

THE EFFECTS OF STEREOTYPE THREAT ON  
OLDER ADULTS' PROSPECTIVE  
MEMORY PERFORMANCE

By

TERRENCE K. KOMINSKY

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University of Sioux Falls

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Thesis Approved:

Dr. Celinda Reese

Thesis Advisor

Dr. Douglas Hershey

Dr. James Grice

Dr. A. Gordon Emslie

Dean of the Graduate College

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## CHAPTER I

### INTRODUCTION

Stereotype threat refers to the experience of finding oneself in a situation where confirmation of a negative stereotype is possible. Any member of a group that has been negatively stereotyped can experience stereotype threat (Steele, 1997; Steele & Aronson, 1995). Further, finding oneself in a context where stereotype threat is salient may cause decrements in task performance by consuming cognitive resources (Sherman, 1996). Since its discovery (Steele & Aronson, 1995), a vast majority of the existing literature has examined stereotype threat experienced by black persons and women in the domains of intelligence testing and mathematics, respectively.

Only recently have researchers examined the effects of stereotype activation on the cognitive performance of older adults (Andreoletti & Lachman, 2004; Hess, Auman, Colcombe, & Rahhal, 2003; Hess, Hinson, & Statham, 2004, Levy, 1996, Stein, Blanchard-Fields, Hertzog, 2002). With age decrements in retrospective memory being prevalent (see Zacks, Hasher, & Li, 2000 for review), it is extremely important to research the role of stereotype threat. Research examining the impact of stereotype threat has indicated that the activation of negative stereotypes can lead to decrements in the retrospective memory performance of older adults (Andreoletti & Lachman, 2004; Hess et al., 2003; Hess et al., 2004; Levy, 1996). The pervasiveness of negative stereotypes surrounding aging may induce inherent feelings of threat in cognitively demanding



situations, but the exact role that stereotype threat plays is still unclear. We will better be able to understand the cognitive performance of older adults, because merely being in a laboratory setting may inadvertently induce stereotype threat in older adults. Thus, additional research could increase our understanding of stereotype threat and older adults' cognitive performance in general. This understanding of stereotype threat can be extended from the typically examined domain of retrospective memory into the relatively new field of prospective memory.

Prospective memory refers to memory for actions to be carried out in the future. Examples of prospective memory are remembering to put gas in the car before driving to work in the morning or remembering to pick the kids up from daycare. Prospective memory is an integral part of everyday life. With peoples' vast dependence on prospective memory it is easy to understand the necessity to research prospective memory. The importance that older adults' place on prospective memory for independent living is easily recognized. Thus, it is important to study the influence of stereotype threat on the prospective memory performance of older adults.

The present research is designed to examine the influence of stereotype threat on older adults' prospective memory performance. The introduction is organized as follows. The first section will provide background information on stereotype threat. The second section will describe research on stereotypes in general. Theories of stereotypes and possible underlying mechanisms will be discussed. The third section focuses specifically on stereotypes of older adults. Outlined are some possible explanations for why older adults are consistently negatively stereotyped. Also incorporated are stereotypes of older adults, and why even older adults stereotype older adults. The fourth section will provide

an in depth examination of much of the stereotype research conducted with older adults. This section will incorporate literature evidencing that simply activating stereotypes can be detrimental due to the negative effects of stereotype threat. Next, a brief review of the prospective memory literature will be presented, including a discussion of age-related differences in prospective memory performance. Finally, specific aims of the current research will establish a rationale for studying stereotype threat on the prospective memory performance of older adults, and outline the specific hypothesis of the proposed research.

## Review of Literature

### *Stereotype Threat*

In 1995 Steele and Aronson published groundbreaking research suggesting that when an individual is exposed to an environment in which he or she may confirm a negative stereotype, inhibited performance is exhibited. A threatening situation does not have to be saturated with negativity; the threat need only be salient enough to invoke the possibility of confirming a negative stereotype (Leyens, Desert, Croizet, & Darcis, 2000). The stereotype does not even have to be applicable to the situation, nor does the individual have to subscribe to the stereotype for his or her performance to be affected. Stereotype threat can influence any individual who identifies himself or herself with a group that is negatively stereotyped. Importantly, Steele and Aronson (1995) suggested that performance might suffer due to the redirection of cognitive resources. The threatened individual may become anxious and allocate attention to the concern of confirming the stereotype when those same resources are needed for the task at hand. Thus, decrements in performance are observed.

Steele (2003) reports that he began to research the phenomenon while reviewing academic records at the University of Michigan. During this review he noticed that black students, on average, were not performing as well as white students at all levels, in all fields. Even after controlling for SAT scores, black college students were performing less well than their white counterparts. Further review of archival grade data suggested that women were also performing below their male counterparts in the fields of mathematics and physics (Steele, 2003). Steele and Aronson formed a hypothesis that when individuals are placed in a context where they may confirm a negative stereotype, individuals will experience stereotype threat, which will lead to decreased performance. Further, individuals who report that the domain being tested is an integral part of how they view themselves (high domain identification) will experience more threat than individuals who do not identify with the domain.

Steele and Aronson (1995) experimentally tested their hypotheses and uncovered an interesting phenomenon. Black and white participants were randomly placed into one of three conditions: diagnostic of intellectual ability, non-diagnostic challenge, and non-diagnostic problem solving. In the diagnostic condition, it was important to stress the test as indicative of verbal ability to induce threat through domain identification and to create an environment where black participants may confirm the negative stereotype of blacks not being as intelligent as whites. The difference in the two non-diagnostic conditions was that in the challenge condition experimenters stressed that the test was a difficult one, and in the problem solving condition experimenters indicated they were only interested in how problems were solved. The dependent variable was performance on a difficult 30-item verbal exam administered in SAT testing format.

Black participants in the diagnostic condition scored significantly lower than did white participants. In the non-diagnostic conditions, when the test was not introduced as reflective of ability, the racial gap was reduced to a non-significant difference with white participants barely scoring above black participants. A second study revealed that speed is also hindered by stereotype threat. Black female students in the diagnostic condition spent a significantly longer time answering questions than did white females in the diagnostic condition and both black and white participants in the non-diagnostic conditions. Steele and Aronson (1995) pointed out the need to make salient the diagnostic quality of the test in the stereotype threat condition. Salience of the diagnostic aspect of the test is required because participants who are more highly identified with the particular ability being tested are more likely to fall victim to the influences of stereotype threat. Steele and Aronson's (1995) description of stereotype threat reflects the detrimental effects it may have for any group about which a negative stereotype exists.

The stereotype threat induced gaps that are experienced by blacks in intelligence testing and academics (Cokley, 2002; Nguyen, O'Neal, & Ryan, 2003; Osborne, 2001, Sackett, Hardison, & Cullen, 2004) and women in mathematics (Arndt, Greenberg, Schimel, & Pyszczynski, 2002; Brown & Pinel, 2003; Inzlicht & Ben-Zeev, 2003; Smith & White, 2002; Spencer, Steele, & Quinn, 1999; Stangor, Carr, & Kiang, 1998, Walsh, Hickey, & Duffy, 1999) have been replicated time and again. However, one group that is widely stigmatized and stereotyped that has received little attention with regard to stereotype threat is that of older adults. Thus, the literature review and proposal that

follows will examine the impact of stereotypes and stereotype threat on the cognitive functioning of older adults.

### *Stereotype Theory*

Humans encounter a vast amount of information every day. In an effort to organize a wide variety of experiences individuals begin to form knowledge structures linking information regarding similar stimuli. Thus, it is of no surprise that people set up information structures about individuals and members of human and/or social groups. Along with placing individuals and human/social groups into categories, we begin to develop beliefs about and expectations of those individuals and groups. It is these beliefs and expectations that lay the foundation for stereotypes (Sherman, 1996).

Stereotypes can be thought of as heuristics that allow people to make quick inferences about individuals who belong to a specific social category with whom they come in contact (Devine, 1989; Kawakami, Young, & Dovidio, 2002). Stereotypes are not only beliefs about characteristics and behaviors of human/social groups and their members, they also include inferences as to why those characteristics and behaviors go together (Hilton & von Hippel, 1996). The way stereotypes are structured has led researchers to believe they are schema variations (Gilbert & Hixon, 1991) that are called upon when presented with a member of a stereotyped group (Hilton & von Hippel, 1996).

A schema, as described by Bartlett (1932), “refers to an active organization of past reactions, or of past experiences. . .” (p. 201). Within the field of psychology, schemas are seen as frameworks built from past experiences that dictate how new experiences and information are viewed. Schemas also influence how we retrieve old information from long-term memory (Leahey & Harris, 2001). Individuals have unique

and eclectic schemas for all facets of their lives. When stereotypes are used as schemas and heuristics, they disallow the perceiver to process all of the information that may be important in making assessments of individuals and groups (Hilton & von Hippel, 1996), and therefore, the assessment and accompanying stereotype may be inaccurate (Gilbert & Hixon, 1991). Thus, valuable information that could have, and possibly should have, been processed is filled in with expectancies. Expectations based on stereotypes appear to prevent complete and accurate individual and group evaluations. The view that stereotypes are a form of heuristic and/or schema has prompted researchers to try to determine and comprehend the underlying mechanisms of stereotypes (Sherman, 1996).

Possible explanations for stereotyping are many. The two most prevalent explanations are cognitive efficiency (Gilbert & Hixon, 1991; Hilton & von Hippel, 1996; Sherman, 1996; Wolfe & Spencer, 1996; Yzerbyt, Schadron, Leyens, & Rocher, 1994) and in-group/out-group differentiation (Branscombe, Wann, Noel, & Coleman, 1993; Schofield & Steers-Wentzell, 2003). Other theories include self-esteem protection (Hilton & von Hippel, 1996; Kunda & Spencer, 2003, Wolf & Spencer, 1996), avoiding prejudice (Kunda & Spencer, 2003), social (Devine, 1989) and evolutionary (Schofield & Steers-Wentzell, 2003) learning, and establishing a positive social identity (Wolfe & Spencer, 1996).

Category systems such as stereotypes are employed to supply information with minimal use of cognitive resources (Gilbert & Hixon, 1991). When one encounters an individual from a stereotyped group, one quickly calls to mind the information related to that group already stored in memory (Sherman, 1996). In other words, as a result of the cognitive efficiency of stereotypes, a complete assessment of an encountered context may

not be undertaken. Stereotypes supply adequate explanations when stereotype-congruent behaviors are observed, but often prevent recognition of attributes that contrast with already established beliefs (Hilton & von Hippel, 1996). Due to the strengthened associations in memory it is far easier for an individual to confirm the typicalities of stereotyped targets than it is to completely process whether an individual truly represents a stereotypical member of a particular social group. In fact, humans are so inclined to confirm their beliefs that even ambiguous behaviors are often evaluated as stereotype consistent (Biernat, 2003).

In addition to being cognitively efficient, the existence of stereotypes is also explained by their relationship to the basic human social process of in-group/out-group differentiation. Members of out-groups are those individuals who are not members of the group or groups with whom one is affiliated. In-group/out-group differentiation theory proposes that people stereotype out-groups because they want to fulfill either a need or a desire for the group to which they belong to be different from other groups. Creating a distinction between groups to enhance one's view of oneself or one's group may then lead to negative behaviors and beliefs that are directed towards the out-group (Wolfe & Spencer, 1996). In fact, people tend to view out-groups more negatively than in-groups even if both groups are exhibiting identical behaviors (Hilton & von Hippel, 1996). The negative attitudes developed by the perceiver are compounded by ideas of in-group heterogeneity and out-group homogeneity.

In-group heterogeneity refers to how the perceiver views the in-group. Due to more experience with their own positively viewed groups, the cognitive structures representing the in-group are vastly more complex than they are for out-groups (Hilton &

von Hippel, 1996; Linville, 1982). In other words, as experience with a group increases, the complexity of the cognitive representation increases. Therefore, out-group homogeneity is amplified because we contrast out-groups to our in-group. Stated differently, as members of our own group(s) begin to look more diverse, all the individuals of an out-group appear to be more alike. In addition, the more stereotypical the out-group is assumed to be, the more similar group members are seen to be (Maurer, Park, & Rothbart, 1995).

