<tr>
<td>Valence*Age Group, $\gamma_{11}$</td>
<td>0.008</td>
<td>0.01</td>
<td>0.58</td>
<td>0.559</td>
</tr>
<tr>
<td>Valence*WCST, $\gamma_{13}$</td>
<td>-0.002</td>
<td>0.0009</td>
<td>-2.42</td>
<td>0.016</td>
</tr>
<tr>
<td>Valence*WAIS, $\gamma_{14}$</td>
<td>0.003</td>
<td>0.002</td>
<td>2.07</td>
<td>0.038</td>
</tr>
<tr>
<td>Valence*Plus-Minus, $\gamma_{16}$</td>
<td>-0.00003</td>
<td>0.00001</td>
<td>-2.22</td>
<td>0.026</td>
</tr>
<tr>
<td>Valence*ERQ-Reappraisal, $\gamma_{18}$</td>
<td>0.019</td>
<td>0.006</td>
<td>3.19</td>
<td>0.001</td>
</tr>
<tr>
<td>Valence*Vocab, $\gamma_{110}$</td>
<td>0.007</td>
<td>0.001</td>
<td>5.07</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Random Effect

<table>
<thead>
<tr>
<th></th>
<th>Variance</th>
<th>S.E.</th>
<th>z value</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $u_{0i}$</td>
<td>0.16</td>
<td>0.026</td>
<td>6.16</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Slope, $u_{1i}$</td>
<td>0.001</td>
<td>0.0004</td>
<td>3.51</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Covariance</td>
<td>-0.004</td>
<td>0.002</td>
<td>-1.59</td>
<td>0.112</td>
</tr>
<tr>
<td>Level -1 Error, $r_{it}$</td>
<td>1.30</td>
<td>0.030</td>
<td>43.65</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Table 7

**Multilevel Limited Conditional Full Models – Valence Uncentered**

**Job Effectiveness Ratings – Job Valence as Predictor**

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>S.E.</th>
<th>t Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept, $\gamma_{00}$</td>
<td>4.33</td>
<td>0.35</td>
<td>13.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age Group, $\gamma_{01}$</td>
<td>-0.09</td>
<td>0.10</td>
<td>-0.88</td>
<td>0.382</td>
</tr>
<tr>
<td>WAIS – Working Memory, $\gamma_{04}$</td>
<td>0.02</td>
<td>0.01</td>
<td>1.73</td>
<td>0.085</td>
</tr>
<tr>
<td>ERQ – Reappraisal, $\gamma_{08}$</td>
<td>-0.08</td>
<td>0.05</td>
<td>-1.78</td>
<td>0.078</td>
</tr>
<tr>
<td><strong>Vocab, $\gamma_{010}$</strong></td>
<td>-0.03</td>
<td>0.01</td>
<td>-3.35</td>
<td><strong>0.001</strong></td>
</tr>
<tr>
<td>Job Specific Valence, $\gamma_{10}$</td>
<td>0.02</td>
<td>0.09</td>
<td>0.27</td>
<td>0.788</td>
</tr>
<tr>
<td>Valence*Age Group, $\gamma_{11}$</td>
<td>-0.002</td>
<td>0.02</td>
<td>-0.10</td>
<td>0.92</td>
</tr>
<tr>
<td>Valence*WAIS, $\gamma_{14}$</td>
<td>0.005</td>
<td>0.003</td>
<td>1.65</td>
<td>0.099</td>
</tr>
<tr>
<td>Valence*ERQ-Reappraisal, $\gamma_{18}$</td>
<td>0.01</td>
<td>0.01</td>
<td>1.10</td>
<td>0.272</td>
</tr>
<tr>
<td><strong>Valence*Vocab, $\gamma_{110}$</strong></td>
<td>0.007</td>
<td>0.003</td>
<td>2.77</td>
<td><strong>0.006</strong></td>
</tr>
</tbody>
</table>

**Random Effect**

<table>
<thead>
<tr>
<th>Variance</th>
<th>S.E.</th>
<th>z value</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercepts, $u_{0i}$</td>
<td>0.12</td>
<td>0.024</td>
<td>4.96</td>
</tr>
<tr>
<td>Slope, $u_{1i}$</td>
<td>0.005</td>
<td>0.001</td>
<td>3.25</td>
</tr>
<tr>
<td>Covariance</td>
<td>0.0003</td>
<td>0.004</td>
<td>-0.15</td>
</tr>
<tr>
<td>Level -1 Error, $r_{it}$</td>
<td>2.08</td>
<td>0.048</td>
<td>43.63</td>
</tr>
</tbody>
</table>

Information to make accurate judgments.

