BRIEF REPORTS

Age-Related Variation in the Influences of Aging Stereotypes on Memory in Adulthood

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Adults 24–86 years of age read positive or negative information about aging and memory prior to a memory test. The impact of this information on recall performance varied with age. Performance in the youngest and oldest participants was minimally affected by stereotype activation. Adults in their 60s exhibited weak effects consistent with the operation of stereotype threat, whereas middle-age adults exhibited a contrast effect in memory performance, suggestive of stereotype lift. Beliefs about aging and memory were also affected by stereotypic information, and older adults’ changed beliefs were more important in predicting performance than was exposure to stereotype-based information alone.

Keywords: aging, memory, stereotypes, stereotype threat

It is increasingly evident that adult age differences in memory need to be understood from a contextual perspective in which both intrapersonal and interindividual variations in performance are considered within the context of multiple normative and nonnormative influences (Hess, 2005). One specific set of influences relates to culturally shared stereotypes about aging, which have been investigated in terms of self-stereotype effects on memory. This research has shown that older adults’ memory performance can be affected through implicit and explicit situational cues that serve to activate aging stereotypes (for a review, see Hess, 2006).

In the present study, we investigated such effects within the stereotype-threat framework (Steele, Spencer, & Aronson, 2002). This framework proposes that stereotypes have a detrimental influence on performance when individuals are put into situations in which their behavior has the potential of reinforcing a negative stereotype about a group to which they belong. These effects are assumed to be greatest in situations in which the diagnosticity of the test with respect to the stereotyped ability is high and when the members of the stigmatized group value this ability. Research on aging has provided evidence for the operation of stereotype threat in studies that have manipulated either the diagnosticity of the memory task (Hess, Hinson, & Statham, 2004; Rahhal, Hasher, & Colcombe, 2001) or cues designed to highlight negative aging stereotypes (Hess, Auman, Colcombe, & Rahhal, 2003). Consistent with propositions regarding stereotype threat, the observed effects were specific to the stereotyped group and were greater in those older adults who most valued their memory ability. Note, however, that other studies have found less consistent effects (e.g., Andreoletti & Lachman, 2004; Chasteen, Bhattacharyya, Horhota, Tam, & Hasher, 2005). In addition, the mechanisms mediating such effects are unclear at present.

We designed this study to extend our understanding of stereotype threat and aging using a procedure similar to that used by Hess et al. (2003). Three issues were of interest in the present case. First, we included an age range that extended from young adulthood into old age. In addition to replicating previous findings with young and older adults, we were interested in stereotype effects at midlife, which we thought might be opposite to the threat-based effects in later life. Specifically, the impending relevance of old age for middle-age adults might result in downward social comparison processes that emphasize the dissimilarity between them and their older counterparts, resulting in stereotype lift (Walton & Cohen, 2003) and associated performance benefits based on the presumed elevation of self-efficacy or worth.

A second goal was to explore the role of various mechanisms underlying stereotype-based effects, including strategy use and emotional responses. With respect to the latter, we assessed several general and domain-specific indicators of phenomenological mechanisms hypothesized to mediate threat by disrupting resource availability. On the basis of recent work by Cadinu, Maass, Rosabianca, and Kiesner (2005), we hypothesized that domain-specific measures that tap into the worry component of anxiety would be the most powerful mediators of threat effects on performance. Finally, we examined the degree to which the value placed on one’s memory ability and heightened concerns about aging made people more vulnerable to stereotype-based cues, thereby exacerbating threat effects.