In summary, stereotypes are cognitively efficient because they draw on experiences already stored in memory, but they may also be detrimental. Stereotypes appear to prevent a full and accurate assessment of encounters with members of stereotyped groups and may exaggerate perceived differences between in-groups and out-groups. Despite these negative features, research suggests that stereotypes are difficult to inhibit. Counteracting an activated stereotype requires more effort than applying it does (Kunda & Spencer, 2003). The cognitive efficiency and inhibition difficulties of stereotypes suggest that employment of stereotypes will occur frequently. The frequency with which stereotypes are applied underscores the importance of understanding the impact stereotypes can have on members of stereotyped groups.

#### *Stereotypes of Older Adults*

Research indicates that individuals of all ages hold stereotypes of older adults (Hess, Auman, Colcombe, & Rahhal, 2003; Hess, Hinson, & Statham, 2004; Hummert, 1990; Hummert, Garstka, Shaner, & Strahm, 1994; Levy, 1996). Many of the stereotypes are negative ones. For example, research has found that older adults are stereotyped as being senile, slow, sick, blind, stooped over (Levy, 1996), forgetful, (Dijksterhuis, Aarts,



Bargh, & van Knippenberg, 2000), slow to respond (Kawakami et al., 2002), severely impaired, curmudgeonly, reclusive, despondent, and vulnerable (Hummert et al., 1994). These negative views have a long history in western societies and can be viewed as a form of ageism. Perdue and Gurtman (1990) suggest that some of these views may arise from fears of the negative aspects of getting older, such as “fears of loss of control, loss of sexuality, and loss of adaptability and intelligence” (p. 200).

Positive stereotypes are far fewer, but nonetheless do exist. Hummert et al. (1994) performed a hierarchical cluster analysis and found that young adults’ positive stereotypes consisted of the three main categories: *golden ager*, *John Wayne conservative*, and *perfect grandparent*. The category of golden ager included traits such as active, adventurous, sociable, independent, skilled, and successful. The John Wayne conservative category included traits like patriotic, old-fashioned, conservative, and nostalgic. The category of perfect grandparent included traits such as intelligent, loving, supportive, generous, and family oriented. In Hummert’s (1990; 1994) work middle-aged adults had the same stereotypes as younger adults, but they also produced additional traits that fell into the category of liberal matriarch/patriarch. The *liberal matriarch/patriarch* category contained traits like, liberal, wealthy, frugal, and old-fashioned. Older adults also held more positive stereotypes, and these results will be discussed shortly.

Stereotypes of older adults are so pervasive that only recently has there been a push in the field of psychology to rectify the negative images of older adults. Whitbourne and Hulicka (1990) reviewed 139 psychology textbooks published between 1949 and 1989. They found that the number of pages devoted to educating the reader on older

adults was significantly less than the number of pages devoted to other topics within each text. In addition to the small amount of space devoted to older adults, they found that even when older adults were described, the discussions were laced with negative connotations. Further, word choice and the voice of the writing demeaned any positive implications that the authors tried to convey. Stuart-Hamilton and Mahoney (2003) conducted a study where participants were educated about older adults and ageism, and yet participants' scores on discrimination and avoidance questionnaires did not differ significantly from pre-test to post-test. Stuart-Hamilton and Mahoney's work corroborated the research of Whitbourne and Hulicka (1990) because they found that even when people are educated about older adults and have been presented with information dispelling myths regarding aging, people still convey ageism.

Research on the pervasiveness of negative stereotypes of older adults (Levy, 1996; Sharps, Price-Sharps, Hanson, 1998) has led to evidence that even older adults stereotype older adults (Hummert, et al., 1994; Levy, 1996). Older adults have more of both positive and negative stereotypes of older adults than do younger and middle-aged adults. Hummert et al. (1994) found that older adults produced all the same negative categories that younger and middle-aged adults did, shrew/curmudgeon, despondent, severely impaired, recluse, but they also produced *elitist*. The category of elitist included traits such as, demanding, prejudiced, wary, snobbish, and naïve (Hummert, 1990; Hummert et al., 1994).

Older adults have more positive stereotypes of older adults because they have a more complex view including more traits than do younger and middle-aged adults (Hummert et al., 1994). Hummert's (1994) work found that older adults maintained the

same positive stereotypes of older adults that younger and middle-aged adults do (i.e., golden ager, John Wayne conservative, and perfect grandparent), but also added *activist* and *small town neighbor*. The category of activist included traits such as, political, sexual, health-conscious, liberal. The small town neighbor category included traits like emotional, quiet, tough, and conservative (Hummert, 1990; Hummert et al., 1994). The higher number of negative and positive stereotypes may be due to their extensive experience with older adults creating the perception of greater in-group heterogeneity.

Adults over the age of 60 do not always identify themselves with old age, possibly because of their strongly entrenched negative images of aging (Levy, 1996). This disidentification of older adults from ‘stereotypical’ older adults can be approached as a function of the in-group/out group phenomenon. Older adults may not feel as though they are ‘old’ because they do not think that the negative views of older adults in western culture depict them. Thus, viewing one’s own group as stereotypical of ‘old’ becomes inconceivable. Further, it may be that older adults attempt to distance themselves from negative stereotypes as a form of self-esteem protection (Hilton & von Hippel, 1996; Kunda & Spencer, 2003, Wolf & Spencer, 1996). When older adults evaluate their own abilities and feel as though they are doing quite well, they may not feel that certain stereotypes accurately depict them. Therefore, they feel as though the group they belong to, older adults, has not properly helped to maintain a positive social identity, and thus they remove affiliation to protect their self-esteem.

### *Stereotype Threat and Older Adults*

Very little research has been conducted on the effects of stereotype threat on older adults. In this section, in depth accounts of the research that most influenced the current

study will be presented. These studies were the first to look at the impact of the influence of stereotype activation on older adults. Stemming from her previous research (Levy, 1996), Levy (2003) stated that stereotypes held about older adults may actually be detrimental to their cognitive and physical functioning. Levy (1996) examined whether older adults could be implicitly primed with positive and negative self-stereotypes and whether such priming would influence their memory performance. She asked 90 participants to engage in five memory tasks before and after experimental manipulations. Sixty individuals participated in both an implicit and an explicit manipulation, and thirty participated in only an implicit manipulation.

The implicit condition consisted of a computerized priming task in which stereotype relevant words were presented very rapidly above or below a fixation point. Participants were to determine as quickly and accurately as possible if a flash, which was actually a word, appeared above or below the point of fixation. In both the positive and negative implicit conditions, primes were presented in five blocks of twenty words. In all blocks, the first word was either *old* or *senior*. Then, 19 words were randomly presented. Fifteen of the twenty related to negative stereotypes (e.g., *Alzheimer's*, *senile*, *decline*, *dependent*) for half the participants and positive stereotypes (e.g., *wise*, *sage*, *learned*, *accomplished*) for the other half. The remaining four words were non-stereotype related (e.g., *together*, *sentence*, *between*, *another*).

The explicit intervention entailed the use of a “cognitive luminescence bulb” and false positive feedback. The cognitive luminescence bulb was just a heating bulb used to create internal or external attributions of participants’ memory performance. The 60 participants in the explicit manipulation were presented with false research results

evidencing positive effects of the luminescence bulb. In other words, participants were told that research had found that memory performance was better when the cognitive luminescence bulb was illuminated. Participants then read a short story about an older adult that was filled with ambiguities. That is, the perception of the older adult's actions could be positive or negative relative to age. Participants were asked to recall the story verbatim and provide a description of the older adult portrayed in the story. All participants were informed that their performance was exceptionally accurate. Following the feedback, half the participants were informed that the bulb was a placebo, and half were allowed to continue believing the fictitious research results. Thus, internal and external attribution conditions were created.

For all participants, the memory battery was first presented prior to the implicit priming task. For the 60 participants involved in the explicit intervention, the second administration occurred after being assigned to either the internal or external attribution condition. The 30 participants not incorporated into the explicit intervention moved onto the battery of memory tests directly from the implicit intervention. Three of the memory tasks were visuospatial recall tasks. The fourth task required participants to recall phrases such as "swims every day" and "watches a lot of" that were paired with photographs of people. The final task involved verbally recalling a list of 15 words.

Levy's (1996) research provided evidence that older adults can be primed without awareness and that such priming does impact performance. Compared to the first administration, older adults who were implicitly primed to activate negative stereotypes performed poorer on four of five memory tasks the second time they were administered. Conversely, participants implicitly primed with positive stereotypes performed better on

four of five memory tasks (Levy, 1996). The verbal recall task did not yield significant differences between administrations for either priming group. The explicit intervention, in contrast to the implicit intervention, did not yield any statistically significant differences in memory performance.

Levy's (1996) research was the first to document that the activation of negative stereotypes can detrimentally impact the memory performance of older adults. Hess et al. (2003) wanted to replicate and extend the findings of Levy (1996). Hess et al. (2003) also looked at the impact of stereotype activation on older adults, but wanted to identify the underlying mechanisms of how performance was affected. Thus, Hess et al. (2003) looked at strategy use and anxiety as possible mediators of the relationship between stereotype threat and memory performance.

It is broadly believed and accepted by adults of all ages that memory declines with age (Cavanaugh & Blanchard-Fields, 2002), and as Levy (1996) has shown, older adults' memory performance declines when primed with negative stereotypes of older adults. To further this line of research, Hess et al. (2003) engaged in research to verify that stereotype threat would in fact impact the memory performance of older adults. They wanted to see if threat lowered strategy use on the memory task, and if increased anxiety was associated with decreased memory performance. Also of interest, was whether higher domain identification resulted in higher reports of stereotype threat. Hess (2003) randomly placed participants into one of three conditions: positive, negative, or neutral. Hess et al. (2003) asked participants to read articles describing the positive and negative impact of age on memory in the positive and negative conditions, respectively.

Participants in the neutral condition were not presented with any articles. Lastly, Hess et al. (2003) incorporated age by testing both younger and older adults.

After reading the articles, participants were exposed to a paired-associates word task used to assess stereotype activation. Hess et al. exposed participants to 54 word pairs. Participants were asked to ignore the first word, and then verbally report as quickly as possible whether the second word was *good* or *bad*. Thirty-six (18 positive and 18 negative) of the pairs were stereotype relevant, where the prime word was *old* or *young*. The remaining 18 pairs consisted of neutral traits preceded by either *blank* or *none*. The task began with a fixation point on the computer screen that was then replaced by the prime word. The prime word was rapidly replaced with the target word. Both younger and older adults in the negative and control conditions responded more quickly to negative traits than to positive traits when those traits followed the *old* prime. The differences in response times suggest that exposure to the negative fabricated research did have an effect on activating negative stereotypes of aging relative to the positive condition. Hess et al. (2003) explain the non-significant difference between the negative and control conditions as being an indicator that in the absence of induced stereotype activation, negative stereotypes may already be activated.

A free-recall memory task of 30 words representing six semantic categories was used to assess the impact of stereotype threat activation on memory performance. Stereotype threat induction impacted the memory performance of older adults, but not younger adults. As the stereotype threat literature suggests, a high level of domain identification influenced memory performance. As the value placed on memory increased, older adults' recall performance decreased. This trend was especially evident

in the negative and control conditions. This relationship was not as evident in the positive condition because domain identification is being reinforced instead of threatened. Furthermore, older adults' strategy use in recall was affected by stereotype threat in the negative condition. Cluster analysis indicated that strategy use in the negative condition was significantly lower than in the positive and neutral conditions. Anxiety did not have a significant impact on recall, but Hess et al. point out that they measured trait anxiety, and future research should measure state anxiety.

Hess et al. (2003) corroborated the work of Levy (1996) by providing additional evidence that negative stereotype activation has a detrimental effect on older adults' memory performance. Hess et al. (2003) also provided evidence that strategy use is detrimentally impacted by stereotype threat resulting in lower memory performance of older adults. Lastly, by comparing older and younger adults, the claim of Steele and Aronson's (1995) that a person must be a member of a stereotyped group and value the domain to experience the threat has been further substantiated.

