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Rapid communication

Stereotype threat can reduce older adults' memory errors

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Stereotype threat often incurs the cost of reducing the amount of information that older adults accurately recall. In the current research, we tested whether stereotype threat can also benefit memory. According to the regulatory focus account of stereotype threat, threat induces a prevention focus in which people become concerned with avoiding errors of commission and are sensitive to the presence or absence of losses within their environment. Because of this, we predicted that stereotype threat might reduce older adults' memory errors. Results were consistent with this prediction. Older adults under stereotype threat had lower intrusion rates during free-recall tests (Experiments 1 and 2). They also reduced their false alarms and adopted more conservative response criteria during a recognition test (Experiment 2). Thus, stereotype threat can decrease older adults' false memories, albeit at the cost of fewer veridical memories, as well.

Keywords: Stereotype threat; Ageing; Memory; Memory errors; Regulatory focus.

Younger adults typically outperform older adults on memory tests. Although most research views this as an inevitable aspect of the ageing process, these age differences may arise in part due to *stereotype threat*. Stereotype threat occurs when people feel that if they perform poorly on a task they will confirm a negative self-relevant stereotype. In response to this threat, people inadvertently conform to the negative stereotype and underperform compared to their potential (e.g., Steele, Spencer, & Aronson, 2002). Of interest to the current research, when negative stereotypes about ageing become salient to older adults, their memory performance decreases (see Barber & Mather, in press a).

Recently it has been proposed that stereotype threat effects might in part occur because of

changes in *regulatory focus* (Seibt & Förster, 2004). According to regulatory focus theory (Higgins, 1997), people differ in how they pursue goals. People with a *promotion* focus concentrate on goal-related rewards and aspirations and are sensitive to the presence or absence of gains. In contrast, people with a *prevention* focus concentrate on goal-related losses and responsibilities and are sensitive to the presence or absence of losses. Although individuals differ in their dispositional tendencies to have a promotion or a prevention focus, situational variables can sometimes override these dispositional tendencies and determine an individual's current regulatory focus (e.g., Shah, Higgins, & Friedman, 1998). One such situational variable may be stereotype threat (Seibt & Förster, 2004).

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More specifically, it has been proposed that stereotype threat invokes a prevention focus. Because of this, stereotype threat should be associated with enhanced vigilance and an increased concern with losses and avoiding errors (Higgins, 2000).

Some previous results are consistent with this. For example, self-reported levels of prevention focus increase when negative stereotypes are primed (Seibt & Förster, 2004). Furthermore, stereotype threat is associated with more conservative, risk-averse, decision making for both younger (Carr & Steele, 2010) and older adults (Coudin & Alexopoulos, 2010). It is also associated with increased monitoring for task errors (Forbes, Schmader, & Allen, 2008) and an increased concern with avoiding mistakes (Brodish & Devine, 2009).

The current research tests predictions derived from the regulatory focus account of stereotype threat within the domain of older adults' memory. According to the regulatory focus account, threat should induce a prevention focus, which in turn should lead to enhanced vigilance and an increased concern with avoiding errors of commission (e.g., Crowe & Higgins, 1997). Because of this, stereotype threat should lead older adults to make fewer memory errors.

EXPERIMENT 1

In Experiment 1, we tested the hypotheses that stereotype threat would reduce older adults' memory errors within the domain of free recall. This would be consistent with the prediction that stereotype threat induces a prevention focus, which in turn causes people to avoid errors of commission.

Method

Participants

Thirty-one older adults (71% women) participated in this study (15 in the no-threat condition and 16 in the stereotype threat condition). Participants were on average 70.42 years old ($SD = 4.76$; range = 63–78) and well educated, having completed an average of 16.61 years of education ($SD = 2.72$; range = 12–24 years). Although we did not recruit based on

education levels, we note that stereotype threat memory impairments are greater for people with high levels of education (presumably because they value the threatened domain, i.e., their memory abilities, more than people with lower levels of education; Hess, Emery, & Queen, 2009). Participants were recruited through a list of research volunteers that was obtained via newspaper and online ads, fliers at senior centres and public places, and letters to University of Southern California alumni.

Two participants (one from each condition) were removed from analyses. One participant recalled only 2 items, a recall level that was more than 2 standard deviations below that of all other participants. A second participant wrote down items on her recall sheet after being debriefed.