It is important to note the differences between the influence of executive functions across conditions. Contrary to expectations, executive functioning ability had a
much greater impact on general impression ratings than on the job effectiveness ratings. Additionally, the age group effects did not replicate those findings from the ANOVA analyses. For both conditions, there were no significant main effects or interactions with age, meaning that age was not associated directly with variation in the dependent variable ratings, nor was it associated with changes in the relationships between the executive functioning abilities and the valence manipulation. For the model estimating general impression ratings based on the overall net valence of attributes, there are no significant between-person differences in the average general impression ratings as a function of age group, WCST performance, Plus-Minus task performance, or the use of reappraisal as an emotion regulation strategy (as measured by the ERQ). Significant between-person differences were observed for the WAIS – Working Memory and the Vocabulary tasks, suggesting that performance on these measures was significantly related to changes in the rating outcomes.

A significant Valence x WCST interaction was also observed (see Figure 2), with high performing individuals (i.e., those with lower numbers of perseverative errors) exhibiting larger general impression rating differences between positively valenced descriptions and negatively valenced descriptions than lower performing individuals. This interaction follows with the previous hypothesis that higher levels of executive ability are associated with greater effectiveness in using available

A significant interaction between Valence and WAIS (Figure 3) performance was also observed, with the same pattern of results as the WCST; that is, individuals
performed better on the task exhibited discriminated more between descriptions based on their valence than did individuals performing at lower levels on the measure. The pattern of results occurs in the same direction for the Plus-Minus task (See Figure 4). Individuals with higher performance levels displayed larger mean rating differences between positively and negatively valenced descriptions compared to individuals with lower levels of performance. More specifically, individuals with higher ability were better able to map their judgments onto the characteristics of the traits contained in the descriptions. These results were in line with the two previously discussed findings.

Figure 2  *Full General Impression Model – Overall Valence x WCST Errors*
Finally, for this model, a significant Valence x Vocabulary performance interaction (see Figure 5) was observed. Again, individuals, within groups, with higher ability were better at discriminating across levels of valence compared to lower performing individuals.

An additional model was tested examining job effectiveness ratings with the net valence of only the job-relevant attributes as a predictor. Results of this model indicates that the main effect of age group was not significant (p=0.38), indicating that both younger and older adults rated descriptions similarly. Additionally the main
effects of WM performance and the use of reappraisal as an emotion regulation strategy did not significantly affect the job effectiveness ratings ($p>.08$).

Interestingly, the valence manipulation in the job condition did not influence the values of the ratings ($p=.79$), indicating the changes in the net valences of the relevant items did not change the job effectiveness rating that participants assigned to a given description. Vocabulary performance significantly influenced job effectiveness ratings, with higher performers making lower ratings across valence levels compared to lower performers.

The interaction between net Valence and Vocabulary performance (See Figure 6) was significant, again with higher performing individuals presumably being
more sensitive to the fluctuations in description valences and rating target individuals more accurately compared to lower performing individuals. Age and WM performance did not influence the relationship between net valence and job effectiveness ratings ($p > .10$). These nonsignificant interactions indicated that both younger and older participants rated descriptions based on the net valence of the attributes similarly, individuals with higher WM performance rated descriptions based on the net valence of the attributes similarly to individuals with lower WM performance.

Figure 5  *Full General Impression Model – Overall Valence x Vocabulary Performance*
The purpose of this research was to test the selective preservation account of aging and affective processing. Briefly, this perspective is based on the observation that cortical structures underlying deliberative and affective processes appear to be differentially affected by aging. Specifically, based on findings that deliberative processes are more negatively affected by aging than affective processes, it was hypothesized that older adults would be more likely than younger adults to rely on affective processing systems when making complex judgments and decisions.

_Aim 1: Examine age differences in the use of affective information_
Based on the selective preservation view, performance on tasks that depend on affective information should be maintained with age, as the underlying cortical systems are thought to remain relatively spared in later life. In contrast, we would expect to observe declines in performance on tasks requiring deliberative processing given that these systems are thought to be most greatly affected by the biological aging process. To test these ideas, I examined age differences in performance on two social judgment tasks, one (impression judgment) that relied primarily on affective functions and another (job judgment) that was assumed to also depend on deliberative processes. Consistent with the selective preservation view, age differences were expected only in the latter task.