To further inspect the impact of stereotypes on memory performance, Hess et al. (2004, Exp 1) continued research of the effects of stereotype activation on the memory performance of older adults. The objectives of Hess et al. (2004) were threefold. Of primary concern was the reliability of the effects of stereotyping on the memory performance of older adults. Next, they also wanted to research how participants' performance may functionally vary with their awareness of the priming. Finally, Hess et al. (2004) wanted to examine the impact of stereotype threat on anxiety. Younger and older adults were randomly assigned to one of four conditions representing combinations



of an awareness condition (aware vs. unaware) and a stereotype prime condition (positive vs. negative).

A scrambled sentence task was presented to participants to induce stereotype activation. Participants were to construct four word sentences from a list of five words. Thirty sets of five words were presented. Twenty of the sets were stereotype relevant whereas the remaining ten sets had no direct link to age. Half of the participants received word sets containing a negative aging word, and the other half were given sets containing a positive word. For participants in the aware condition, the age-related prime word was highlighted, and participants had to use the highlighted word in the constructed sentence. Age related words in the unaware condition were not highlighted. Next, participants were informed they would be taking a memory test later. Participants were to study thirty words representing six different semantic categories, and then write down as many of the words as they could recall. Prior to the recall task, participants completed anxiety and self-handicapping measures, and also made predictions about how many words they would recall.

Younger adults recalled a significantly higher number of words than older adults. However, in the aware condition there were no differences in recall between age groups. In the unaware condition older adults performed significantly better following positive primes relative to negative primes. The results indicate that older adults' awareness of the primes prompted them to engage more heavily in strategy use to counteract the influence of stereotype activation. This provides evidence that memory performance of older adults does vary as a function of awareness. Lastly, compared to younger adults,

older adults scored significantly lower on state anxiety. Thus, relative to younger adults, the presence of threat did not elevate older adults' anxiety levels.

In a second experiment Hess et al. (2004) attempted to replicate the findings of the first experiment but with some slight modifications to the procedure. A tailored implicit priming task was used instead of the scrambled sentence task. The implicit priming task entailed presenting all participants with a lexical decision task similar to Levy (1996). A fixation point was presented in the middle of the screen, then the target word was presented above or below that point. Participants were then asked to identify the presented word. In the implicit condition, pilot testing was conducted to gauge the longest length of presentation that would still be below each participant's perception. Due to participants being able to visually identify the target words at 250ms, this was the length of presentation used in the explicit condition.

All participants were presented with the lexical decision task. Half of the participants were presented with implicit primes and the other half were presented with explicit primes. Stereotype relevant words were used as primes. Non-prime words were non-pronounceable non-words. Half the participants received positive primes; the other half was presented with negative primes. The priming task consisted of three sets of 30 trials. Composition of the 30 words entailed 16 age-related and 14 non-pronounceable words. Of the first three age-related words, two of the following three words were randomly chosen: *aged*, *old*, and *senior*.

No significant results were obtained for domain identification or anxiety. However, younger adults performed significantly better than older adults on the recall task. Younger adults recalled more words in the aware condition than did older adults,

but no age differences occurred in the unaware condition. Younger adults recalled significantly more words than older adults in the negative prime condition. Older adults' free recall scores were significantly higher in the positive than in the negative priming conditions.

Hess et al. (2004) helped to establish the reliability of the effect of implicit priming with older adults. Priming effects were only found for older adults, thus corroborating Levy (1996) and further substantiating the position that one has to be a member of a stereotyped group to experience threat (Steele & Aronson, 1995). Importantly, it appears that strategy use of older adults significantly increased when they were made aware of the primes. Thus, perhaps when older adults are aware of negative stereotypes, they are able to vary the degree to which they engage in strategy. It is possible that older adults who were made aware of the negative stereotypes utilized more strategies or applied more resources to a particular strategy to offset the effects of stereotype threat.

The research described above (Hess et al., 2003, Hess et al., 2004; Levy, 1996) provides empirical evidence that stereotypes impact the memory performance of older adults in a negative fashion. However, it is important to note that Andreoletti and Lachman (2004) provided evidence that education offsets the negative effects of stereotype activation. Andreoletti and Lachman (2004) posit that the offsetting effect occurs due to the differing beliefs between higher and lower educated participants. Those with more education believe they can control their memory performance, and overall, they have higher levels of memory self-efficacy. The results indicated that higher levels of education are associated with lower susceptibility to stereotype threat.

To date, all stereotype threat research involving older adults has examined the effect of threat on retrospective memory (RM) performance (Andreoletti & Lachman, 2004; Hess et al., 2003, Hess et al., 2004; Levy, 1996). RM is memory for past events. Remembering a list of words over a short span of time is an example of RM and is commonly used in the methodologies of stereotype threat research involving older adults. However, other types of memory have not been examined in the stereotype threat literature.

### *Prospective Memory*

Prospective memory (PM) is another important type of human memory. PM refers to memory for actions to be carried out in the future (e.g. Einstein & McDaniel, 1990; Einstein, McDaniel, Richardson, Guynn, & Cunfer, 1995; Rendell & Thomson, 1999). PM, while often viewed as the opposite of RM, is largely supported by retrospective memory. Rendell and Thomson (1999) and Kidder, Park, Hertzog, and Morrell (1997) point out that prospective memory tasks are comprised of two components: the prospective aspect of remembering to perform the intended action, and a retrospective factor, meaning that individuals who are activating prospective memory tasks need to recall the content of the action they are about to perform. At first it may seem that these types of memory are competing, but in fact, they are not. Rendell and Thomson (1999) have made it very clear that without retrospective memory there would not be prospective memory at all. Retrospective memory facilitates remembering to carry out an intention or action in the future. This means that PM entails remembering to engage in an action and to recall information about that event. For example, an individual may need to remember to give a phone message to his or her roommate. The

RM component would be to remember who called and the message itself, and the PM component would be remembering to pass on the message.

Remembering to perform actions in the future is an integral part of everyday functioning and therefore, extremely important in everyone's everyday life. More importantly, because of implications PM has with regard to independent living, it is particularly important to the daily functioning of older adults. Kidder et al. (1997) point out that an estimated 50% of all memory errors are prospective in nature. With half of all memory errors linked to PM, the potential negative impact on older adults is quite unsettling. Many times older adults are required to take multiple prescriptions, and therefore need to remember to take them throughout the day. The ramifications of a prospective memory error in this domain could be deleterious and possibly deadly. It is for these reasons that research on the impact of stereotypes on prospective memory in older adults is necessary.

A large quantity of PM research has been conducted in the laboratory (Rendell & Thomson, 1999). Laboratory research designs typically include having participants remember intentions over short periods of time. Such tasks include carrying out an intention after a specified amount of time has passed, computer tasks where participants need to monitor strings of digits presented to them for three consecutive odd numbers (Vogels et al., 2002), and identifying when a specific background appears by pressing a key on a computer keyboard (Kidder et al., 1997). All the aforementioned types of PM tasks are typically embedded in working memory tasks.

Prospective memory, as currently researched, is broken into two distinct varieties. A majority of the research has looked at what is referred to as event-based PM. Marsh,

Hancock, and Hicks (2002) define event-based prospective memory as an intention that depends on a connection to a stimulus provided by the environment that serves as a cue for a plan or intention to be enacted. Returning to the example of giving a phone message to a roommate, encountering the roommate is an external cue that should prompt the PM action. Einstein and McDaniel (1990) developed a general paradigm in which the PM task is to press a key on the computer keyboard when a certain word appears on the screen at anytime throughout the experiment. The specified word is then placed in a word list between 3 and 8 words long that is presented under the premise of a short-term memory trial.

Event-based prospective memory, relative to time-based PM, has been studied more often with older adults. Laboratory research on event-based PM has often found that the performance of older adults is not significantly different from that of younger adults (Einstein & McDaniel, 1990; Einstein, et al., 1995, Exp. 2; Reese & Cherry 2002; Vogels et al., 2002, word comparison task, pictures task). However, there are some studies (Kidder et al., 1997; Maylor, 1998) that document younger adults outperforming older adults on event-based PM tasks.

What could account for the different findings within the research? In the research citing older adults as performing worse than younger adults (Kidder et al., 1997; Maylor, 1998) it appears as if there are not any accommodations made to help equalize the cognitive demands of tasks for older adults and younger adults. Research not finding age differences (e.g., Einstein & McDaniel, 1990; Reese & Cherry, 2002) has, for older adults, incorporated modifications in the short-term memory task in which the PM task is embedded. For example, if younger adults see word lists of 4-9 words, then older adults

will be presented with lists between 3-8 words. All other criteria are still rigidly maintained. This slight accommodation seems to result in equivalent performance between older and younger adults on STM tasks that would normally reflect age differences had such modifications not been employed. The complexities of event-based PM performance become increasingly salient when one notes that there is also research (Rendell and Thomson, 1999; Vogels et al., 2002) evidencing instances where older adults perform significantly better than younger adults. Examination of this research indicates that the age-related differences in performance on the PM tasks are due to the type of PM task and the nature of the ongoing RM task.

The second variation of prospective memory is that of time-based prospective memory. Instead of a specific event, this type of prospective memory hinges upon an action being performed at certain time or times. Generally, participants are instructed to perform an action at a given time or times during the testing interview. For example, Einstein et al. (1995, Exp. 1) had participants press a key on a computer keyboard twice throughout an experiment, once at 10 minutes and once at 20 minutes. The PM task of key presses was embedded in a STM task presented on a computer. Einstein et al. found that older participants performed significantly poorer than did younger adults at pressing the key on time. McGann, Ellis, and Milne (2002) suggest that time-based prospective memory, due to the multiple times an intention may have to be enacted (i.e. taking medication) and constant monitoring, requires high demands of attentional resources because time-based PM is significantly more dependent on self-initiated cues compared to the external cues of event-based PM.

Initially, PM research was studied outside of the lab in naturalistic settings but began to be heavily studied in the lab due to methodological and control problems (Einstein & McDaniel, 1990). Recently naturalistic research methods are once again being sought (Rendell & Thomson, 1999) and more ecologically valid paradigms are being employed. Naturalistic PM studies vary from logging times into a hand held organizer at specified times throughout the day (Rendell & Thomson, 1999) to manipulating electronic badges at work (Sellen, Louie, Harris, & Wilkins, 1997). The performance of older adults on PM tasks outside of the laboratory is typically better than that of younger adults (Rendell & Thomson, 1999), but that may be because older adults are better at utilizing external strategies, thus they show better performance on naturalistic tasks (Kidder et al., 1997).

The present research will employ an event-based PM task; therefore, it is important to use an event-based task that has proved to be consistent in comparing the performance of older and younger adults. Furthermore, it is important to design a methodology that will place older adults in a position where they could perform equivalently to younger adults. Use of a task that allows for equality between older and younger adults on PM performance provides a unique opportunity to examine the effects of stereotype threat on older adults' PM performance using a well-established PM task in a stereotype threat activation paradigm. In addition, using a PM task where age differences are not expected will allow for better understanding of the impact of stereotype threat. Stereotype threat may impact older adults in a context in which they typically perform just as well as younger adults.



## Specific Aims

The primary aim of the present study was to examine the impact of stereotype threat on older adults' performance on prospective memory (PM) tasks. Previous research has examined the impact of cultural stereotypes (Levy, 1996) and stereotype threat (Hess et al., 2003; Hess et al., 2004) on older adults' memory performance. However, only retrospective memory (RM) has been investigated. Previous research examined memory for spatial (Levy, 1996), auditory (Levy, 1996), and written verbal materials (Hess, et al., 2003; Hess et al., 2004).

In order to extend the stereotype threat research to PM performance, the current study embedded a PM task in an STM task. The PM task consisted of pressing a response key on a keyboard when a target event occurred. Different levels of threat were induced through a stereotype activation task in order to examine the impact of stereotype threat on older adults' PM performance. The stereotype activation task consisted of participants in positive and negative conditions having read articles that described maintenance of good memory skills throughout the age process or marked declines in older adults' memory performance as compared with younger adults. Participants in the neutral condition did not read any articles. The stereotype activation task should have induced positive or negative activation depending on condition, but the control group was not prompted to activate any stereotype. A lexical decision task was used as a manipulation check in order to ensure that stereotype activation occurred. Participants in the negative stereotype activation condition should have experienced stereotype threat, which was expected to lower PM and STM performance. Further, it was expected that positive stereotype activation would lead to PM and STM performance that is

significantly better than PM and STM performance of participants in the negative condition.

