Journal of Experimental Social Psychology 46 (2010) 51–60

Contents lists available at ScienceDirect

Journal of Experimental Social Psychology

journal homepage: www.elsevier.com/locate/jesp

Stereotype activation, inhibition, and aging

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ARTICLE INFO

Article history:
Received 31 January 2007
Revised 15 September 2009
Available online 23 September 2009

Keywords:
Stereotypes
Prejudice
Aging
Memory
Comprehension

ABSTRACT

This research explored age-related changes in drawing stereotypic inferences during the comprehension of narrative texts. Previous research suggests that declines in inhibitory function can lead older adults to rely more on stereotypes and be more prejudiced than younger adults, even in the face of a desire to be non-prejudiced. In two experiments reported here, younger and older adults read stories that allowed for stereotypic inferences. Older adults were less likely to inhibit stereotypic inferences as measured by recognition measures and lexical decision times. A third control experiment verified that the results of the lexical decision task were not due to *a priori* response biases for the specific target words. Overall, older adults were more likely to make and maintain stereotypic inferences than younger adults, potentially causing them to be more prejudiced than younger adults.

Age differences in prejudice are widely documented in the psychological literature, with older adults typically showing greater prejudice than younger adults toward a variety of social groups (Firebaugh & Davis, 1988; Herek, 2000; Wilson, 1996). For many years, the unexamined assumption that guided psychological understanding of these results was that older people as a cohort came of age in more prejudiced times, and thus their attitudes reflected their earlier socialization. According to this explanation, older people are more prejudiced than younger people because their attitudes have not changed, or have changed only slightly, since their young adulthood when prejudiced attitudes were more widespread, accepted, and strongly endorsed than they are today (Gilbert, 1951; Karlins, Coffman, & Walters, 1969; Katz & Braly, 1933; Schuman, Steeth, Bobo, & Krysan, 1997). In contrast to this traditional explanation for age differences in prejudice, von Hippel, Silver, and Lynch (2000) suggested that older people may exhibit greater prejudice because they have difficulty inhibiting their unintentionally activated stereotypes and associated negative evaluations. In the current paper, we explore this possibility by examining age differences in stereotype activation.

Stereotype activation and inhibition

In an influential model of prejudice, Devine (1989) proposed that stereotypes become over-learned due to their societal prevalence, and are automatically activated upon encounters with individual members of stereotyped groups. Non-prejudiced individuals are differentiated from prejudiced individuals in this model not by whether prejudiced thoughts are activated, but by whether they inhibit those thoughts and replace them with more egalitarian beliefs. Prejudiced individuals endorse the stereotypic thoughts that are automatically activated, and non-prejudiced individuals reject and subsequently inhibit the stereotypic thoughts.

Although later research has indicated that activation of stereotypic thoughts is not automatic for all people or in all situations (e.g., Fein & Spencer, 1997; Son Hing, Chung-Yan, Hamilton, & Zanna, 2008), most models of stereotyping and prejudice have maintained a tacit role for unintended activation and intentional inhibition. For example, Gilbert and Hixon (1991) provided evidence that stereotype activation is not inevitable, but once stereotypes are activated, individuals who are distracted are more likely to apply them in judgment. This finding suggests that effortful inhibitory processes may be critical for preventing activated stereotypes from influencing judgment. Relatedly, Bodenhausen (1990) has demonstrated that people are more likely to apply stereotypes when they are off-cycle in their circadian rhythm. Because inhibitory abilities are weaker during circadian off-cycles (May & Hasher, 1998; May, Hasher, & Stoltzfus, 1993), this finding is consistent with the notion that people prevent themselves from relying on stereotypes by effortfully inhibiting them.

Extending this research to the domain of aging, von Hippel et al. (2000) found that increases in stereotyping and prejudice that emerged among older adults appeared to be a function of inhibitory deficits. In their study, older adults were more likely to rely on stereotypes than younger adults, and these age differences were mediated by performance on a task designed to measure inhibitory ability (a reading task in which people were to ignore distracting text; Connelly, Hasher, & Zacks, 1991). Similarly, older adults were

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doi:10.1016/j.jesp.2009.09.010

also more prejudiced than younger adults, and in this case these age differences were partially mediated by inhibitory ability. The von Hippel et al. (2000) study provided evidence for the mediating role of inhibitory ability in increased stereotyping among older adults, but it did not address the question of where in the information processing sequence inhibitory ability exerts its effects. Inhibitory ability could have an impact anywhere from the encoding stage to the point of response monitoring.