Materials

We generated six categorized lists, each containing five exemplars drawn from the Van Overschelde, Rawson, and Dunlosky (2004) norms (e.g., a fruit: mango, cherry, lemon, blueberry, cantaloupe). Exemplar frequency was matched across the lists; on average, exemplars were produced by 14.93% of people in the Van Overschelde et al. (2004) norms ($SD = 2.46\%$).

Procedure

Participants first completed a demographics questionnaire. We next manipulated stereotype threat by asking participants to read fictitious news articles taken from Hess, Auman, Colcombe, and Rahhal (2003). In the threat condition, these articles described research confirming that memory declines with age. In the no-threat condition, these articles described research suggesting preservation and improvements in memory with age. In both conditions, participants were told that our study was designed to follow up on these results.

During encoding, participants were shown the previously described list of 30 categorized words printed on a sheet of paper for 2 min. Category names were not provided, and items were presented in an intermixed fashion. Participants were asked to learn these words in preparation for an upcoming memory test. Immediately after encoding, participants were given a blank sheet of paper and were

asked to write down as many of the words as they could recall. The number of errors produced during this test was our critical variable of interest; however, we also examined veridical recall.

Results

As in previous studies, there was a significant reduction in veridical recall as a function of stereotype threat. Older adults in the stereotype threat condition recalled fewer items ($M = 11.00$, $SD = 3.96$) than older adults in the no-threat condition ($M = 15.13$, $SD = 5.38$), $t(27) = -2.34$, $SE = 1.77$, $p = .03$, $d = -0.87$. Novel to this study and consistent with the regulatory focus predictions, stereotype threat improved recall accuracy. As shown in Figure 1, the proportion of the recall product that was intrusions (i.e., number of intrusions divided by total number of items recalled) was lower for participants in the stereotype threat condition ($M = .01$, $SD = .04$) than it was in the no-threat, control condition ($M = .05$, $SD = .06$), $t(27) = -2.21$, $SE = .02$, $p = .036$, $d = -0.82$. Thus, although stereotype threat reduced the quantity of information that was recalled, it simultaneously improved the quality.

Discussion

Experiment 1 tested the regulatory focus prediction that stereotype threat would reduce memory errors.

Results were consistent with this; stereotype threat improved recall accuracy. In fact, there was a 78% reduction in older adults' likelihood to make at least one intrusion when under stereotype threat. Whereas 60% of participants in the no-threat, control condition made at least one intrusion, only 13% of participants in the stereotype threat condition did.

We also observed a reduction in veridical recall under stereotype threat. It is worth noting that reduced veridical memory is often associated with increased false memories in other studies. For instance, older adults tend to recall fewer correct items but also to make more intrusions than younger adults (e.g., Norman & Schacter, 1997). In contrast to this, our results indicate that under threat, older adults shifted their criterion to be more conservative across all item types.

EXPERIMENT 2

In Experiment 1, we demonstrated that stereotype threat reduced intrusions during a free-recall test. In Experiment 2, we examined whether threat would similarly reduce false alarms during a recognition test and also be associated with a more conservative response criteria. Together, these results would support the notion that threat induces a prevention focus in which older adults become more concerned with losses and avoiding mistakes.

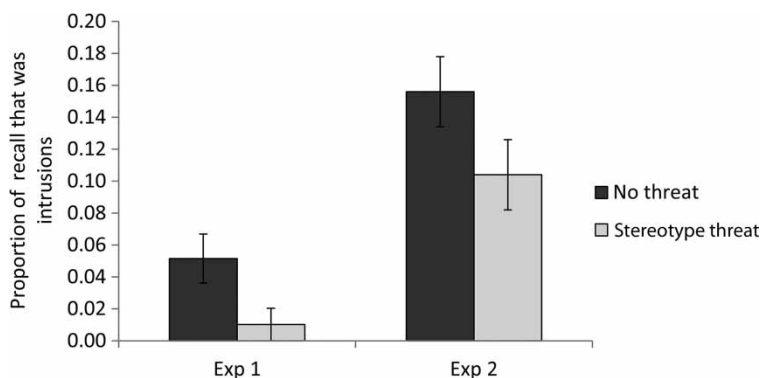


Figure 1. The proportion of the recall product that was intrusions (i.e., number of intrusions divided by total number of items recalled) as a function of stereotype threat condition and experiment. Error bars represent \pm standard error of the mean.