Method

Participants

A total of 162 adults (89 women, 73 men; mean age = 55.6 years, range = 24–86) were recruited from the community through newspaper advertisements and were paid $20 for their participation. The participants were distributed relatively evenly over the age range tested.
Materials and Procedure

Prior to coming into the laboratory, participants received an envelope in the mail that contained (a) a background questionnaire, (b) the SF-36 Health Survey (Ware, 1993), (c) the Metamemory in Adulthood Questionnaire (MIA-Ach; Dixon & Hultsch, 1984), (d) the Memory Controllability Inventory (MCI) and Aging Concerns Scale (ACS; Lachman, Bandura, Weaver, & Elliott, 1995), and (e) a nine-item questionnaire comprising items identified as indicators of anxiety about aging (Lasher & Faulkender, 1993; Lynch, 2000). MIA-Ach scores were used as indices of the value placed on one’s memory ability and had previously been shown to moderate stereotype threat effects (Hess et al., 2003). We thought that responses to the MCI and ACS, which assess things such as the degree to which people believe that aging-related decrements in performance are inevitable or that the probability of their getting Alzheimer’s disease is high, could be reflections of worry about memory.

Participants were randomly assigned to either the positive or negative condition. The testing procedure was similar to that used by Hess et al. (2003). Briefly, participants read two news articles that either contradicted (positive condition) or supported (negative condition) stereotypical views of aging and memory. After reading the first article, they were informed that there would be a memory test later. After reading the second article, participants completed a four-item evaluation apprehension questionnaire (Spencer, Steele, & Quinn, 1999) and the short form of the State Anxiety subscale of the State–Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). These were thought to assess general emotional responses to the test situation. The memory task was then described, and participants predicted how many words they would be able to recall. Participants were given 2 min to study a list of 30 words (five words from each of six semantic categories), and then they wrote down all the words that they could remember. Participants again completed the MCI and ACS and were debriefed. Several additional ability tests were then administered, including the Vocabulary Test II (Parts 1 and 2) from the Kit of Factor-Referenced Tests (Ekstrom, French, Harman, & Derman, 1976).

Results

The basic analysis used was an Age × Condition general-linear-model-based analysis of variance (ANOVA), with age treated as a continuous variable and centered through standardization. Quadratic and cubic effects of age were also examined along with their interactions with condition. Because our major interest was in the differential impact of stereotype condition across ages independent of general cognitive skill, we used a composite ability measure (i.e., mean of the standardized scores for the Letter–Number Sequencing Task of the Wechsler Adult Intelligence Scale—Third Edition [Wechsler, 1997] and letter/pattern comparison tasks [Saltzhouse & Coon, 1994]) as a covariate in all analyses.

Memory

Our primary variable of interest was the proportion of words correctly recalled. Analysis of these data revealed two significant interactions: Age_linear × Condition, $F(1, 153) = 5.15, p = .03$, $\eta_p^2 = .03$, and Age_cubic × Condition, $F(1, 153) = 4.73, p = .03$, $\eta_p^2 = .03$. Separate analyses conducted within conditions revealed a significant cubic effect of age in the positive condition, $F(1, 77) = 4.77, p = .02$, whereas in the negative condition, the linear component of age was significant, $F(1, 77) = 5.43, p = .02$, and the quadratic effect just missed significance, $F(1, 77) = 3.65, p = .06$. We further examined these data in two different ways. First, predicted recall scores were calculated at representative points of the age distribution: the mean and 0.75 and 1.5 standard deviations above and below, which corresponded roughly to ages 31, 43, 56, 68, and 80 years. As can be seen in Table 1, the two largest differences between conditions were at 43 and 68 years of age. At the former age, recall was significantly higher in the negative than in the positive condition, reflecting a contrast effect in performance. In comparison, the trend was in the hypothesized opposite direction at 68 years of age, but the difference was not significant. Following procedures outlined by Jaccard, Turrisi, and Wan (1990), we also examined linear trends in each condition at each of these ages to identify the impact of the two types of stereotype-related information on performance. In the positive condition, a significant negative linear effect was evident at 31 years of age ($B = -0.16, p = .02$) and then again at 80 years of age ($B = -0.24, p = .02$). In other words, there was some decline initially but relative stability until late in life. In the negative condition, the only significant decline was observed at 68 years of age ($B = -0.07, p = .05$).

Moderators of Threat

Neither MIA-Ach scores nor anxiety about aging moderated the stereotype effects on memory performance. The null finding for MIA-Ach scores contrasts with previous results by Hess et al. (2003) and may reflect the fact that the oldest third of the sample in general placed relatively high value on their memory ($M = 63.6$; possible range $= 16–80$).