These predictions, and the previously mentioned STM predictions, were based on Hess et al.'s (2003) research on the effects of stereotype threat on RM. One question that was addressed in the present research was whether this outcome would also apply to PM. PM may be a separate memory system, but since PM contains an RM component, it is somewhat dependent on RM. Because of the relationship between RM and PM, results were expected to be similar to Hess et al.'s (2003) findings for RM.

A second aim was to examine the variables that influence the relationship between stereotype threat and PM performance. Hess et al. (2003) indicated that 58% of the variance associated with recall was due to the effects of stereotype threat on strategy use. This provides evidence that lower recall in the negative stereotype activation group was largely due to the effects of threat on older adults' use of effective strategies. Although some research exists that has not found a significant relationship between stereotype threat and strategy usage (Hess et al., 2004), the present research was modeled after Hess et al. (2003) and the results were expected to be similar. We expected that strategy use would be significantly lower in the negative condition relative to the positive and neutral conditions.

Older adults' strategy use was assessed in the same fashion as participants in Einstein and McDaniel's (1990) no external aid condition. At the end of the experiment participants were asked about internal strategy use. At the end of the current study, participants were asked to describe any strategies they used to remember the PM task. Further, participants also filled out a questionnaire that asked participants how often they

thought about the PM task. This questionnaire was a measure of monitoring and should have reflected strategic and effortful processing during the PM task. An indicator of higher and lower monitoring should have reflected high and low strategic processing, respectively.

In addition, the influence of stereotype threat on state anxiety was examined. When stereotype threat was present, anxiety should have been higher. Hess et al. (2003) measured trait anxiety and suggested that subsequent research should measure state anxiety to better understand the relationship between anxiety and stereotype threat. However, subsequent research (Hess et al., 2004) measured state anxiety, and analyses did not reveal that stereotype threat significantly influenced anxiety levels. Similar to Hess et al. (2004), state anxiety was also measured to investigate whether activation of positive or negative stereotypes differentially influenced participant anxiety levels. The current research was largely modeled after the methodology in Hess et al. (2003), but used the state anxiety measurement of Hess et al. (2004). Therefore, it was expected that participants in the negative stereotype activation condition would report significantly higher levels of anxiety than would participants in the positive stereotype activation condition. The neutral and negative conditions were expected to report similar levels of anxiety due to the prevalence of negative aging stereotypes (Hess et al., 2003).

The third aim of the current study was to evaluate whether higher identification with a domain would lead to higher reports of experienced threat and lowered performance. A metamemory questionnaire assessed how much value participants placed on their memory ability. This measure allowed for comparison of performance between high and low identification individuals. Due to higher anxiety associated with evaluation

apprehension (Steele & Aronson, 1995), it was expected that highly identified participants in the negative stereotype activation and the control groups would experience higher levels of anxiety than low identification individuals. Thus, PM performance for highly identified individuals in the negative condition should have been lower than all other participants.

### *Summary*

In summary, this study extended the research of stereotype threat by examining its effects on older adults' PM performance. Specifically, stereotype threat was expected to negatively impact PM performance. Examination of the effects of stereotype threat on strategy use and anxiety in older adults has helped in understanding how stereotype threat influences PM performance. In addition, the current study was expected to provide further evidence that individuals who highly identify with the domain being tested would experience stereotype threat and subsequent performance decrements. Confirmation of the outlined predictions would provide the first evidence of the influence of stereotype threat on PM.

## CHAPTER II

### METHOD

#### *Participants*

Participants were 60 community dwelling older adults ( $M_{\text{age}} = 75.85$ ,  $SD = 8.02$ ) recruited from a small midwestern city. They ranged in age from 62 to 91 years of age, and gender was roughly balanced with 25 men ( $M_{\text{age}} = 77.04$ ,  $SD = 8.01$ ) and 35 women ( $M_{\text{age}} = 75.00$ ,  $SD = 8.04$ ) participating. Participants were recruited from senior housing communities and other local civic groups. Based on participants' answers to three questions related to self-perceived health from the Older American Resources and Services Multidimensional Functional Assessment Questionnaire (OARS; Duke University Center for the Study of Aging and Human Development, 1975), most participants (86.7 %) reported good or excellent health. Eight participants reported fair health and no participants reported their health as poor. Participants were monetarily compensated ten dollars for participation.

Participants were randomly assigned to one of three conditions (negative stereotype activation, positive stereotype activation, no stereotype activation/control,  $n = 20$  per group). Establishment of pre-experimental equivalence between conditions was achieved on all demographic variables (age, education, health, & marital status),  $F_s < 1$  and (race)  $\chi^2(2, N = 60) = 2.03$ ,  $p = .362$ . All participants were Caucasian except one who identified himself/herself as Native American.

Two measures of working memory were administered. The Backward Digit Span (BDS; Wechsler, 1955) test required participants to listen to and immediately recall in reverse order progressively longer sequences of single-digit numbers presented at the rate of 1-s. Participants received one practice trial followed by two trials of two, two trials of three, two trials of four, and so forth, up to a maximum of two trials of eight-digit sequences. Testing proceeded until two consecutive trials within a given sequence length were missed. The Size Judgment Span (SJS; Cherry & Park, 1993) test required participants to listen to progressively longer sequences of words. The words included in the SJS test were ones that can be easily visualized and differ with respect to physical size (e.g., frog, hairpin, piano). Participants were asked to recall the words in order of their physical size, from the smallest to the largest item (e.g., hairpin, frog, piano). Participants were given two practice trials followed by the presentation of three trials of two words, three trials of three words, three trials of four words, and so forth up to a maximum of three trials of eight words. Testing proceeded until three consecutive trials within a sequence length were missed. The working memory measures were scored by giving full credit to sequence levels in which two trials were correctly recalled, and half credit to sequences in which only one trial was correctly recalled. Participants in the three conditions did not differ in vocabulary or working memory (BDS, SJS) abilities pre-experimentally,  $F_s < 1$ . Participants also completed the Gardner and Monge (1977) 30-point Word Familiarity Survey. They chose a synonym for each given word from five choices. Participants were allotted one point for each correct choice for a total of 30 possible points. Group means for all demographic and individual difference measures can be found in Table 1.

## *Materials*

The following section outlines the behavioral measures that were used in the current research. Descriptions of each item, scaling information, and scoring information are reported.

*Domain identification.* A subscale of the Metamemory in Adulthood (MIA; Dixon & Hultsch, 1984) questionnaire was administered. The Memory Achievement (MIA-Ach) subscale consists of 16 items that assess how much value people place on their memory ability. Scores were measured on a 5-point Likert scale where 1 indicated *agree strongly* and a 5 indicated *disagree strongly*. Memory Achievement was scored by calculating mean ratings for each group.

*Stereotype Activation.* Four brief research-type reports (Hess et al., 2003) of aging and memory were used to activate stereotypes. Two of these articles discussed the maintenance of good memory skills throughout the age process, and two of the articles described marked declines in older adults' memory performance as compared with younger adults. There was a long and short article of each type. Article valence and length were both counterbalanced across all participants not in the neutral condition. These articles were adapted from Hess et al. (2003) in that they were changed to emphasize memory for intentions instead of focusing on memory for words (See Appendix A for articles).

*Filler Task.* Participants in the neutral condition were asked to complete a visual search task. Participants were provided with a highlighter, and a sheet of paper on which a variety of capital letters were randomly distributed. Participants were asked to locate

and highlight as many of the capital 'A's as they could find. Participants received four different sheets in all, subsequent sheets increased in density of letter distribution.

*Stereotype Activation Evaluation.* The stereotype activation evaluation task was derived from the manipulation check in Hess et al. (2003) with all personality-traits derived from Anderson (1968). This task was used to measure stereotype activation in the different stereotype conditions, positive, negative, and neutral. Participants were exposed to 54 word pairs. Each pair started with a prime word and ended with a trait term. There were 36 target pairs, which either started with the prime word *young* or the prime word *old*. Both *young* and *old* were paired with 9 different positive and 9 different negative traits. The remaining 18 word pairs began with the word *blank* or the word *none* and ended with a neutral trait term. Syllable length and frequency of the word in the English language was controlled (see Appendix B for lists of characteristics).

Participants were told that they were to ignore the prime word and, as quickly as possible, determine whether the second word was a good or bad characteristic. Participants were asked to focus on a fixation point in the middle of the computer screen. The prime word replaced the fixation point and was presented for 200ms before it was masked. The mask was then presented for 100ms after which time the trait term appeared and remained until participants made their response. Subsequent trials were presented 1500ms after participants' responses. Participants' responses were made using the keyboard where a right arrow key press indicated a good characteristic and a left arrow key indicated a bad characteristic. Mean reaction times for judging characteristics as good or bad were calculated for both young and old primes for all groups.



*Anxiety.* The 20-item STAI form Y-1 (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) contained statements that were used to assess state anxiety. Participants' answers to statements such as "I feel calm" and "I am tense" were rated on a 4-point scale, where 1 was *not at all* and 4 was *very much so*. Cronbach's alphas of .93 (males and females), .90 (for females), and .92 (for males) have been reported as reliability coefficients for working adults and adults ages 50-69, respectively. Mean anxiety ratings were calculated.

*Short-Term Memory Task.* Materials were presented on a Dell PC with a 17 in. monitor. The stimuli used in the STM task were 60 words drawn from Snodgrass and Vanderwart's (1980) word set. Participants were presented with word sets varying between 3 and 8 words. The length of presentation of the word lists was 1-s per word. Therefore, a list of five words was presented for 5-s. Prior to viewing a word list, participants saw a screen with the phrase "Prepare for trial." Subsequently, a word list was presented. Next, a screen appeared with the word "Recall," indicating participants were to then orally recall as many of the words as they could remember from the list they just studied. Participants saw a total of 36 trials broken into 6 blocks of 6 trials with a 15-s rest period between each block.

Recall scores for the STM task were scored in two ways. First, the proportion of perfect recall trials was calculated based on the number of trials in which the participant correctly recalled all of the words presented. Second, the average proportion of items correctly recalled across the 36 STM trials was calculated.

*Prospective Memory.* The prospective memory test was embedded within the STM task. For all participants, the target event was the word *boat*, and the correct

response to the target event was to press the F9 key. When participants saw the word *boat* on the screen as part of a word list, they were to press the F9 key on the computer keyboard.

The target word was presented six times throughout the short-term memory task, once in each block of six trials. Participants had six separate opportunities to correctly respond to the PM target. The presentation of *boat* was constrained to never appear in either the first or last trial of a block. Thus, the presentation of the word list in which *boat* appeared varied between trials two and five of the six trial block. Prospective memory performance was scored as the proportion correct out of six possible opportunities.

*Monitoring.* A four-item posttest questionnaire was used to assess participants' level of PM task monitoring across the STM trials. Participants used a 7-point Likert-type scale that indicated how often they thought about the prospective memory task during the different phases of the STM task (i.e., prepare for trial phase, word set phase, recall phase, rest phase). A 1 on the scale indicated that participants did not think about the task at all, whereas a 7 indicated they thought about the PM task all of the time during that phase of the experiment. Monitoring estimates obtained from the post-test questionnaire were scored by calculating mean ratings for each group across the four phases of the STM task.

*Strategy Assessment.* Participants were asked an open-ended question at the end of the experiment where they were given the opportunity to describe any strategies they used to remember the PM task. Of the participants who remembered to press F9, strategies were coded into eight different categories: 1) no strategy, 2) automatic

response, 3) rehearsal, 4) vigilance, 5) imagery, 6) association, 7) looked at key, 8) held finger over key. Percentages of participants who utilized the different strategies were calculated.

*Vision Test.* Participants were required to complete a vision test. Standing ten feet from the eye-chart, participants were asked to read subsequently smaller lines of letters. When participants failed to correctly identify all letters of a line, the task was stopped. Participants were then scored on the last line they correctly identified.

### *Procedure*

A week prior to coming to the lab, participants were mailed the MIA-Ach and the demographics sheet so they could bring them to the testing session already completed. This helped to decrease the length of their time in the laboratory and prevent fatigue.