Nevertheless, two recent studies suggest that the findings of von Hippel et al. (2000) are not just evidence of age-related differences in response monitoring. First, Gonsalkorale, Sherman, and Klauer (2009) used the Quadruple Process model (Conrey, Sherman, Gawronski, Hugenberg, & Groom, 2005) to examine the source of age differences in implicit prejudice as measured by the Implicit Association Test (IAT; Greenwald, McGhee, & Schwarz, 1998). Their modeling results indicated that older adults are less successful than younger adults in regulating automatic bias toward African Americans, but show no differences in degree of bias itself.

Second, Stewart, von Hippel, and Radvansky (2009) conceptually replicated this modeling result using the process dissociation procedure (Jacoby, 1991). In their experiment, Stewart et al. (2009) found that age differences in implicit prejudice toward African Americans emerged only in the control component, with older participants showing decreased control over their automatic biases. Furthermore, this age difference in control was itself mediated by the reading with distraction task used in von Hippel et al. (2000). Finally, Stewart et al. also found that motivation to be nonprejudiced only translated into low prejudice responses on the IAT when participants also had good control over their automatic biases. These results of Gonsalkorale et al. (2009) and Stewart et al. (2009) suggest that age differences in prejudice are the result of poor inhibitory control and that these age differences do not just represent poor response monitoring. Rather, older adults seem to have difficulty controlling their prejudiced associations.

In the current work, we extend these findings by examining whether age differences in stereotype inhibition can be found at the initial encoding of stereotype-relevant information. Such a finding would suggest that inhibitory processes play a critical role early in the information processing sequence, with the potential to influence interpretations, judgments, and memory for stereotypic individuals and events (von Hippel, Sekaquaptewa, & Vargas, 1995). Prior to examining age differences in the encoding of stereotype–relevant information, we first discuss age differences in text comprehension to provide the necessary background for the procedures of our experiments.

Aging and comprehension

It is generally agreed that there are three levels of memory representation created during text comprehension (van Dijk & Kintsch, 1983): the surface form, the textbase, and the situation model. The surface form is a verbatim representation of the words and syntax present in a message. While this level of representation is important for immediate comprehension, it is rapidly forgotten. Within a few minutes, people are close to chance levels in identifying the surface form. The textbase representation consists of the basic idea units, or propositions, that were actually presented in a text, but separate from the actual wording. For example, the sentences "The boy hit the girl" and "The girl was hit by the boy" have different words and syntax, but they both refer to the same basic idea. Thus, they would be represented by the same textbase representation.

The third level is the situation model (Johnson-Laird, 1983; van Dijk & Kintsch, 1983; Zwaan & Radvansky, 1998). This is a representation of the situation described by the text beyond what is explicitly expressed by the text itself (Glenberg, Meyer, & Lindem, 1987). The situation model is a representation that is a combination of the ideas presented in a text along with the inferences generated by the comprehender. This level of representation is the focus of our research because one influence of stereotypes involves their impact on the types of inferences people make (Dunning & Sherman, 1997; Slusher & Anderson, 1987). That is, if a stereotype is not explicitly stated in the text, but can be inferred, it would be only be represented at the situation model level, and not the surface and textbase levels.

Although older and younger adults differ at the lower levels of comprehension (e.g., Kemper, 1987; Kemtes & Kemper, 1997; Light & Capps, 1986; Meyer & Rice, 1981), there is little to no evidence to suggest that there is a major age-related decline at the situation model level (Radvansky, 1999; Radvansky & Dijkstra, 2007). Younger and older adults use situation models similarly to make recognition decisions (Radvansky, Gerard, Zacks, & Hasher, 1990), to integrate information about common situations (Radvansky, Zacks, & Hasher, 1996; Radvansky, Zacks, & Hasher, 2005), to update their situation models during comprehension (Morrow, Leirer, & Altieri, 1992; Morrow, Stine-Morrow, Leirer, Andrassy, & Kahn, 1997; Radvansky, Copeland, Berish, & Dijkstra, 2003; Radvansky & Curiel, 1998; Stine-Morrow, Morrow, & Leno, 2002), to draw logical conclusions (Gilinsky & Judd, 1994), and are similarly sensitive to information that varies in situational importance (Radvansky, Copeland, & Zwaan, 2003). It should be noted that although processing at the situation model level is largely preserved, it can be compromised if there are processing difficulties at other levels that would feed into situation model construction (e.g., Copeland & Radvansky, 2007).