Results provided evidence in support of the hypothesis that age differences should be minimal when performance was dependent primarily upon processing of affective information. Participants made relatively accurate judgments in the general impression condition, with no age differences in performance.

Little support was provided, however, for the hypothesis that age differences in performance would increase with the involvement of deliberative processes. Lower levels of judgment accuracy were observed in the job condition compared to the general impression condition, suggesting that the job judgment task was indeed more difficult, presumably due to the increased reliance on deliberative functions. No group differences were found in this relationship, however, suggesting that older and younger adults were equally capable of identifying, focusing on, and basing their judgments only on the job relevant attributes in a given description. Additionally, it was also observed that judgment accuracy was higher when job ratings were
predicted by the valence of only those that were relevant to the job versus all attributes within a description. This finding provides support for the conclusion that all participants are effective in identifying the job relevant attributes in a description and are able to place greater emphasis on those attributes as opposed to the irrelevant items when making their job effectiveness ratings.

Study time analyses also provided support for the idea that participants, across groups, were able to identify and focus on task-relevant information when necessary in the job condition. Specifically, relevant attributes were attended to longer than irrelevant attributes, especially in the job condition. A trend was observed in terms of group differences in the ability to focus only on the job relevant attributes in the job condition, suggesting that older adults were more sensitive to the distinction between relevant and irrelevant information in the job specific condition. This effect may be due to the increased levels of social expertise gained over the lifespan, allowing older adults to more effectively process information in the context of a social judgment task. This result fits well when more closely examining findings in judgment accuracy data through the use of group-level contrasts across conditions and relevance. These contrasts indicated that both younger adult groups displayed significantly worse accuracy in the job condition compared to the general impression condition, whereas older adults displayed no differences in accuracy across conditions. This trend suggests that in the context of a social judgment task, older adults do not show a performance deficit when asked to base their judgments only on a specific subset of relevant attributes. Additionally, this research may not only indicate that the social judgment task is based more on the efficacy of
experience-based affective processing systems and less so on the efficacy of executive functions. It is possible that younger adults have not yet acquired the levels of social experience that the older adults are displaying, leaving the social judgment performance of the younger adults to suffer.

Overall, these findings fit with previous research examining the use of diagnostic information and social expertise in a social judgment task (Hess & Auman, 2001; Leclerc & Hess, in press). According to this view, individuals use what they know about categories (i.e., job titles) to influence their processing. Because older adults have greater amounts of experience with social situations and have amassed social expertise, they have been found to focus mainly on diagnostic information (i.e., information that is most telling of a target individuals’ characteristics). In the context of the current research, it may be the case that older adults, who are thought to have amassed greater social expertise, are better able to process information based on the schematic information received at the onset of each description (i.e., the type of judgment to make & the occupation of the target) compared to younger adults.

Given the lack of condition effects in the study time data, however, caution should be exercised in interpreting the meaning of relevance effects on study times in the job condition in light of the fact that similar effects were revealed in the impression judgment condition. This is an unexpected finding given that relevance was specific to the job judgment, and thus should not have influenced perceptions of the stimuli when participants were forming a general impression of the individual. This finding prevents a clear interpretation of the relevance effect in the job
condition, and may help to explain the lack of strong differences across conditions. In the context of this study relevance was confounded with the stimuli simply due to the fact that I was unable to entirely control the stimuli (i.e., stimulus words appearing both as relevant and irrelevant across occupations) and simultaneously maintain minimal age differences in the valence and relevance perceptions of the words based on the norming sample.

Aim 2: To further identify underlying mechanisms of the observed age-related differences in the influence of affective information on judgment processes.

Assuming that deliberative processes are involved in identifying the job relevant items when making job effectiveness judgments, it was expected that the divided attention task would disrupt younger adults’ performance. In addition, if poor deliberative functions affect older adults’ performance, there should be a similarity between the performance of the divided attention young and the older participants.