Upon arriving at the laboratory participants were seated at a computer. Participants in the positive and negative conditions were presented with one of two positive or negative articles, respectively. The remaining third of participants made up the control group who did not read any articles. Participants were then read the instructions to the STM task. They were informed that they would be presented with short word lists. Their job was to study the words and then orally recall as many of the words as they could remember. Participants were then allotted three practice trials.

Once they had completed the three practice trials, participants were presented with the second article, the positive article in the positive condition or the negative article in the negative condition. Because participants in the neutral condition did not read an article, they engaged in a filler task to ensure equal overall testing times between

conditions. Following the second article, all participants completed the stereotype activation assessment and then the anxiety questionnaire.

Next, participants were informed of a secondary interest in their ability to remember to do something in the future. They were told they would be seeing a number of words on the computer throughout the experiment, and that when they saw the word *boat* on the screen they were to press the F9 key on the computer keyboard. After the PM instructions, participants were then reminded of the STM instructions and were allowed three more practice trials. Next, participants were asked to complete the vocabulary questionnaire. Immediately after the vocabulary questionnaire, the STM task began. Next, participants were asked to complete the monitoring measure, the strategy question, the BDS, the SJS, and the vision test. The experimental session concluded with debriefing.

## CHAPTER III

### ANALYSES

#### *Analyses*

*Overview of analysis plan.* Separate analyses of variance (ANOVAs) were conducted on all dependent measures as a function of condition (positive, neutral, or negative). Conditions were coded as 1 for positive, 2 for neutral, and 3 for negative. Variables correlated with stereotype threat condition were calculated using Kendall's tau. Intercorrelations among other dependent variables were calculated using Pearson Product Moment Correlations. Unless otherwise noted an alpha of .05 was used for determining significance. It was necessary to examine up to three decimal places for ANCOVA analyses of mediation to highlight differences in effect size. For consistency, all results have been reported to the third decimal place.

*Stereotype activation evaluation.* Reaction times for the stereotype activation evaluation task were recorded as the length of time it took for the participant to respond with a key press once the target word had appeared on the screen. Response times were eliminated if they were three standard deviations above or below an individual's mean for all responses. The result was the exclusion of .02% of the response times from analysis. A 3 (condition: positive, neutral, negative) x 2 (prime: young, old) x 2 (valence: positive, negative) split-plot ANOVA was conducted to compare the stereotype activation between groups. Condition was a between-subjects variable, and prime and valence were within-

subjects variables. It was hypothesized that participants in the positive condition would respond faster to positive characteristics following the *old* prime, and participants in the negative condition would respond faster to negative characteristics following the *old* prime. However, the main effect of condition was non-significant,  $F(2, 57) = 1.291, p = .283$ , partial  $\eta^2 = .043$ , observed power = .269. The main effect of valence was significant,  $F(1, 57) = 80.589, p < .001$ , partial  $\eta^2 = .586$ . The means indicated that participants responded faster to positive trait terms than to negative trait terms averaging across conditions. The main effect of prime was marginally significant,  $F(1, 57) = 3.197, p = .079$ , partial  $\eta^2 = .053$ , observed power = .420. The means indicated that participants were responding faster to traits following the prime word *old* relative to traits following the prime word *young* averaging across conditions. Contrary to hypotheses, all two-way interactions were non-significant,  $F_s < 1$ . Thus, there was no support for the interaction of prime and valence. More importantly, the hypothesized three-way interaction of condition-prime-valence was also non-significant,  $F = .617, p = .543$ , partial  $\eta^2 = .021$ , observed power = .148, which may have been due to an unsuccessful manipulation of stereotype threat. Mean reaction times for prime and valence within each condition can be found in Table 2.

*Aim one.* Separate one-way ANOVAs of condition (positive, neutral, negative) were conducted to examine the effects of stereotype threat on PM and STM performance. Participants in the three conditions did not differ on either PM or STM performance,  $F_s < 1$ . Group PM and STM performance means can be found in Table 3.

*Aim two.* Separate one-way ANOVAs of condition (positive, neutral, negative) were conducted on monitoring, anxiety, and strategy use. Between conditions, neither

monitoring [ $F(2, 57) = 1.589, p = .213$ ], anxiety [ $F(2, 57) = 1.917, p = .156$ ], nor strategy use ( $F < 1$ ) were significantly different. Pearson product-moment correlations were computed for monitoring, anxiety, and strategy use with PM and STM performance. Anxiety was not significantly correlated with either PM ( $r(60) = .091, p = .487$ ) or STM (proportion correct,  $r = -.113, p = .390$ ; proportion perfect,  $r = -.069, p = .602$ ) performance. However, as anticipated, a negative but non-significant relationship between anxiety and STM performance was observed. This non-significant relationship indicates that as anxiety increased, STM performance decreased. Monitoring was positively correlated with PM performance,  $r = .623, p < .001$ . Increases in monitoring resulted in increases in PM performance. All correlations involving strategy were conducted with strategy as a dichotomous variable. Participants either did not use a strategy<sup>1</sup> (coded as 0) or they did use a strategy (coded as 1). Strategy use was positively correlated with PM performance,  $r = .415, p = .001$ . As strategy use increased, so did PM performance. Monitoring and strategy use were positively correlated,  $r = .302, p = .019$ . As monitoring increased, strategy use also increased. A comprehensive list of correlations can be found in Table 4.

The responses to the strategy question of participants who remembered to press F9 in response to *boat* ( $n = 37$ ) were coded into eight different categories. The different categories and the percentage of participants who pressed F9 that employed them were as follows: 21.6% of participants claimed to use no strategy, 27% reported that pressing F9 was an automatic response to seeing boat, 13.5% used rehearsal to aid PM performance, 24.3% of participants utilized a vigilance strategy, 2.7% used imagery, 5.4% used

association, 2.7% looked at the F9 key, and 2.7% of participants held their finger over the F9 to key to aid memory performance.

Separate analyses of covariance (ANCOVAs) were conducted to assess the mediating effects of anxiety, strategy use, domain identification, and education on the relationship between stereotype threat and PM performance. Past research on the effects of domain identification in intelligence testing (Steele & Aronson, 1995) and education (Andreoletti & Lachman, 2004) in STM prompted us to investigate their effects on the relationship between stereotype threat and PM performance.

The following steps were adhered to in all four ANCOVA analyses. First, the relationship between stereotype threat condition and PM performance was established via a one-way ANOVA. Next, the bivariate correlation of stereotype threat condition and the potential mediating variable was calculated. Then, the bivariate correlation of the potential mediating variable and PM performance was calculated. Last, an ANCOVA analysis was conducted with the potential mediating variable as the co-variate.

As previously stated, the relationship between stereotype threat and PM performance was non-significant,  $F(2, 57) = .427, p = .655$ , partial  $\eta^2 = .015$ , observed power = .119. Nonetheless, ANCOVA analyses were still computed to establish the effects of the potential mediating variables on effect-size. With the exception of two, all bivariate correlations of potential mediating variables with stereotype threat and PM performance were non-significant. It is important to note that when correlations are non-significant, it is difficult to be confident in the sign of the coefficient and therefore the direction of the relationship between variables.



There was a negative relationship between anxiety and stereotype threat condition,  $\tau = -.221, p = .031$  and a positive but non-significant relationship between anxiety with PM performance  $r = .091, p = .487$ . As previously stated, conditions were set up as 1, 2, and 3 representing the positive, neutral and negative conditions, respectively. A negative relationship indicates more anxiety in the positive condition than the negative condition. A positive but non-significant relationship of anxiety and PM performance indicates that as anxiety increased, so did PM performance. With anxiety as the covariate, the result of the analysis was non-significant,  $F(2, 56) = .468, p = .629$ , partial  $\eta^2 = .016$ , observed power = .123. The observed significant relationship and the non-significant relationship are counterintuitive. It was expected that an increase in anxiety would be associated with an increase in stereotype threat. Also expected was that as anxiety decreased, performance on the PM task would improve. Review of analyses indicated that anxiety is potentially acting as a suppressor in the stereotype threat-PM performance relationship. This finding is inconsistent with our a-priori hypothesis regarding the influence of anxiety.

Strategy was treated as a dichotomous variable in the ANCOVA analysis: Participants either utilized a strategy or they did not. Participants who reported no using a strategy or said pressing F9 was an automatic response were deemed “no strategy.” All other participants were viewed as having engaged in a strategy. There was a negative but non-significant relationship of strategy use and stereotype threat condition,  $\tau = -.082, p = .506$ . A negative but non-significant relationship suggests more participants engaged in strategy use in the positive condition relative to the negative condition. However, strategy performance was significantly correlated with PM performance,  $r = .415, p =$

.001. As strategy increased, so did PM performance. The result of the analysis when strategy use was co-varied was,  $F(2, 56) = .494, p = .613$ , partial  $\eta^2 = .017$ , observed power = .127. The directionality of the non-significant relationship and correlation are consistent with expectations. Strategy use also appears to have a suppressing effect on the stereotype threat-PM relationship. However, this is to be expected, and was hypothesized.

Mediation analysis of domain identification did not necessitate a high-low dichotomy and was therefore treated as a continuous variable. Higher scores indicate high identification with memory and lower scores indicate low identification with memory. A positive but non-significant relationship existed between domain identification and stereotype threat,  $\tau = .019, p = .854$ , and a negative but non-significant relationship between domain identification and PM performance,  $r = -.114, p = .384$ . Thus, higher domain identification was reported in the negative condition and lower domain identification reported in the positive condition. The result of the ANCOVA analysis with domain identification as the covariate was,  $F(2, 56) = .407, p = .668$ , partial  $\eta^2 = .014$ , observed power = .113. Non-significant relationships of domain identification with stereotype threat and PM performance were expected under the framework of the current research. Domain identification seems to facilitate the relationship between stereotype threat and PM performance. Consistent with our hypothesized stereotype threat-domain identification interaction, the potential facilitative effect of domain identification is to be expected.

A positive but non-significant relationship existed between education and both stereotype threat,  $r = .102, p = .370$ , and PM performance,  $r = .041, p = .754$ . Higher

educational attainment was reported in the negative condition relative to the positive condition. Also, more education was associated with higher PM performance. Results of the ANCOVA with education co-varied were,  $F(2, 56) = .404, p = .670$ , partial  $\eta^2 = .014$ , observed power = .112. A positive but non-significant relationship between education and stereotype threat condition was not anticipated, but a positive but non-significant relationship between education and PM performance was expected. Education also appears to facilitate the relationship between stereotype threat and PM performance. However, the results of analyses did not concur with our expectations regarding the influence of education.

*Aim three.* A 3 (condition: positive, neutral, negative) x 2 (domain identification: high, low) ANOVA was conducted to assess the influence of domain identification on PM performance. The analysis yielded a significant condition-domain identification interaction,  $F(2, 54) = 3.591, p = .034$ , partial  $\eta^2 = .117$ . Neither of the main effects of condition or domain identification were significant,  $F_s < 1$ . Simple effects tests indicated that the interaction was produced by a significant difference between groups in PM performance scores in the positive condition,  $F(1, 54) = 6.35, p = .015$ . Thus, high identification participants performed significantly worse than ( $M = .258$ ) low identification participants ( $M = .741$ ) in the positive condition (see Figure 1). No differences between high and low domain identification were present in the control and negative conditions. Additional analyses were conducted in an attempt to better understand the effects of domain identification in the positive condition. Independent-samples  $t$ -tests revealed that there was no difference between high and low identified

participants' strategy use,  $t(18) = .772, p = .450$ , or anxiety,  $t(18) = -.653, p = .522$ , in the positive condition.

For correlational analyses, domain identification was treated as continuous. Correlations were also computed between domain identification and PM ( $r = -.114, p = .384$ ) and STM (proportion correct,  $r = .230, p = .077$ ; proportion perfect,  $r = .092, p = .487$ ) performance. No significant correlations were obtained, although positive but non-significant relationships were observed between domain identification and STM performance.