Threat-Based Mechanisms

We next examined potential mechanisms underlying stereotype-based effects. Neither of our general measures of emotional response—state anxiety, evaluation apprehension—was affected by our stereotype manipulation. In contrast, both of our domain-specific measures (i.e., MCI and ACS) were affected. A multivariate analysis of variance conducted on the four MCI subscale scores revealed a significant Condition × Time (pretest vs. posttest) interaction, $F(4, 152) = 8.95, p < .001$, $\eta_p^2 = .19$. The same interaction was also significant for the two ACS subscale scores, $F(2, 150) = 5.51, p = .01$, $\eta_p^2 = .07$. Although univariate ANOVAs revealed slight variations across subscales, these interactions reflected the fact that controllability beliefs increased and aging-related concerns decreased from pretest to posttest in the

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Recall Clustering</th>
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<tbody>
<tr>
<td></td>
<td>Positive</td>
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<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>31</td>
<td>.60 (.04)</td>
</tr>
<tr>
<td>43</td>
<td>.55 (.03)</td>
</tr>
<tr>
<td>56</td>
<td>.57 (.03)</td>
</tr>
<tr>
<td>68</td>
<td>.59 (.03)</td>
</tr>
<tr>
<td>80</td>
<td>.48 (.06)</td>
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</tbody>
</table>

Note. Standard errors in parentheses.

* $p < .05$ (condition effect significant).
positive condition, whereas the opposite pattern was observed in the negative condition (see Table 2). This interaction was moderated by age for the ACS scores, $F(2, 150) = 3.23, p = .04, \eta^2_g = .04$, because of the interaction being somewhat stronger in the oldest participants.

Strategy use was indexed by the adjusted ratio of clustering (ARC; Roenker, Thompson, & Brown, 1971). An ANOVA on these scores revealed significant effects due to agequad, $F(1, 155) = 4.99, p = .03, \eta^2_g = .03$, and its interaction with condition, $F(1, 155) = 4.16, p = .04, \eta^2_g = .03$. The pattern of ARC scores was somewhat similar to that for recall, with the only significant condition effect, however, obtained at the oldest age point (see Table 1).

Given the complexity of the observed relationships involving both memory and these potential mediators, traditional mediation analyses seemed unfeasible because the strength of the proposed mechanisms could vary by age. For example, elevated aging concerns might have very different outcomes on the young versus those who are already old. Thus, we decided to perform analyses of recall in which our hypothesized mediators were entered as moderator variables (ARC scores and change scores [pretest–posttest] for the six MCI and ACS subscales).

Significant effects were only found for three of these variables. A significant three-way interaction was obtained between agequad, condition, and MCI Present Ability subscale change scores, $F(1, 143) = 5.24, p = .02, \eta^2_g = .04$, and Agecubic × Change, $F(1, 143) = 5.47, p = .02, \eta^2_g = .04$, interactions were also obtained, with the Agequad × Change interaction approaching significance, $F(1, 143) = 3.78, p = .054, \eta^2_g = .03$. Calculating predicted recall scores for change scores plus or minus one standard deviation from the sample mean at our five representative age points (see Table 3, bottom) revealed that lower recall was associated with belief decrements at all but the oldest point, but the effect was only significant at 68 years of age. Comparisons of these scores with those in Table 1 suggest that the strength of this effect in the young–old group is stronger when performance is examined in relation to beliefs than when it is examined in relation to condition.