Of particular importance to the current research is a study by Radvansky, Zwaan, Curiel, and Copeland (2001) that used a recognition paradigm developed by Schmalhofer and Glavanov (1986). This paradigm assesses the strength of verbatim, textbase, and situation model representations. Radvansky et al. (2001) found that although there were age-related declines at the surface and textbase levels, there was no such decline at the situation model level, with the older adults performing at a similar, if not better, level as the younger adults (see also Stine-Morrow, Gagne, Morrow, & DeWall, 2004; Stine-Morrow, Loveless, & Soederberg, 1996). As such, the situation model is the focus of the current study.

To turn to the role of situation models in stereotyping, stereotypes guide inferential processing at encoding to facilitate stereotypic interpretations that were not explicitly communicated (Dunning & Sherman, 1997; von Hippel et al., 1995). This process seems to take place outside of conscious awareness, and in a manner dissociated from conscious endorsement of stereotypes (Dunning & Sherman, 1997). As such, it is expected that situation models will incorporate stereotypes to make inferences.

To test this possibility, we relied on standard narrative comprehension methods from cognitive psychology to examine the role of stereotype at encoding via the drawing of stereotypic inferences. Because older adults are more likely to rely on stereotypes than younger adults, and because older adults are at least as likely to draw inferences from narratives or text, it is expected that they will also be more likely to draw stereotypic inferences. This idea was tested in two experiments using two different measures of stereotyping. Experiment 1 used a recognition test method, previously used by Radvansky et al. (2001) with older adults to assess the strength of the situation model level of representation. Experiment 2 used lexical decision probes to provide more direct evidence that age differences in stereotypic inferences emerged at encoding. A follow-up experiment then addressed the issue of whether there were any material confounds that led to the results of Experiment 2. The predictions of both Experiments 1 and 2 are that while both age groups may initially activate stereotypes when

reading stories about members of stereotyped groups, older adults are less likely than younger adults to inhibit their stereotypes, and, as a consequence, their inferential processing at the situation model level will show greater evidence of stereotyping.

Experiment 1

The aim of Experiment 1 was to assess whether older adults were relatively more likely to draw and remember stereotypic inferences during comprehension than younger adults. If so, then these inferences would be more likely to be stored in their situation models. As a reminder, because the surface and textbase levels of representation are based on information from the text itself, the situation model is the only level that includes inferences, and so we focus our attention at that level. It is expected that older adults' situation model measures will show greater evidence of stereotyping than those of younger adults. These measures of stereotypic inference-making were also compared with measures of inhibitory ability and self-report assessments of prejudice to examine whether these individual differences measures captured any of the processes. Note that the situation model memory measure directly assesses the consequences of failures to inhibit unwanted stereotype-based inferences by evaluating their presence in later memory performance. Thus, the design of this study differs from that of von Hippel et al. (2000), in which the stereotyping measure was distinct from the inhibition measure. According to predictions, older adults should show less evidence of stereotype inhibition in their situation models than younger adults, and this indicator of stereotype inhibition should itself be related to individual differences in inhibitory ability.

Method

Participants

Seventy-one younger adults and 48 older adults were tested. The younger adults ranged from 18 to 25 years of age ($M = 19.7$), and were recruited from the University of Notre Dame and Indiana University South Bend. These participants included 39 who identified themselves as White, 19 as Black, nine as Hispanic, and four as Asian.[1] They received partial course credit for their participation. The older adults ranged from 60 to 88 years of age ($M = 72.1$), were recruited from the community and were paid $10 for their participation. These people included 35 who identified themselves as White, and 13 as Black. The younger adults had more education (*Range* 12–15; $M = 13.5$ years) than did the older adults (*Range* 9–20; $M = 12.7$ years), $t(117) = 2.30$, $p < .05$. The younger adults scored similarly on the Shipley vocabulary test (*Range* 21.25–38; $M = 30.2$) to the older adults (*Range* 16.75–39; $M = 29.8$), $t < 1$. However, the younger adults scored higher on the Salthouse and Babcock (1991) speeded figure comparison test, which serves as a processing speed measure (*Range* 6–30; $M = 19.4$), than did the older adults (*Range* 3–20; $M = 9.6$), $t(117) = 11.62$, $p < .05$, and the younger adults scored higher on the Turner and Engle (1989) operation span test of working memory capacity (*Range* 4–39; $M = 15.9$) than did the older adults (*Range* 0–24; $M = 6.9$), $t(117) = 7.09$. All participants were native English speakers.