## CHAPTER IV

### DISCUSSION

The findings of the current research were as follows. First, no significant interactions were found in the analysis of the stereotype evaluation task data. However, a significant main effect of valence and a nearly significant main effect of prime were found. Aim one was not fulfilled in that PM and STM performance did not vary reliably across conditions. In terms of aim two, no differences in monitoring, anxiety, and strategy use were found between conditions. In addition, anxiety, strategy use, domain identification, and education did not significantly influence the relationship between stereotype threat condition and PM performance. However, high levels of monitoring and strategy use were associated with better PM performance. In aim three a significant interaction between condition and domain identification was uncovered.

#### *Stereotype Evaluation*

All two-way interactions were non-significant, as was the hypothesized three-way interaction. In light of these results, discussion of non-significant two-way interactions has been foregone and has been focused on the three-way interaction. Non-significance of the hypothesized condition-prime-valence interaction may be reflective of an ineffective manipulation of stereotype threat. Low salience of the stereotype threat manipulation could have contributed to the lack of threat experienced by participants in the negative condition. The procedure established in Hess et al. (2003) was not adhered

to exactly. Researchers in the current study could have put more emphasis on the articles in the respective conditions. Hess et al. (2003) prefaced article presentation with comments about how recent scientific evidence either contradicted or supported traditional views of memory and aging in the positive and negative conditions, respectively. However, Hess et al. (2004) found that an over-emphasis of threat resulted in the ability of older adults to counter the detrimental effects of stereotype threat on memory performance. In the present study, the articles were given to participants without the preface used in Hess et al. (2003). The lack of significant findings of the current study may have been due to the attempted induction of stereotype threat having been too subtle.

Additionally, participants may have questioned the validity of articles based upon their presentation. The text of the articles was in newspaper-like columns and in a newspaper-like font, but was presented on standard 8in x 11in white printer paper. It may have been that this type of presentation undermined the effectiveness of the manipulation of threat. Had it been possible to have the articles printed on newsprint, they may have seemed more legitimate and may have lead to a successful manipulation of stereotype threat.

An alternate explanation may be that inducing stereotype threat is not the issue. It may be a matter of offsetting preexisting negative stereotypic beliefs. In other words, instead of manipulating the induction of stereotype threat, perhaps researchers should be manipulating the induction of *stereotype rebound* - the countering of a widely accepted-as-fact negative stereotype. Perhaps presenting information countering the negative stereotype and increasing confidence in older adults regarding their memory abilities will

increase their memory performance. It may be that we were unable to induce stereotype rebound in our positive group. It appears that the significant condition-valence interaction reported in Hess et al. (2003) was influenced by the manipulation affecting the positive group rather than the neutral or negative conditions. Hess et al. (2003) reported that in the positive condition, responses were faster to positive traits and slower to negative traits relative to the control and negative conditions. Hess et al. (2003) posited that eliminating, or at least minimizing, threat-related factors optimizes older adults' memory performance. Future research is needed to determine whether stereotype threat or stereotype rebound influences memory performance among older adults.

Although no significant interactions were found, a significant main effect of valence and a nearly significant main effect of prime appeared. The means revealed that, across conditions, participants responded faster to positive trait terms relative to negative trait terms. This finding corroborates Hess et al. (2003) based on their reported reaction times. A potential explanation is found in the literature on emotion and aging. There is evidence that older adults experience less intensity of negative emotions (e.g., anger, sadness, fear) and some increase in positive emotions (e.g., happiness; Gross, Carstensen, Pasupathi, Tsai, Skorpen, & Hsu, 1997). Charles, Mather, and Carstensen (2003) reported that older adults remember less emotionally negative information relative to emotionally positive information. The combination of less emotional intensity in response to negative traits and a decrease in memory for emotionally negative information may explain longer response times to negative traits relative to positive traits obtained across conditions.

Related processes may lead to a viable explanation for the similarity of control and negative conditions in the current study and the condition-valence interaction observed in Hess et al. (2003). Older adults attend less to negative stimuli (Mather & Carstensen, 2003) and encode less information about a negative emotional experience at the beginning of that experience (Mather, Canli, English, Whitfield, Wais, Ochsner, et al., 2004). Our manipulation of stereotype threat required participants to read two research-type reports valenced according to condition. In light of Mather, et al. (2004), it may have been that soon after our older adult participants in the negative condition began to read, they reduced the amount of attention devoted to the articles because of the negativity associated with them. This lapse in attention may have reduced the amount of encoded information from the article, which may have significantly reduced the effectiveness of the manipulation in the negative condition. Thus, decreased attention to the articles in the negative condition may have lead to performance that was consistent with participants in the control condition who did not read any articles.

As previously stated, a nearly main effect of prime was encountered. The means indicated that participants were responding faster to words following the *old* prime relative to the *young* prime. This finding may lend support to the proposal in Hess et al. (2003) of a dominant negative aging stereotype. This disparity in response times may be due to in-group/out-group differentiation. Older adults have more complex schemas and are more familiar with their in-group (Branscombe, et al, 1993; Linville, 1982), older adults. This familiarity may account for the faster response times to trait terms following the *old* prime irrespective of valence. Banaji and Hardin (1996) found a similar effect



with respect to gender. Participants responded faster to words that matched their own gender relative to words not matching participants' gender.

An alternate explanation of the marginally significant main effect of prime may be found in connectionism. It has been suggested that links between nodes in a connectionist framework are weighted such that increased familiarity and typicality are weighted more heavily, that is to say more strongly associated or linked (Martindale, 1991). Under this assumption, it may be that traits connected to the node 'old' in older adults' neural networks are larger in number and stronger in connection relative to the network of traits connected to the node 'young'. Activation within the 'old' network would spread faster, which would lead to faster responses to all traits following the *old* prime relative to the *young* prime. This difference in response rates would result in a pattern of reaction times similar to those obtained in the current study.

It is important to note that the mean reaction times obtained from participants in the current research were all higher than those reported by Hess et al. (2003). The differences are mostly likely due to Hess et al. (2003) using voice-activation software to record response times instead of the key presses used in the current research. Interestingly, older adults' manual response times are typically faster than vocal response times (Baron & Journey, 1989). An exception to the finding is when memory demands are increased (Dooze & Feyereisen, 2004). Also, slower reaction times are indicative of conscious rather than automatic processing. It seems reasonable to suggest that either the rule governing response decisions taxed working memory, or conscious processing intervened. In the current study, participants were told that they were to determine whether the trait presented on the computer screen was a good or bad trait. It may be that

keeping the rule for responding to traits in working memory depleted cognitive resources and increased manual response times. Also, occasionally a participant would verbalize the phrase, “it depends.” This suggests that participants felt that the valence of individual traits may be contextually dependent. Forcing a good/bad decision may have led to higher manual response times because participants were contemplating trait valence in different situations. That is, the reaction times obtained in the current study could be reflective of conscious choice rather than automatic attitudes. In other words, the reaction times reported by our participants may not have been reflective of automatic attitudes.

#### *Aim one*

The analyses of aims one and two were dependent upon an effective manipulation of stereotype threat. Under ordinary circumstances, the analyses and subsequent discussion would have been omitted once it was discovered that the manipulation was unsuccessful. However, the present study represents the work of a master’s thesis. Therefore, analyses for aims one and two were conducted and discussed as initially planned for exploratory purposes.

Non-significant variation in PM and STM performance across conditions was not hypothesized but was not surprising given that stereotype threat was not effectively manipulated and that conditions were pre-experimentally equivalent on all individual difference measures. Given these two pieces of information, there was no reason to expect differences between conditions in PM or STM performance.

## *Aim Two*

It was expected a priori that anxiety and monitoring scores would vary across conditions such that lower anxiety and higher monitoring would be representative of the positive condition relative to the control and negative conditions. Strategy use was also hypothesized to reliably vary across conditions. High strategy use in the positive and neutral conditions and low strategy use in the negative condition was expected. However, upon consideration of the ineffective threat manipulation and the pre-experimental equivalence of conditions on individual difference measures, differences between conditions for both anxiety and monitoring were not anticipated.

While differences between conditions were not expected following preliminary analyses, it likely would have been difficult to invoke threat and anxiety in our highly educated sample because of a combination of beliefs about memory control (Lachman, Weaver, Bandura, Elliot, & Lewkowicz, 1992) and amount of education (Andreoletti & Lachman, 2004; Christensen, Korten, Jorm, Henderson, Jacomb, & Rodgers, 1997). Lachman et al. (1992) reported that memory scores were better when participants believed that memory declines were not inevitable. Participants who viewed memory functioning as controllable improved their memory ability from pre-test to post-test on a recognition and recall task. More highly educated participants believe that they can compensate for cognitive declines (Christensen et al., 1997) and show better memory performance than individuals with less education (Andreoletti & Lachman, 2004). Thus, it may be that our unusually well-educated sample of older adults reported less anxiety because they felt they were in control of their memory performance, or that their education would help to compensate for age-related memory declines.

Although strategy and monitoring did not differ between conditions, this research did uncover information about the relationships between strategy, monitoring, and PM that is relevant to a current debate within the field. McDaniel and Einstein (2000) posit that participants can rely on automatic retrieval to accomplish a PM task requiring focal processing. A PM task requiring focal processing is one in which the PM cue is a focal component of the on-going task. Conversely, a PM task requiring non-focal, or strategic, processing is one in which the PM cue is not highly related to the on-going activity. A PM task of this nature requires more resources to employ strategies to monitor for the PM cue. The PM paradigm adapted from Einstein and McDaniel (1990) used in the current study utilizes focal processing. It is a focal processing based PM task because the PM cue *boat* is embedded in the STM word sets that participants are to be memorizing. Due to the focal processing nature of our PM task, participants in all conditions may have been able to rely solely on automatic retrieval. Indirectly related to aim two, however, there were data collected in the current study that rival the assertions made by McDaniel and Einstein (2000) regarding focal processing and strategy use.

Given the information on focal and strategic processing in McDaniel and Einstein's (2000) multiprocess framework, minute correlations, if any, would be anticipated between monitoring and strategy use with PM performance. However, in the current study significant positive correlations between all three variables were obtained. As monitoring increased, so did strategy and PM performance, and increased strategy was associated with increased PM performance. See Table 4 for correlation values. These correlations indicate that regardless of the focal processing requirements of the PM task, older adults are still utilizing strategies to help monitor for the PM cue. These

results are in direct contrast to the focal processing aspect of McDaniel and Einstein's (2000) multiprocess framework especially when past research (Reese & Cherry, 2002, Einstein & McDaniel, 1990) has validated this particular PM task as requiring focal processing.

*ANCOVA results.* Two of the four variables influenced the stereotype threat-PM performance relationship in expected directions. The influences of the two remaining variables were in contrast to expectations. It appears that strategy use and domain identification influenced the stereotype threat-PM performance relationship in expected directions. When strategy use was controlled for, the magnitude of the effect between stereotype threat and PM performance was larger. The observed influence of domain identification in the current research corroborates Steele and Aronson (1995) in that when an individual highly identifies with the domain that is threatened, that individual's performance should be hampered. Co-varying domain identification diminished the size the effect of stereotype threat on PM performance.

Anxiety and education did not impact the relationship between stereotype threat and PM performance in way that were anticipated. It was expected that co-varying anxiety would lead to a decrease in the effect size of the relationship between stereotype threat and PM performance. However, an increase in effect size was obtained. It appears that anxiety was suppressing the relationship by decreasing the impact of stereotype threat on PM performance. When education was co-varied, the effect size was reduced. Thus, it may have been that participants with higher education felt more pressure to perform well, which is at odds with past research (Andreoletti & Lachman, 2004, Christensen et al., 1997).

As the obtained results indicate, the relationship between stereotype threat and PM performance is extremely complicated. There are many variables that may be exerting an influence and potentially in unpredictable manners. Very few studies have been published regarding the effects of stereotypes on memory performance in older adults (Andreoletti & Lachman, 2004; Hess et al., 2004; Hess et al., 2003; Levy, 1996). Thus, there is little evidence alluding to the magnitude of the impact of stereotype threat on older adults' memory performance. Much more research is needed to gain a further understanding of the multivariate relationship between stereotype threat and memory performance in older adults.