Interestingly, no evidence was found in any of the data suggesting that divided attention younger adults were performing similarly to older adults. The secondary task seemed to sufficiently tax the divided attention group in that their judgment accuracy in the job specific condition was significantly worse compared to the young adult control group. Additionally, numerous previous studies have utilized the digit memory task used in the current research with success (e.g., Hinson, Jameson, & Whitney, 2003; Ransdell, Arecco, & Levy, 2001; Logie et al., 2004). It may be that different underlying resources are used to process information about people versus information about inanimate sources (i.e., the digit memory secondary task).
Finally, it was hypothesized that age differences in decision-making ability due to declines in cognitive resources or deliberative processing mechanisms would be exacerbated under conditions of high complexity (i.e., increased information quantity). Results of the current study again provide no evidence in support of the complexity hypothesis. The number of attributes contained within a description did not influence the accuracy of judgments. Perhaps the addition of the affective information in the high complexity condition served as reinforcement to impressions formed from attributes presented early in a description instead of as a source of greater demands on processing resources.

Aim 3: Examine the impact of individual differences in executive functioning ability on the influence of affective information on judgment processes.

Individuals with deficits in executive functions may have difficulty properly processing information related to judgments and decisions, resulting in decreased judgment accuracy. It was hypothesized that age-related differences in deliberative abilities would account for age-related variation in performance on the social judgment task requiring ratings to be made only on specific, relevant attributes.

Consistent with past research, older adults performed at lower levels compared to younger adults on measures of deliberative abilities, such as the WCST (updating and monitoring working memory), the WAIS-III letter-number sequencing subtest (working memory span), and the Stroop task (inhibition of irrelevant and interfering information). These results replicate a great deal of previous behavioral aging research that has indicated significant age-related decline in performance on tasks associated with DLPFC regions.
Examination of the relationship between these abilities and performance suggested that, in general, those higher in executive functioning were more accurate in making social judgments. In the impression condition, higher performers across executive functions (i.e., WCST, Letter-Number Sequencing & Plus-Minus) displayed greater accuracy than low performers in mapping their judgments onto the characteristics of the traits contained in the descriptions. This suggests that executive functions facilitate performance, with those individuals with greater working memory, updating, and task switching ability being better able to remember behavioral attributes and update impressions online, resulting in more accurate judgments.

I also observed a relationship between the valence manipulation and vocabulary performance. More specifically, individuals performing at higher levels on the vocabulary measure exhibited greater sensitivity to the stimulus attributes than those performing at lower levels. There are multiple possible explanations for these particular findings. Greater verbal ability, representative of crystallized skills, may indicate that high performing individuals are better able to discriminate stimuli in their world. High performing individuals may see stimuli more closely to its intended meaning, and with their greater ability to reason about verbal stimuli, are able to produce clearer conclusions about the target individuals.

These findings are intriguing since I had originally hypothesized that performance on the general impression task performance would be minimally related to executive skills. In contrast, results of my analyses actually suggest the opposite that, in fact, executive abilities were more related to performance in the general
impression condition than in the job-specific condition. Previous research examining the effects of executive functions on the development of somatic markers has suggested that interference in executive abilities such as working memory disrupt gambling task performance and somatic markers (Jameson, Hinson, & Whitney, 2004). In the context of the current task, it may be that the impression judgment is more likely to require the development of a somatic marker in order to make an accurate judgment compared to the job specific condition, which is more dependent on previously activated schemas regarding the specific occupation of the target individual.

What do these findings have to say about age differences in the influence of affective information on judgment performance? At the most basic level, the results suggest that when asked to form general impressions of others, both younger and older adults are able to effectively base their judgments on affective information. Additionally, when asked to limit their focus to information that is specifically relevant to a particular judgment, both younger and older adults are able to effectively focus on only the relevant information when making judgments. This research, however, does not provide evidence in direct support of the selective preservation view in that the observed declines in deliberative performance did not influence the influence of affect in judgment performance. A number of alternative explanations could be used in the context of the current data.

It may be that older adults are more experienced in dealing with processing affect. Older adults’ previous experience with social information may help them to overcome declines in executive functioning. An important finding from this research
is that age-related changes in information processing do not seem to be driven solely by reduced attention capacity during task performance, suggesting perhaps that older adults are indeed more experienced social processors and perform at higher levels than younger adults on a social judgment task, regardless of the stimulus characteristics.