### Table 2

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Positive</th>
<th></th>
<th></th>
<th>Negative</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
<td>Pretest</td>
<td>Posttest</td>
<td></td>
</tr>
<tr>
<td>Memory Controllability Inventory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present Ability</td>
<td>5.44 (0.12)</td>
<td>5.38 (0.12)</td>
<td>5.58 (0.12)</td>
<td>5.16 (0.12)</td>
<td></td>
</tr>
<tr>
<td>Potential Improvement</td>
<td>5.34 (0.12)</td>
<td>5.52 (0.11)</td>
<td>5.42 (0.12)</td>
<td>5.36 (0.11)</td>
<td></td>
</tr>
<tr>
<td>Effort Utility</td>
<td>5.52 (0.12)</td>
<td>5.68 (0.11)</td>
<td>5.56 (0.12)</td>
<td>5.33 (0.11)</td>
<td></td>
</tr>
<tr>
<td>Inevitable Decrement</td>
<td>4.89 (0.14)</td>
<td>5.42 (0.14)</td>
<td>4.76 (0.14)</td>
<td>4.42 (0.14)</td>
<td></td>
</tr>
<tr>
<td>Aging Concerns Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independence</td>
<td>4.93 (0.12)</td>
<td>5.20 (0.14)</td>
<td>4.91 (0.12)</td>
<td>4.56 (0.14)</td>
<td></td>
</tr>
<tr>
<td>Alzheimer’s Likelihood</td>
<td>5.18 (0.12)</td>
<td>5.40 (0.12)</td>
<td>5.15 (0.12)</td>
<td>5.18 (0.12)</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Scores represent the mean response to all items on each subscale (possible range = 1–7). Higher scores represent more positive beliefs. Standard errors are in parentheses.

More intriguing are the effects involving change scores on the MCI Potential Improvement subscale. A main effect of change score was obtained, $F(1, 143) = 6.34, p = .03, \eta^2_g = .03$, with recall decreasing along with decreases in beliefs about potential improvement ($B = 0.04$). Significant Agequad × Change, $F(1, 143) = 5.24, p = .02, \eta^2_g = .04$, and Agecubic × Change, $F(1, 143) = 5.47, p = .02, \eta^2_g = .04$, interactions were also obtained, with the Agequad × Change interaction approaching significance, $F(1, 143) = 3.78, p = .054, \eta^2_g = .03$. Calculating predicted recall scores for change scores plus or minus one standard deviation from the sample mean at our five representative age points (see Table 3, bottom) revealed that lower recall was associated with belief decrements at all but the oldest point, but the effect was only significant at 68 years of age. Comparisons of these scores with those in Table 1 suggest that the strength of this effect in the young–old group is stronger when performance is examined in relation to beliefs than when it is examined in relation to condition.

### Discussion

This study was intended to extend the understanding of the impact of aging stereotypes on memory performance. Several findings of note emerged. First, the activation of positive and negative stereotypes had different effects depending on the age of the individual. Consistent both with predictions derived from the stereotype-threat framework (Steele et al., 2002) as well as with previous work on aging (e.g., Hess et al., 2003), our stereotype manipulation had minimal impact on younger adults. Of more interest is the finding that performance in midlife was actually elevated in the negative condition relative to the positive condition, with the effect strongest in the mid-40s. This result appears to be consistent with the notion of stereotype lift, in that performance in out-group members benefited when negative information about the target in-group (i.e., older adults) was highlighted. The fact that this effect became weaker as participants’ ages approached the 60s may reflect the increasing likelihood of identification with older adulthood, thereby affecting the social comparison processes thought to underlie this effect (see Walton & Cohen, 2003). In contrast, the absence of uplift in the younger adults may reflect...
both low salience of and low identification with the comparison group.

Threat effects were anticipated at the older end of our age range, but the effects were not as strong as expected on the basis of prior work that used a similar procedure (Hess et al., 2003). Around 68 years of age, memory was better in the positive than in the negative condition, but the effect was not significant. Calculation of slopes associated with the effects of each stereotype condition, however, indicated that the detrimental effects on recall performance associated with the negative stereotype condition were most evident around this same age. In contrast, there was no evidence for threat-based effects for the oldest participants in our study, a result we have recently replicated (Hess, Hinson, & Hodges, 2006). The fact that these relationships were observed for Potential Improvement and Independence scores as well as Present Ability scores, however, argues against this interpretation.