### *Aim Three*

The interaction of condition and domain identification was significant just as hypothesized. However, the direction of the interaction was unexpected and did not support Steele and Aronson (1995). Steele and Aronson reported that when in the presence of stereotype threat, individuals who highly identify with the threatened domain did not perform as well as individuals who are less identified with the threatened domain. Analyses in the current study revealed no differences between high and low identified participants in the control and negative conditions. There was, however, a difference in PM performance between high and low identified participants in the positive condition. This difference in performance in the positive condition is difficult to explain. It may be that high-domain participants became overconfident and felt they did not need to devote as much effort to monitoring or relied on automatic processes (McDaniel, Robinson-Riegler, & Einstein, 1998; Einstein & McDaniel, 1990) to identify the PM cue and complete the PM task. Follow up analyses revealed no difference between high and low

identified participants' strategy use or reported anxiety in the positive condition. Perhaps high identification individuals selected strategies to aid in performance but did not devote as much effort to employing them. Alternatively, it may be that low identified participants experienced what has been previously referred to as stereotype rebound. They were not as worried about performing well on the PM task because they do not view memory as a defining characteristic of self. However, perhaps when they read the positive manipulation they were encouraged that they could perform well in spite of the negative stereotype of memory and aging. Thus, low identification participants devoted more effort than they normally would have in order to perform well.

A second explanation opposing the previous account is also worth noting. In an attempt to better understand the underlying mechanisms of this effect, a correlation analysis was conducted to analyze the relationship between anxiety and domain identification in the positive group,  $r(20) = .203, p = .391$ . While not significant, the direction of the relationship may provide some insight. As domain identification increased, so did anxiety. This association may potentially explain why low identified participants performed significantly better than highly identified participants. The high identification participants were more anxious about performing well compared to low identification participants. That increase in anxiety may have consumed cognitive resources (Steele & Aronson, 1995) that were necessary to devote to strategic processes and monitoring. Hence, the result is significantly lower PM performance by highly identified participants compared to lower identified participants.

Regarding a majority of the results of the current study, two points are to be made. First, a substantially larger sample size may have been necessary to have detected

significant differences between conditions. The small sample size utilized in the current study limited the power necessary to identify significant differences between conditions. Second, the effect sizes for stereotype threat within different paradigms are unknown. Further, effect sizes for focal processing PM tasks are generally small. The average effect size between younger and older adults for the PM task used in the current study is .14 (Henry, MacLeod, Phillips, & Crawford, 2004). The small effect sizes of the variables the current study examined necessitate ample power for detection. Therefore, while a majority of the results in the current study were non-significant, the small estimates of observed power may be an appropriate explanation.

### *Implications*

While a majority of the expected results were not obtained, we have nonetheless gained a broader understanding of stereotype threat and its influence as a factor in older adults' PM and STM performance. It cannot be said that the current study has helped to validate stereotype threat as a true psychological phenomenon, and it may be that there are many unpublished studies that have evidence countering the existence of stereotype threat. Regardless, the current study has helped to determine how salient stereotype threat may need to be before it has an influence on the memory performance of older adults. Moreover, the current study has helped to further science in a replicatory fashion in addition to showing that stereotype threat requires more research attention.

Additionally, a broader understanding of the extraneous influences on PM has been attained, such that we have shown that monitoring and strategy use have an impact on successful PM performance. Further, the current study has help to pave the way to understanding more about the size of the effects that those extraneous variables have on



PM performance in a stereotype threat framework. To date, no other research has presented the effect sizes of potential mediating variables on the stereotype threat-PM performance relationship. Importantly, our findings substantiate the necessity of conducting more research to completely understand PM.

From a practical perspective, PM is important in everyday life and for older adults' independent living. With older adults' necessity to self-administer, sometimes multiple, medications at different times of day, understanding the mechanisms that are linked to successful prospective memory performance is invaluable. This research has improved our understanding of the prospective memory errors experienced by older adults in that reducing anxiety about memory ability may decrease the overall number of errors. Further, being educated about one's ability to control memory performance may also alleviate a portion of PM errors. Further, extremely high identification with the domain of memory may be counterproductive for older adults' PM success. These results have helped to lay the groundwork for future research on the influences of stereotype threat on older adults' PM performance. That is, future research should be directed towards studying contextual factors that contribute to documented age-related memory declines.

#### *Future Directions*

Age-related differences found in the laboratory may be exaggerated due to an influence of stereotype threat. The current research was unable to elucidate on age-related differences being inflated by stereotype threat. However, our findings suggest that more research is needed to determine whether performance differences between younger and older adults on a number of tasks may be exaggerated due to laboratory-

based paradigms. Further, it is important for future research to include more educationally diverse samples to examine stereotype. A future line of research should examine the effects of a more salient threat manipulation with a more diversely educated sample to see if, and when, the buffer effect of education on memory breaks down. Researchers should continue to manipulate the salience of stereotype threat to determine the effects, if any, that different levels of threat have on older adults' task performance in laboratory settings. Moreover, researchers should endeavor to understand whether it is stereotype threat or stereotype rebound that is driving the performance differences reported in the literature.

An additional line of research should examine the effects of strategy use and monitoring on focal processing tasks. Are strategies and higher levels of monitoring still being made use of by older adults in PM tasks requiring focal processing? Our research suggests that they are. Researchers need to examine PM performance differences when participants are using strategies and increased monitoring relative to automatic or involuntary retrieval on focal processing tasks. Research also needs to be directed toward the impact of stereotype threat on performance on a focal processing PM task. This is especially important since focal processing is thought to draw upon minimal cognitive resources. These are just a few of the questions that need to be addressed in this area of PM.

One last line of research needs to be devoted to understanding more about the interaction of anxiety, domain identification, and PM performance. Researchers should look at the potential of highly identified individuals experiencing more anxiety due to a pressure to perform well. The counterintuitive results obtained in the current study - low

identification participants outperforming high identification participants in the positive condition - suggest that truly understanding PM may lie in the interaction of these three variables.

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## FOOTNOTES

<sup>1</sup>Not using a strategy and relying on automatic processes to remember to press F9 were coded as no strategy because automatic processing requires minimal cognitive resources. An automatic response is an involuntary response; hence, participants who indicated reliance on automatic processes were assumed to not have used a strategy.

## APPENDIXES

APPENDIX A

STEREOTYPE ACTIVATION ARTICLES



## NEGATIVE ARTICLES

### Science Notes

#### Memory for Intentions Lost in Old Age

Palo Alto (AP). In a study published in the journal *Nature*, scientists working at Harvard Medical School have found an interesting explanation for the stereotypical decline in memory as people age. “We have known for a long time that older adults don’t remember certain things like names or dates as well as they did when they were young” says Harvard professor Dr. William Lutz, “and older adults are particularly poor at remembering intentions.” Dr. Lutz explains that older adults tend to remember fewer appointments and upcoming activities than their younger counterparts, and have thus lost many useful memory skills as they aged.

Interestingly, there is even evidence that the parts of the brain that deal with remembering intentions are poorly developed in older adults when compared to younger adults. Using a technique called fMRI (Functional Magnetic Resonance Imaging), Dr. Lutz and his colleagues viewed a region of the brain called the frontal lobe, which is thought to be partially responsible for the ability to carry out intentions. Dr. Lutz found that the frontal lobe is considerably smaller in older adults than in young adults. And more importantly, when asked to perform future actions, this area in older adult brains was 25% less active. “The missing tissue in older adults’ brains is consistent with the very poor memory for intentions observed in older adults.”

These findings shed new light on the long-standing debate between those scholars who have argued that the brain simply declines in old age, and those who have argued that at least some memory skills are spared. “I hope that the Harvard [Medical School] data can finally close the book on this debate” says Stanford researcher Penny Delong, “Now we know that it’s just a fact of nature. Our brains deteriorate as we age, and as a result, so does our memory.”

## Research: Aging is Linked to Memory Problems

(Associated Press). The negative stereotype about old age in American society is associated with a variety of things, not the least of which is a failing memory. Psychologists are quick to point out that stereotypes are often based in misconceptions. Unfortunately, an increasing number of research findings are strongly suggesting that this one is based in fact. A recent study by psychologists Sandra Dawson and Andrea Long at Harvard University demonstrates this point quite clearly.

“We were interested in finding out how aging affects the memory performance of people in our country,” said Dr. Long. “Our belief was that age differences in memory skills were not as pervasive as we are led to believe. We especially thought that this would be true in today’s society, where older adults are healthier than ever before.”

Dawson and Long tested their ideas by comparing the memory abilities of young and older adults on a series of tests that examined many different aspects of memory. Much previous research had shown that age differences existed in almost every type of remembering situation. These researchers felt, however, that some of these findings were dated.

“We were extremely discouraged by our findings,” said Dr. Dawson. “Contrary to our expectations, we found age differences that were just as strong as those observed thirty years ago.”

The researchers examined memory for a variety of things, such as faces and carrying out planned activities. The older adults in their sample, who ranged in age from 59 to 91, remembered less on average of every type of material than did younger adults, aged 15 to 30. Dawson and Long were not necessarily surprised that they observed older adults having memory problems. They were surprised, however, at the apparently pervasive nature of these problems.

“Unfortunately, our findings reinforce the inevitability of aging-related memory loss,” noted Dr. Long. “The fact that we continue to observe age differences in the current population suggests that historical changes in health practices have not had much of an impact on memory functioning. This suggests that memory problems may be based in biologically based aging processes that are relatively immune to interventions.”

Although findings such as these only reinforce our mostly negative conceptions of the effects of aging on mental abilities, these researchers note that this does not necessarily imply that older adults are unable to function in everyday life. They suggest, however, that in order to maintain adequate levels of functioning, older adults may have to increasingly depend upon the help of memory tools (e.g., notes, prescription organizers) as well as friends and family.

## POSITIVE ARTICLES

### Science Notes

#### Memory for Intentions Spared in Old Age

Palo Alto (AP). In a study published in the journal *Nature*, scientists working at Harvard Medical School have found an interesting explanation for the stereotypical decline in memory as people age. “We have known for a long time that older adults don’t remember certain things like names or dates as well as they did when they were young” says Harvard professor Dr. William Lutz, “but older adults tend to be very good at remembering intentions.” Dr. Lutz explains that older adults have had much more experience with remembering appointments and upcoming events than their younger counterparts, and have gained useful memory skills that do not decline with age.

Interestingly, there is even evidence that the parts of the brain that deal with remembering intentions are better developed in older adults than in younger adults. Using a technique called fMRI (Functional Magnetic Resonance Imaging), Dr. Lutz and his colleagues viewed a region of the brain called the frontal lobe, which is thought to be partially responsible for memory for intentions. Dr. Lutz found that the frontal lobe is considerably larger in older adults than in young adults. And more importantly, when asked to perform future actions, this area in older adult brains was 25% more active. “The extra tissue in this area of older adults’ brains is consistent with the excellent memory for intentions observed in older adults.”

These findings shed new light on the long-standing debate between those scholars who have argued that the brain simply declines in old age, and those who have argued that at least some memory skills are spared. “I hope that the Harvard [Medical School] data can finally close the book on this debate” says Stanford researcher Penny Delong, “Now we know that it’s just a fact of nature. Some cognitive skills such as memory for intentions are spared, and may even increase as we age.”

## Positive Outlook on Aging and Memory

(Associated Press). A recent study by researchers at Harvard University has shed new light on the factors associated with memory changes associated with aging. Psychologists Sandra Dawson and Andrea Long have proposed that culturally determined beliefs about aging may have an important effect on the prevalence of memory problems in later life.

“Widespread beliefs about the inevitability of memory decline is common in some cultures, but not in others,” said Professor Long. “The interesting implication of this view is that members of cultures with positive beliefs regarding aging may actually have memory skills that equal or exceed those of younger members of that culture.”

Dawson and Long tested the impact of culture by comparing the memory abilities of young and older adults in the Peoples Republic of China. The Chinese culture has a long tradition of honoring their old people. In the 2000 years preceding 1949, the Chinese government officially endorsed the practice of ancestor worship and respect for the old. Interestingly, the Communist Revolution in China has actually strengthened rather than weakened these traditional views of old age. The researchers reasoned that these positive views should be translated into superior memory performance by older adults in China.