[1] Additional analyses that removed all minority members from the participant sample did not reveal any meaningful differences in the data. For Experiment 1, the difference between the education of the younger (*Range* 12–15; $M = 13.2$ years) and older adults (*Range* 9–20; $M = 13.1$ years) was no longer significant, $t < 1$. Also, For the EMS and IMS scales, younger adults scored higher on the EMS ($M = 2.8$; $SD = .88$) than the older adults ($M = 2.3$; $SD = .98$), $t(85) = 2.35$. In comparison, similar scores on the IMS were obtained for the younger ($M = 4.6$; $SD = .49$) and older adults ($M = 4.4$; $SD = .68$), $t(85) = 1.41$, $p = .16$. No other results in Experiment 1 changed. There were no differences in the outcomes of Experiments 2 and 3.

Materials

Four stories were written for this experiment. Two stories were relevant to stereotypes about African Americans, one was relevant to stereotypes about Appalachian people, and one was relevant to stereotypes about Jews. A sample story is provided in the Appendix A. These stories were written so that each contained information that allowed for stereotypic inferences, without explicitly providing any stereotypic content. For example, in the sample passage, the sentence "Malcolm wasn't surprised when he received his SAT scores" allows for the stereotypic inference that the scores were low (see Dunning & Sherman, 1997). There were eight such pre-specified points in each story. In addition, there were also eight points along which people were likely to make inferences that did not involve stereotypes. Membership in stereotyped groups was conveyed in these stories by varying whether the names were stereotypically associated with different ethnic groups (see Greenwald et al., 1998), a technique that has been used effectively with older and younger adults (Nosek, Banaji, & Greenwald, 2002).

As an individual difference measure of inhibitory processing, we used a text-reading task from Connelly et al. (1991). For this task people read aloud a series of six paragraphs written in italics, half of which contain distracting, unrelated, words presented in a different (i.e., upright) font from the rest of the paragraph (Experimental condition) and half which only presented a series of Xs instead of distracting words (Control condition). Because in normal adult reading the eyes are typically substantially ahead of vocalization, this task requires the reader to inhibit the vocalization of words that have already been encoded or to inhibit the encoding of the irrelevant words. These inhibitory processes are effortful and result in a substantial slowing in reading speed. Performance on this task mediated age differences in stereotyping and prejudice in von Hippel et al. (2000) and age differences in control of automatic biases in Stewart et al. (2009), and thus it was chosen to assess whether this individual difference measure of inhibition would be associated with stereotype inhibition in participants' situational models.

To test whether participants' stereotypic inferences were predicted by explicit prejudice, we also administered a 12-item version of the Attitudes Towards Blacks Scale (ATBS; Brigham, 1993). To test whether participants' stereotypic inferences were predicted by their motivation to be non-prejudiced, we administered a 10-item version of the Internal and External Motivation to be Non-Prejudiced Scales (IMS & EMS; Plant & Devine, 1998) (of which there were five internal and five external statements). People indicated their agreement with each statement using a response scale from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*).

Procedure

People were tested individually. The inference assessing texts were presented on a PC in white on a black background in 40-column mode. People read one practice story first, followed by the experimental texts. The experimental stories were presented in a different random order for each person. Reading was self-paced. The texts were presented one sentence at a time. After reading a sentence, participants pressed the space bar with their left hand and the next sentence appeared. After each story, participants answered two comprehension questions by clicking one of the two buttons on the mouse with their right hand. The left mouse button was pressed for "yes, this is true", and the right mouse button for "no, this is false". These comprehension questions never asked about the critical inference sentences. There were equal numbers of "yes" and "no" answers.