As just noted, the evidence for stereotype threat related to aging was somewhat weaker than observed in previous research. Examination of hypothesized mechanisms underlying stereotype-based effects, however, suggests that individual differences in reaction to the test context may be the most important determinant of threat-type effects. Consistent with previous research in aging (e.g., Chasteen et al., 2005; Hess et al., 2004), there was little evidence in support of general emotional responses (e.g., anxiety) mediating memory effects associated with our stereotype-based manipulation. We also did not find much support for strategy use as a mediator. The meaning of this latter null effect is somewhat unclear but may in part reflect the less than optimal status of output clustering as a measure of strategic behavior.

We did, however, find that our stereotype manipulation had a relatively strong impact on beliefs and concerns about memory, and that this effect was largely independent of age. This finding is interesting given the relatively simple, situation-specific manipulation in the present study. Although not as great as those observed in memory training programs, the changes we obtained are notable. For example, changes on the four MCI scales ranged from about 23% to 91% of the change observed by Lachman, Weaver, Bandura, Elliott, and Lewkowicz (1992) in a study that involved 3–9 hr of training.

More important is the observation that changes in beliefs moderated memory performance. Older adults whose beliefs became more positive following the stereotype manipulation regarding their present memory ability, potential for improvement, and independence tended to have better recall than those whose beliefs became more negative. An interesting finding is that the influence of changes in memory beliefs on performance was stronger than that associated with our condition manipulation. This suggests that whereas situational cues may increase the probability of a particular type of response, it is the individual’s specific response that is ultimately most important. In addition, the age-specificity of this moderating effect (i.e., it was strongest in the 60s) is consistent with a threat-based interpretation of the results in that factors in the test context that were causing people to change beliefs affected only performance in the stereotyped group. We hypothesized that changes in negative memory beliefs and concerns in the test context might be considered a reflection of the worry component of anxiety, in which case our results appear to be consistent with those of Cadinu et al. (2005).  

1 It is possible that the changes in MCI and ACS scores, and their moderating influence on performance, might just reflect accurate memory monitoring. The fact that these relationships were observed for Potential Improvement and Independence scores as well as Present Ability scores, however, argues against this interpretation.

Table 3
Predicted Recall as a Function of Change in Memory Controllability Inventory (MCI) Present Ability and MCI Potential Improvement Scores

<table>
<thead>
<tr>
<th>Stereotype condition</th>
<th>Change</th>
<th>Age (years)</th>
<th>MCI Present Ability</th>
<th>MCI Potential Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>31</td>
<td>43</td>
<td>56</td>
</tr>
<tr>
<td>Positive</td>
<td>Increase</td>
<td>.59 (.05)</td>
<td>.55 (.04)</td>
<td>.60 (.03)</td>
</tr>
<tr>
<td></td>
<td>Decrease</td>
<td>.66 (.05)</td>
<td>.57 (.04)</td>
<td>.53** (.03)</td>
</tr>
<tr>
<td>Negative</td>
<td>Increase</td>
<td>.66 (.06)</td>
<td>.60 (.04)</td>
<td>.65 (.03)</td>
</tr>
<tr>
<td></td>
<td>Decrease</td>
<td>.55 (.06)</td>
<td>.60 (.04)</td>
<td>.57 (.03)</td>
</tr>
<tr>
<td>Both</td>
<td>Increase</td>
<td>.66 (.04)</td>
<td>.60 (.04)</td>
<td>.65 (.02)</td>
</tr>
<tr>
<td></td>
<td>Decrease</td>
<td>.56 (.04)</td>
<td>.60 (.04)</td>
<td>.57* (.02)</td>
</tr>
</tbody>
</table>

Note. Standard errors are in parentheses. Significance levels are associated with change in beliefs within stereotype conditions at each age point for Present Ability scores and across type of change for Potential Improvement scores.

* p < .09. ** p < .05.
performance by consuming working memory. The differential impact of negative changes in beliefs on performance across ages may indicate that changes in beliefs were more likely to be tied to disruptive internal thoughts in older adults than they were in younger adults. In conclusion, the present findings suggest that stereotype-based influences on memory performance in adulthood cannot be understood simply in terms of situational factors but must take into account individual characteristics that may affect the individual’s perception and response to the situation.

References

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