The social judgment task may also be seen as pulling for top-down processing. As a result, the nature of the task may activate category labels which would help participants to organize data based on schemas, allowing them to overcome the decline in executive functions. Perhaps if the study was re-run using similar stimuli with a task that did not present participants with category labels (i.e., occupation titles) ahead of time, it would better assess participants’ ability to suppress irrelevant affective information when asked to make decisions regarding only a subset of presented information.

In a recent chapter, Mitchell, Mason, Macrae, and Banaji (2006) discussed the idea that discrete brain regions subserve knowledge about people as mental agents based on the idea that people differ from other type of entities by virtue of having mental states. As such, it is suggested that there are discrete brain regions involved in social cognitive tasks, with the most frequently implicated being the medial prefrontal cortex (PFC). Previous research also suggests a number of other regions that contribute critically to social cognitive processing, including the temporoparietal junction, orbitofrontal cortex, amygdala, superior temporal sulcus, and the temporal poles (for reviews see Adolphs, 1999; 2001; Blakemore et al., 2004; Frith & Frith, 1999; Gallagher & Frith, 2003).
A series of fMRI studies provide support for this hypothesis (Mitchell, Heatherton, & Macrae, 2002). This research presented participants with items from three different categories: people (represented by common American names, e.g., John, Mary), fruits (banana, grape), and articles of clothing (mitten, socks). Each of the items was presented with an adjective (curious, pitted, woolen), and participants were asked to decide if the adjective could be used to describe the item. Results of this work indicated that semantic judgments about inanimate objects engaged cortical regions previously connected to object-knowledge tasks (i.e., left-lateralized inferotemporal cortex and ventrolateral PFC). Importantly, judgments about other people were associated with patterns of activation in a qualitatively different set of brain regions (i.e., medial PFC, right temporoparietal junction, superior temporal sulcus, and fusiform gyrus). Together these results indicate that decisions about characteristics of other people appear to engage entirely separate brain regions compared to judgments regarding inanimate objects, suggesting a unique set of cognitive process for the two types of decisions.

This neurobiological research is important in the context of the current research in that our task represents a social judgment paradigm, which is hypothesized (e.g., Mitchell et al., 200) to recruit from cortical regions that my be different than those hypothesized to underlie performance on the majority of decision-making tasks used in previous research with older adults. The vast majority of this work has focused on examining age-related changes in decisions about inanimate objects such as drug coverage plans and purchasing a car. One study has examined age differences in decisions about political candidates (Riggle &
Johnson, 1996), but participants were not asked to choose a candidate based on the characteristics of the individual. Rather, their decisions were based strictly on facts gathered about the candidates’ positions on a number of political issues, taking away any affective component of the decision information that would be present in an analogous social judgment task. There is a disconnect between the emphasis on affective processing systems used in order to perform well on the task in the current research compared to the strict emphasis on the deliberative processing systems needed in order to perform well on one of the decision making tasks found in the previous literature. Not only does the current task require participants to focus more heavily on affective information, but the nature of the social judgment task also simultaneously places significantly less strain on deliberative information. Regions recruited for a social judgment task (e.g., medial PFC, orbitofrontal cortex, and amygdala) are all regions that have also been previously associated with processing of affective information. Mitchell and his colleagues suggest that social cognitive processing, such as the type involved in my task, prompts deeper, more elaborative encoding generally supportive of episodic memory (Craik & Lockhart, 1972), such as the generation of schemas (Cohen & Ebbesen, 1979) or formation of a particularly rich network of inter-item associations (Hastie & Kumar, 1979; Srull, 1981).

The current task was intended to utilize both deliberative and affective processing in order to examine the selective preservation hypothesis. In light of the fact that greater social expertise is observed in older adults and cortical regions associated with affective processing appear well maintained, even in later life, no significant age differences were observed in performance on the social judgment
task. Because of this lack of age variation, it was impossible to ascertain whether observed aging-related declines in executive functions really do account for age-related differences in judgment and decision-making performance.

Although this study does speak to age-related differences in the influence of affective versus deliberative processing systems in decision and judgment tasks, it does not directly examine patterns of activation within brain regions associated with deliberative and affective processing in order to draw direct conclusions regarding age-related differences at the neurobiological level in these patterns during decision-making and judgment tasks. Additionally, our older adult sample was limited to high functioning individuals with high levels of both education and SES. The younger adult sample was drawn from introductory psychology sections throughout the university, with the majority of participants representing traditional undergraduate students (i.e., high functioning, middle class, 18-19 years old). Both of these restrictions limit the generalizability of the study and may have had an influence on the outcomes of the current research. With the majority of the sample high functioning, more conservative conclusions regarding the relationship between deliberative functioning and the influence of affective systems on judgment performance might be in order.