As a secondary aim, in Experiment 2 we also manipulated the reward structure of the items at encoding. Previous research has also shown that people tend to have higher task performance when their regulatory focus matches the reward structure of the task—that is, when there is a *regulatory fit*. That is, people with a promotion focus typically do better when the task emphasizes gaining rewards rather than avoiding losses. The reverse is true for prevention focus (e.g., Shah et al., 1998). In line with this rationale, stereotype threat effects disappear, and sometimes even reverse, when the task has a losses-based structure rather than a gains-based structure (Grimm, Markman, Maddox, & Baldwin, 2009; Seibt & Förster, 2004). For example, in our previous research, stereotype threat *impaired* older adults' working memory performance when the task emphasized gains, but *improved* their working memory performance when the task emphasized losses (Barber & Mather, in press b). In the current study, we expected to replicate this pattern.

Method

Participants

Sixty-four older adults (50% women) participated in this study. Participants were on average 70.85 years old ($SD = 5.82$; range = 61–86) and highly educated, having completed an average of 16.41 years of education ($SD = 3.05$; range = 12–28). Participants were recruited via the same methods as those used in Experiment 1.

Materials and procedure

Participants completed four free-recall study–test cycles. During each cycle, participants were shown 20 words. All words were concrete nouns, 4–7 letters long, with a Kucera–Francis frequency value between 26 and 53 occurrences per million words. Half of the words led to point gains if subsequently remembered (between 1 and 8 points). The other half led to point losses if forgotten (between 1 and 8 points). Words were presented in the centre of the computer screen with the associated point value below.

Counterbalancing was used such that words appeared equally often in Study–Test Cycle 1 or 2 as in Cycle 3 or 4, and equally often led to point gains if remembered as to point losses if forgotten. Words appeared equally often as a studied item during these recall tests as a lure during the recognition memory test.

Prior to beginning the first free-recall study–test cycle, participants were shown examples of the scoring procedure. We next manipulated stereotype threat (see the Appendix). We did this by varying whether the instructions for the memory tests (a) mentioned that we were interested in memory performance or not, (b) stated there were age differences in performance or not, and (c) made participants state aloud their age or not.

After the threat induction, participants began the first study–test cycle. Participants saw 20 words on the computer screen at a rate of 2 s per word. A self-paced free-recall test immediately followed. The experimenter wrote down the recalled words and then provided performance feedback. This process was repeated for each study–test cycle (with new words in each cycle).

After completing all four free-recall study–test cycles, we repeated the threat manipulation. Participants were then given a surprise, self-paced, recognition test in which they were presented with the 64 critical words from the previous free-recall tests alongside 64 new words. Participants determined whether each word appeared earlier or was a new word. At the end of the experiment, participants completed a series of questionnaires, including a demographics form.

Results

We first examined veridical memory during the free-recall tests (see Table 1). According to the regulatory focus account, stereotype threat should impair recall of the gains-related items but improve recall of the losses-related items. To test this, we ran a 4 (study–test cycle) \times 2 (condition) \times 2 (item type) analysis of variance (ANOVA) on the total number of items recalled. Results revealed a significant three-way interaction,

$F(3, 186) = 5.09$, $MSE = 1.59$, $p < .01$, $\eta_p^2 = .08$. Because of this, we next examined each of the study–test cycles separately.

Results were consistent with the regulatory focus hypothesis on the first study–test cycle. Here, stereotype threat differentially affected recall as a function of whether the items led to gains versus losses. In general, participants recalled more of the gains-related than losses-related items, $F(1, 62) = 23.15$, $MSE = 1.38$, $p < .001$, $\eta_p^2 = .27$; however, this depended upon condition, $F(1, 62) = 8.16$, $MSE = 1.38$, $p < .01$, $\eta_p^2 = .12$. Participants in the stereotype threat condition recalled numerically fewer of the gains-related items, but statistically more of the losses-related items, than participants in the no-threat condition [gains-related: $t(62) = -0.89$, $p = .38$, $d = -0.22$; losses-related: $t(62) = 2.75$, $p < .01$, $d = 0.69$]. This is similar to the pattern observed in our previous study (Barber & Mather, in press b). Unexpectedly, this pattern only emerged on the first study–test cycle.