Their findings were very supportive of their hypothesis. Using a variety of memory tasks, including memory for faces and carrying out planned activities, Dawson and Long found that older adults aged 59 to 91 performed at the same level as younger adults aged 15 to 30. Interestingly, they also found that, regardless of age, these Chinese citizens had very positive views about aging and old age.

“We were extremely encouraged by our findings,” said Dawson. “They provide strong support for the idea that memory loss is not an inevitable aspect of old age.” She notes that there is most certainly a causal link between how a culture views and treats its older citizens, and memory performance.

“If you live in a culture that views old age as being necessarily associated with memory decline, and everyone around you expects to see you having memory problems, then you will most likely behave in a way consistent with these expectations,” Long noted.

Findings such as these continue to damage our mostly negative conceptions of the effects of aging on mental abilities. Rather than supporting the view that biological changes lead to inevitable losses, these findings suggest that the degree of memory loss is to a certain extent dependent upon the environment.

APPENDIX B  
TRAITS USED IN THE STEREOTYPE ACTIVATION  
EVALUATION TASK

POSITIVE

SINCERE  
UNDERSTANDING  
TRUTHFUL  
INTELLIGENT  
OPEN-MINDED  
WISE  
GOOD-NATURED  
CHEERFUL  
EARNEST

HONEST  
LOYAL  
TRUSTWORTHY  
DEPENDABLE  
THOUGHTFUL  
CONSIDERATE  
RELIABLE  
WARM  
RESPONSIBLE

NEUTRAL

RESTLESS  
SOLEMN  
ORDINARY  
EXTRAVAGANT  
CONVINCING  
SENSITIVE  
AVERAGE  
ECCENTRIC  
DELIBERATE

CHOOSY  
IMPRESSIONABLE  
SKEPTICAL  
DISCIPLINED  
NORMAL  
CAUTIOUS  
DAYDREAMER  
TOUGH  
CONVENTIONAL

NEGATIVE

NARROW-MINDED  
PESSIMISTIC  
GLOOMY  
DISAGREEABLE  
COMPLAINING  
INTOLERANT  
SELFISH  
COLD  
WEAK

ANNOYING  
HELPLESS  
IRRATIONAL  
GROUCHY  
BORING  
IRRITATING  
HUMORLESS  
UNFRIENDLY  
CRITICAL

## APPENDIX C

IRB

Oklahoma State University Institutional Review Board

Date: Friday, March 04, 2005  
IRB Application No AS0551  
Proposal Title: Reading Comprehension and Measures of Memory

Reviewed and Expedited  
Processed as:

**Status Recommended by Reviewer(s): Approved Protocol Expires: 3/3/2006**

Principal Investigator(s)

Terrence Kominsky	Celinda Reese
215 N. Murray	215 N. Murray
Stillwater, OK 74078	Stillwater, OK 74078

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The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 415 Whitehurst (phone: 405-744-5700, emct@okstate.edu).

Sincerely,



Sue C. Jacobs, Chair  
Institutional Review Board



Table 1

*Demographic and Health Information*

	Condition			Total
	Positive	Neutral	Negative	
Age				
<i>M</i>	77.50	74.05	76.00	75.85
<i>SD</i>	9.34	7.93	6.59	8.02
Vocabulary				
<i>M</i>	19.60	19.75	19.95	19.77
<i>SD</i>	7.12	5.96	4.65	5.90
Health at present time <sup>a</sup>				
<i>M</i>	1.85	1.85	1.80	1.83
<i>SD</i>	.59	.75	.62	.64
Health prevents activities <sup>b</sup>				
<i>M</i>	1.70	1.65	1.55	1.63
<i>SD</i>	.57	.50	.61	.55
Health compared to others <sup>c</sup>				
<i>M</i>	1.25	1.25	1.25	1.25
<i>SD</i>	.44	.44	.44	.44
Years of Education <sup>d</sup>				
<i>M</i>	5.80	5.95	6.20	5.98

<i>SD</i>	1.32	1.00	.95	1.10
Backward Digit Span <sup>e</sup>				
<i>M</i>	3.98	4.28	4.15	4.13
<i>SD</i>	1.05	1.20	.82	1.02
Size Judgment Span <sup>f</sup>				
<i>M</i>	3.68	3.93	3.90	3.83
<i>SD</i>	.59	.77	.72	.69

---

Note.  $n = 60$ , 20 per condition. <sup>a</sup>Health at the present time on a 4-point Likert Scale (1 = *excellent* to 4 = *poor*). <sup>b</sup>Health prevents activities (1 = *not at all* to 3 = *a great deal*). <sup>c</sup>Health compared to others (1 = *better* to 3 = *poorer*). <sup>d</sup>Years of education (1 = *less than 7<sup>th</sup>*, 2 = *7<sup>th</sup> to 9<sup>th</sup> grade*, 3 = *10<sup>th</sup> to 11<sup>th</sup> grade*, 4 = *high school degree*, 5 = *partial college or specialized training*, 6 = *college degree*, 7 = *graduate degree*). <sup>e,f</sup>Measures of working memory. Scores range from 2 to 8.

Table 2

*Mean Response Times (in Milliseconds) for Positive and Negative Traits Across Prime and Stereotype Conditions*

Condition	Young Prime		Old Prime	
	Positive Traits	Negative Traits	Positive Traits	Negative Traits
Positive				
<i>M</i>	1458	1808	1444	1699
<i>SD</i>	500	716	570	519
Neutral				
<i>M</i>	1201	1596	1205	1474
<i>SD</i>	384	665	442	558
Negative				
<i>M</i>	1326	1580	1273	1570
<i>SD</i>	510	427	327	459

Note. *n* = 60, 20 per condition.

Table 3

*Mean Retrospective and Prospective Memory Performance*

Dependent Measures	Condition			Total
	Positive	Neutral	Negative	
Prospective Memory				
<i>M</i>	.48	.61	.55	.54
<i>SD</i>	.49	.44	.44	.45
STM Proportion Correct				
<i>M</i>	.68	.69	.72	.70
<i>SD</i>	.11	.08	.08	.09
STM Proportion Perfect				
<i>M</i>	.30	.28	.32	.30
<i>SD</i>	.13	.11	.11	.11

Note.  $n = 60$ , 20 per condition.

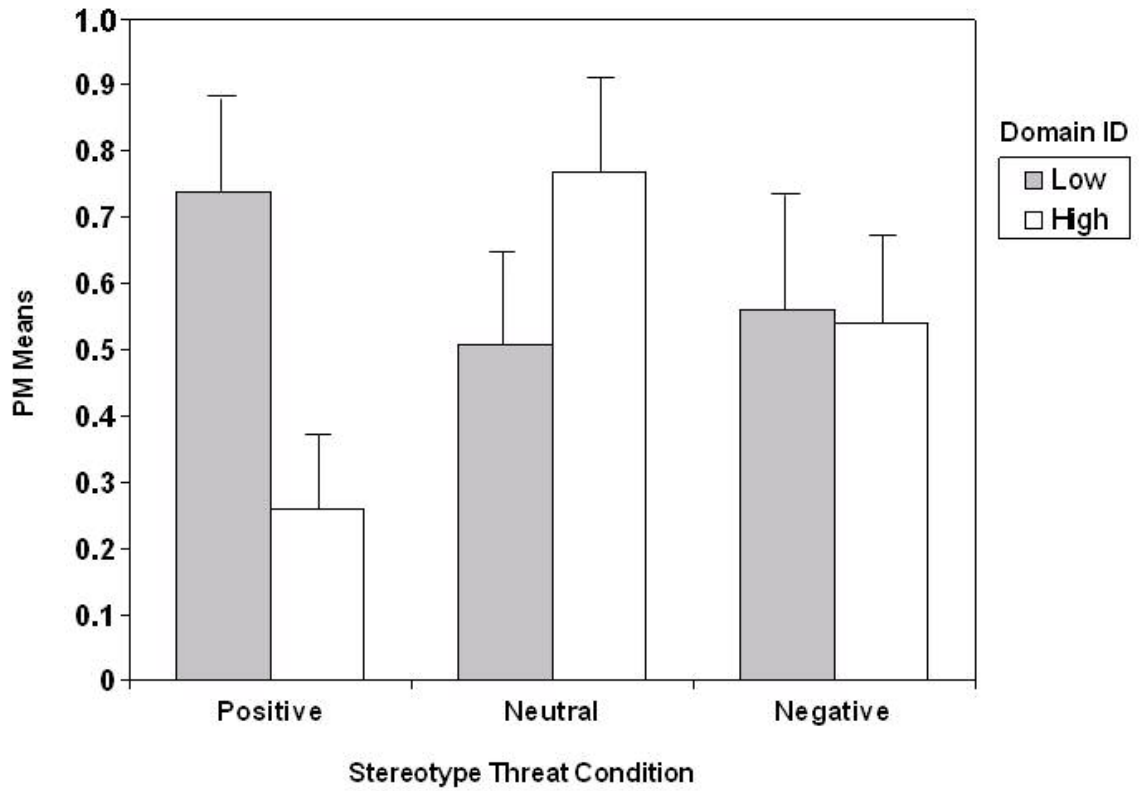
Table 4

*Bivariate Correlations Among Measured Variables (n=60)*

	ST Threat	Monitoring	Anxiety	Strategy Use	Education	Domain ID	PM Perform	STMpc	STMpp
ST Threat	-	.083 <sup>a</sup>	-.221 <sup>*a</sup>	-.082 <sup>a</sup>	.102 <sup>a</sup>	.019 <sup>a</sup>	.033 <sup>a</sup>	.114 <sup>a</sup>	.078 <sup>a</sup>
Monitoring		-	.092	.302 <sup>*</sup>	.006	.010	.623 <sup>**</sup>	.228	.188
Anxiety			-	-.080	-.165	.108	.091	-.113	-.069
Strategy Use				-	.011	.114	.415 <sup>**</sup>	-.137	.069
Education					-	-.004	.041	.128	.145
Domain ID						-	-.114	.230	.092
PM Perform							-	.334 <sup>**</sup>	.330 <sup>*</sup>
STMpc								-	.908 <sup>**</sup>
STMpp									-

Note. \* $p < .05$ , \*\* $p < .01$ . <sup>a</sup> Computed using Kendall's tau.

Figure 1



PM Proportion Scores for High and Low Domain Identification Groups Across Stereotype Threat Condition. Bars provide s.e.m. estimates per group.

VITA

Terrence Kerry Kominsky

Candidate for the Degree of

Master of Science

Thesis: THE EFFECTS OF STEREOTYPE THREAT ON OLDER ADULTS'

PROSPECTIVE MEMORY PERFORMANCE

Major Field: Experimental Psychology

Biographical:

Personal Data: Born in Salt Lake City, Utah, on November 9, 1980, the son of Larry and RaeAnn Kominsky.

Education: Graduated from Kemmerer High School, Kemmerer, Wyoming, in May 1999; received Bachelor of Arts degree in Psychology from University of Sioux Falls, Sioux Falls, South Dakota in May 2003. Completed the requirements for the Master of Science degree with a major in Experimental Psychology at Oklahoma State University in December, 2005.

Name: Terrence Kerry Kominsky

Date of Degree: December, 2005

Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: THE EFFECTS OF STEREOTYPE THREAT ON OLDER ADULTS'  
PROSPECTIVE MEMORY PERFORMANCE

Pages in Study: 87

Candidate for the Degree of Masters of Science

Major Field: Experimental Psychology

Scope and Method of Study: The purpose of this study was to examine the impact of stereotype threat on the prospective memory (PM) performance of older adults. Participants were randomly assigned to one of the following stereotype threat conditions: positive, neutral, or negative. Participants in the positive and negative conditions read articles that depicted either positive or negative aspects of memory and aging. Participants then completed a short-term memory task in which the PM task was embedded.

Findings and Conclusions: Articles did not appear to have an impact on STM or PM performance. However, a significant domain identification-stereotype threat condition interaction was found for PM performance. The interaction was driven by low identification participants performing significantly better ( $M = .74$ ) than high identification participants ( $M = .26$ ) in the positive condition. Successful stereotype threat induction may depend on the salience of the threat. The study of memory and aging needs to include contextual influences that affect memory performance.

ADVISORS APPROVAL: Dr. Celinda M. Reese