Future research might further examine the selective preservation hypothesis by attempting to replicate this study using a paradigm that does not involve judgments about others, but instead judgments with the inclusion of both affective and nonaffective information in the context of a real-life decision-making task (i.e. purchasing a car, buying a home). By asking participants to ignore irrelevant
affective information and attend to relevant nonaffective information, we may be able to better understand the changing influence of affect on older adults’ decision-making processes, as well as the influence of differences in deliberative abilities on this influence.

In order to more directly examine the selective preservation hypothesis, it would be important to investigate age-related changes in the patterns of activation in structures associated with both deliberative and affective processing mechanisms during decision-making and judgment tasks using neurobiological methodology. How do the patterns of activation in both deliberative and affective regions differ across the lifespan during a decision-making task?

Conclusions

The current research serves to integrate the emerging areas of judgment, aging, and affect. Although previous studies have examined each of these factors, little work has focused on examining the interconnections between the three. Results of this work provide only partial support for the selective preservation hypothesis. Additionally, results indicate that older adults maintain judgment ability, and individuals are able to separate out judgment-relevant information when making a judgment in the presence of affective information.

It may be that the current task, with descriptions containing strictly affective information, is an unrealistic representation of a true life judgment. This task may not provide the proper context in which to examine age-related changes in interplay between the deliberative and affective processing systems in decision-making and judgment tasks given that the task may not fully test the limits of the deliberative
processing systems. Alternatively, it may also be that the ability to make effective judgments is relatively well preserved with aging in the context of a social judgment task. An important question for future research relates to the extent to which these findings generalize to the nonsocial realm. A more complete neurobiological examination of the selective preservation view, which would involve a direct age comparison of deliberative and affective system efficacy, as well as an investigation of age differences in patterns of activation within the brain of the influence of affective information on decisions and judgments, is recommended before conclusions about the selective preservation hypothesis are made.
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Function. (pp. 177-190). Hove: Psychology Press.


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APPENDICES
Appendices Contents

Appendix A – Mean rating values used to categorize attributes

Appendix B – Target description characteristics – Guidelines used to create various levels of overall net and job relevant valence

Appendix C – Stimulus description exemplars for each of the four occupations
## APPENDIX A

*Mean Rating Values Used to Categorize Attributes*

<table>
<thead>
<tr>
<th>Category</th>
<th>Occupation</th>
<th>Valence Rating</th>
<th>Relevance Rating</th>
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<tr>
<td>Positive Relevant</td>
<td>Doctor</td>
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<td>6.39</td>
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<tr>
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<td>Doctor</td>
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</tr>
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<td>5.40</td>
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<td>Negative Relevant</td>
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<td>2.12</td>
<td>5.46</td>
</tr>
<tr>
<td>Negative Irrelevant</td>
<td>Professor</td>
<td>2.53</td>
<td>2.49</td>
</tr>
<tr>
<td>Positive Relevant</td>
<td>Manager</td>
<td>6.00</td>
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</tr>
<tr>
<td>Positive Irrelevant</td>
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<td>Negative Irrelevant</td>
<td>Manager</td>
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<tr>
<td>Positive Relevant</td>
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<td>5.97</td>
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<td>Negative Irrelevant</td>
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<td>3.0</td>
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*Note:* Both the valence and relevance ratings were normed using a 1-7 scale.
### Target Description Characteristics

#### 1) Low Complexity – (6 Attribute Descriptions)

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<tr>
<th>Net Valence – Overall</th>
<th>Net Valence – Job Specific Makeup*</th>
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<tbody>
<tr>
<td>6+</td>
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<tr>
<td></td>
<td>(G) 3+, (J) 3+</td>
</tr>
<tr>
<td>4+</td>
<td>1+</td>
</tr>
<tr>
<td></td>
<td>(G) 3+, (J) 2+ 1-</td>
</tr>
<tr>
<td>2+</td>
<td>1-</td>
</tr>
<tr>
<td></td>
<td>(G) 3+, (J) 1+ 2-</td>
</tr>
<tr>
<td>0</td>
<td>3-</td>
</tr>
<tr>
<td></td>
<td>(G) 3+, (J) 3-</td>
</tr>
<tr>
<td>4+</td>
<td>3+</td>
</tr>
<tr>
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<td>1+</td>
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<tr>
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<td>3+</td>
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#### 2) High Complexity (12 Attribute Descriptions)