Although the pattern of veridical recall was only consistent with the regulatory focus predictions on Study–Test Cycle 1, the pattern of intrusions was consistent with the regulatory focus predictions across all four study–test cycles. Here, we conducted a 4 (study–test cycle) \times 2 (condition)

ANOVA on the proportion of the recall product that was intrusions (i.e., number of intrusions divided by total number of items recalled). Consistent with Experiment 1, there was a main effect of stereotype threat condition, $F(1, 62) = 2.80$, $MSE = .06$, $p < .05$ (one-tailed), $\eta_p^2 = .04$, which did not interact with study–test cycle, $F < 1$. As seen in Figure 1, across the study–test cycles, the recall of older adults under stereotype threat included a smaller proportion of errors ($M = .10$) than did the recall of older adults in the no-threat condition ($M = .16$).

We next turned to our key outcome measure: performance on the recognition memory test. Here we first examined discriminability (i.e., the participant’s ability to distinguish old from new items) as well as response bias (i.e., the participant’s tendency to respond either “old” or “new”). Because some participants had hit rates close to 100%, we used a nonparametric measure of discriminability, A' (using a method suggested by Snodgrass, Levy-Berger, & Haydon, 1985). A' scores can range from 0 to 1, with .5 indicating chance performance. We used the measure of B''_D to estimate bias (see Donaldson, 1992). Scores greater than zero on this measure indicate a conservative bias (i.e., a tendency to guess “new” on the recognition test). Scores less than zero indicate a liberal bias (i.e., a tendency to guess “old”).

If stereotype threat induces a prevention focus, then older adults under threat should adopt a more conservative response criterion. Consistent with this, an independent-samples t -test revealed a significant difference between the conditions in terms of response bias, $t(61) = 2.11$, $p = .04$, $d = 0.53$. Participants in the stereotype threat condition had a more conservative response bias ($M = .34$) than participants in the no-threat condition ($M = .08$). In contrast, there was no significant difference between the conditions in discriminability, $t(61) = 1.61$, $p = .11$, $d = 0.41$.

Similar support for the regulatory focus predictions was found when examining hit and false-alarm rates. Participants in the two conditions did not significantly differ in hit rates (stereotype threat condition: $M = .64$; no-threat condition: $M = .67$, $t(61) = -0.56$, $p = .58$, $d = -0.14$). This is

Table 1. Total number of items recalled as a function of stereotype threat condition, study–test cycle, and item type

Item type	Study–test cycle	No-threat condition		Threat condition	
		M	SD	M	SD
Gains-related	1	2.75	1.30	2.47	1.24
	2	2.09	1.20	2.50	1.68
	3	2.40	1.36	2.72	1.37
	4	2.19	1.20	3.38	1.66
Losses-related	1	1.16	1.14	2.06	1.48
	2	1.97	1.40	2.28	1.30
	3	1.69	1.14	2.50	1.44
	4	1.94	1.39	1.94	1.41

Note: Stereotype threat condition: no-threat versus threat; study–test cycle: 1–4; item type: gains versus losses.

consistent with previous studies finding no *overall* reduction in hit rates (or in overall corrected recognition) under stereotype threat (e.g., Hess et al., 2009; Kang & Chasteen, 2009; Thomas & Dubois, 2011). In contrast, participants in the stereotype threat condition made fewer false alarms ($M = .20$) than participants in the no-threat condition ($M = .28$), $t(61) = -2.37$, $p = .02$, $d = -0.60$. To our knowledge, this is the first demonstration that stereotype threat can reduce older adults' false alarms.

Discussion

Results of Experiment 2 were partially in line with the regulatory focus account of stereotype threat. On Study–Test Cycle 1, stereotype threat led to a numeric decline in the number of gains-related items recalled but to a significant improvement in the number of losses-related items recalled (i.e., when there was regulatory fit). This is consistent with our previous results (Barber & Mather, in press b). The predicted regulatory-focus effect did not emerge for accurate recall in the subsequent study cycles, which may be the result of dissipation of the strength of the threat induction. Consistent with predictions, stereotype threat also led to memory benefits: Older adults under threat had a lower intrusion rate and made fewer false alarms on the recognition memory test. This was likely because stereotype threat was associated with a more conservative response bias.

GENERAL DISCUSSION

Most people have at least one social identity that is associated with negative stereotypes, be it their age, race, weight, religion, or political affiliation. Problematically, according to stereotype threat theory, when these negative stereotypes become salient, they can interfere with performance in domains where that stereotype is relevant (see Steele et al., 2002). For example, older adults are stereotyped as having poorer memory abilities than younger adults. When this stereotype becomes salient to older adults their memory performance decreases (e.g., Hess et al., 2003).

The goal of the current research was to examine whether stereotype threat comes not only with costs, but also with benefits for older adults' memory. Based on the regulatory focus account of stereotype threat, we predicted that stereotype threat may reduce older adults' memory errors. Results were consistent with this. Stereotype threat reduced the likelihood that participants made intrusions during the free-recall tests in both Experiments 1 and 2. Furthermore, stereotype threat was associated with a lower false-alarm rate in Experiment 2. These patterns probably emerged because stereotype threat was associated with a more conservative response bias (Experiment 2). Although having a conservative response bias may lead people to withhold low-confidence correct answers, it can also lead to the benefit of reducing memory errors.

Although we observed a reduction in older adults' memory errors under stereotype threat, it is important to note that this benefit may not occur for all forms of learning and memory. That is, the benefits of regulatory focus will not universally lead to task improvements. For example, the benefit of a higher criterion in reducing memory errors may not occur for certain types of high confidence errors (see Thomas & Dubois, 2011), which tend to be resistant to changes in response criteria (for a review, see Gallo, 2010).

We also suggest that there are alternative, regulatory-focus-based, explanations of previous stereotype threat findings. First, previous research has often found that threat is associated with a reduction in clustering in recall (e.g., Hess et al., 2003). Although this is often explained as arising from reductions in executive control resources, it can alternatively be explained by changes in regulatory focus. Whereas a promotion focus is associated with relational processing, prevention focus is associated with item-specific processing (Zhu & Meyers-Levy, 2007). Because of this, individuals in a prevention focus display lower clustering in recall. Regulatory focus theory can also explain why stereotype threat often reduces older adults' veridical memory performance. If threat induces a prevention focus, then performance should be impaired on any task that implicitly or explicitly

emphasizes gains (e.g., a traditional recall or recognition memory test; see also Grimm et al., 2009). Because of this, a practical application of these results is that clinicians could change memory assessment instructions to emphasize the importance of avoiding mistakes or losses. This should lead to an amelioration of stereotype threat-related memory impairments.

A second practical application of these results is geared towards older adults rather than clinicians. When older adults are confronted with ageist stereotypes, they may find themselves becoming very careful to avoid mistakes and losses. This type of prevention focus could lead to remembering less information and inadvertently confirming the stereotype that older adults have poor memory abilities. To combat this, we suggest that older adults consciously try to be eager to do their best in these situations and not just focus on being vigilant to avoid doing their worst.

One limitation of these studies is that we did not directly measure regulatory focus as a function of stereotype threat. Previous research demonstrates increases in self-reported prevention focus under threat for younger adults (Seibt & Förster, 2004); however, future research should include similar assessments for older adults. We also note that the sample size in Experiment 1 was small. Although the finding that stereotype threat can reduce intrusions in free recall was replicated in Experiment 2, future research is needed to test this issue in a larger sample in order to better estimate the magnitude of this effect. Research is also needed to clarify how delay relates to stereotype threat. In Experiment 2, the expected regulatory fit pattern within free recall only emerged on Study-Test Cycle 1. This could be due to a dissipation of threat with time. This would be consistent with some previous work showing that threat impairs performance on a first memory test, but not on subsequent tests (Kang & Chasteen, 2009). Future research is needed to clarify the time course of stereotype threat effects.

In summary, although previous research has shown that stereotype threat impairs memory performance in older adults, the current research suggests that it also serves some benefits.

Stereotype threat can decrease false memories in older adults, albeit at the cost of lower veridical recall as well.

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APPENDIX

Instructions in Experiment 2

Stereotype threat condition: “The primary goal of this study is to examine age differences in memory abilities. The test that you are about to complete has been used extensively by researchers to study aging effect on memory. A good memory ability will allow you to perform this task without difficulty. Younger adults typically do better than older adults on this task. Poor performance on this task predicts cognitive decline and

dementia. Before we begin, please tell the experimenter how old you are.”

No-threat condition: “One goal of this study is to examine individual differences in abilities. The test that you are about to complete examines your ability to process words. This test has been used extensively by researchers to study individual differences in cognitive abilities. In an effort to reduce potential biases, this test was developed to be appropriate for individuals of all ages. In other words, this test is free of age-related biases such that adults of all ages perform similarly.”