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<th>Net Valence – Job Specific Makeup*</th>
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<tr>
<td>8+</td>
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<td>2+</td>
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</tr>
</tbody>
</table>

* Makeup represents the number of attributes within a target description for each valence that are from the general competence category (G) and the job-specific category (J).
APPENDIX C

The following are the stimulus descriptions presented in the social judgment task. They are presented separately based on the occupation to which they were assigned. It is important to note that the order of the attributes within each description was counterbalanced across conditions and participants.

DOCTOR
1) pessimistic, musical, artistic, clumsy, poetic, honest
2) pessimistic, greedy, frivolous, unaccommodating, unlucky, clumsy
3) rational, frivolous, musical, understanding, artistic, impulsive
4) unaccommodating, theatrical, adventurous, compassionate, economical, helpful
5) artistic, unproductive, poetic, theatrical, clumsy, economical, helpful, musical, impulsive, compassionate, pessimistic, adventurous
6) economical, pessimistic, musical, poetic, impulsive, theatrical, unproductive, adventurous, negligent, unaccommodating, clumsy, artistic
7) tone deaf, clumsy, greedy, unlucky, pessimistic, unromantic, unaccommodating, frivolous, detail-oriented, unproductive, compassionate, materialistic
8) materialistic, unproductive, unlucky, unromantic, unaccommodating, tone deaf, negligent, greedy, impulsive, clumsy, pessimistic, frivolous

PROFESSOR
1) brave, articulate, people-oriented, materialistic, economical, sensitive
2) frivolous, fair, inventive, musical, athletic, close-minded
3) frivolous, careless, irresponsible, active, worrisome, close-minded
4) greedy, inventive, patient, musical, worrisome, fair
5) articulate, patient, frivolous, unromantic, irresponsible, fair, materialistic, close-minded, inventive, tone deaf, worrisome, greedy
6) careless, close-minded, economical, tone deaf, monotonous, inventive, unromantic, boring, articulate, athletic, adventurous, brave
7) close-minded, pessimistic, musical, frivolous, monotonous, careless, active inconsistent irresponsible adventurous worrisome athletic Professor
8) inventive, people-oriented, economical, musical, patient, fair, active, articulate, sensitive, brave, adventurous, athletic

MANAGER
1) unaccommodating, careless, poetic, honest, athletic, brave
2) honest, fair, tone deaf, people-oriented, unromantic, materialistic
3) tardy, unaccommodating, tone deaf, pessimistic, brave, theatrical
4) adaptable, egotistical, theatrical, tardy, unromantic, adventurous
5) unlucky, athletic, pessimistic, poetic, pessimistic, unproductive, clumsy, theatrical, tardy, egotistical, adventurous, careless
6) clumsy, unlucky, honest, materialistic, adaptable, people-oriented, ungraceful, tone deaf, rational, fair, unromantic, helpful
7) poetic, athletic, rational, well-traveled, people-oriented, adaptable, adventurous, theatrical, honest, helpful, brave, fair
8) adventurous, well-traveled, fair, theatrical, egotistical, pessimistic, athletic, brave, adaptable, honest, musical, helpful

JUDGE
1) offensive, close-minded, adventurous, mathematical, detail-oriented, unromantic
2) fair, articulate, messy, monotonous, detail-oriented, creative
3) negligent, detail-oriented, athletic, frivolous, fair, creative
4) patient, intelligent, economical, active, honest, materialistic
5) articulate, materialistic, frivolous, messy, negligent, monotonous, unromantic, detail-oriented, greedy, close-minded, honest, fair
6) detail-oriented, greedy, materialistic, monotonous, articulate, frivolous, messy, fair, unromantic, honest, intelligent, patient
7) close-minded, active, mathematical, athletic, detail-oriented, economical, adventurous, honest, musical, fair, pessimistic, patient
8) fair, frivolous, active, messy, intelligent, creative, mathematical, honest, athletic, detail-oriented, patient, articulate