Immediately after reading all of the stories, participants were given the irrelevant text task. People saw each paragraph individually. Their task was to read each paragraph aloud as quickly as possible, without making errors. The times to read the paragraphs

were recorded and the ratio of the Experimental to the Control condition reading times was used as an index of inhibitory ability. A ratio was used rather than a difference score to provide some correction for general processing speed differences between young and old participants.

After completing the irrelevant text task, participants were given a recognition test based on a method developed by Schmalhofer and Glavanov (1986) and used with older adults by Radvansky et al. (2001). For this test, 16 sentences (critical sentences) were selected from each text to serve as the test items. Half of these sentences included neutral information that was intended to lead readers to make non-stereotypic causal inferences. The other half of the sentences contained information that was intended to induce a stereotypic inference.

There were four versions of each test item. One was the *Verbatim* critical sentence from the text. The second was a *Paraphrase* that retained the propositional content of the original, but had its wording altered either by using synonyms, rewording, or both. The third was an *Inference* that was information that was likely to be inferred during the reading, but which was never actually mentioned. Finally, the fourth was a *Wrong* sentence that contained information that was thematically consistent with the text, but was inconsistent with what had been stated. For this test, a brief title was provided for each set of 16 sentences to remind people to which story the items referred. Participants' task was to indicate whether each of the sentences had actually appeared (i.e., verbatim) in the story. People were warned that some items might differ in only their wording. People pressed one of two buttons on the computer mouse to indicate "yes" or "no" whether the sentence had been read before. Only one version of each critical sentence was used per person, an equal number of Verbatim, Paraphrase, Inference, and Wrong items appeared for each story, and the items were rotated across participants. Examples for the stereotype and non-stereotype conditions are shown below.

Stereotype:

- Verbatim: Malcolm wasn't surprised when he received his SAT scores.
- Paraphrase: When Malcolm's SAT scores came, he wasn't surprised by his scores.
- Inference: Malcolm had scored low on the SAT.
- Wrong: Malcolm had not taken the SAT yet.

Non-stereotype:

- Verbatim: Susan, the family friend, was the first to see Jamal walk in.
- Paraphrase: The family friend, Susan, was the first to see Jamal come in.
- Inference: Susan was sitting so that she could see the back door.
- Wrong: Susan didn't see Jamal until he had been there for a while.

The stereotypicality of the inferences for each of the four stories was assessed by a pretest of 30 younger (age 18–21) and 20 older (age 65–73) adults. For this pretest, participants were presented with the experimental stories as a whole, with the critical inference sentences included, and marked in bold. Their task was to indicate how stereotypic each of the stereotypic and neutral inferences was in the context of the stories using a 1 (*not stereotypic*) to 9 (*very stereotypic*) scale. People rated the stereotypic inferences as significantly more stereotypic than the neutral inferences (African–American stories; $M = 6.42$ vs. $M = 3.76$ for stereotype and neutral items, respectively, $F(1, 48) = 90.52$, $MSE = 1.76$, $p < .001$, Appalachian story; $M = 5.52$ vs. $M = 3.36$, for stereotype and neutral items, respectively, $F(1, 48) = 74.66$, $MSE = 1.38$, $p < .001$, Jewish story; $M = 6.18$ vs. $M = 3.70$ for stereotype and neutral items, respectively, $F(1, 48) = 56.26$, $MSE = 2.05$, $p < .001$). These data were collapsed across the ethnic groups and submitted to a 2 (Age) × 2 (Condition: Stereotype vs. Control) mixed-model ANOVA. There was no significant effect of Age, $F(1, 38) = 1.74$, $MSE = 2.83$, $p = .20$, there was a significant effect of Stereotypicality, $F(1, 38) = 75.89$, $MSE = 1.47$, $p < .001$, and no interaction, $F(1, 38) = 2.01$, $MSE = 1.47$, $p > .10$. These findings suggest that any age differences in inference-making that emerge with these stories are unlikely to be caused by age differences in the content of the relevant stereotypes, but rather are likely to be associated with other age-related cognitive changes.

Finally, after participants finished the recognition memory task, they were given the ATBS, and the IMS/EMS measures.

Results

For the levels of representation recognition test, the data were analyzed using a signal detection approach. A′ scores (following Donaldson, 1992), a non-parametric signal detection measure, were calculated as a discrimination measure. For the situation model measure, inferences were considered hits and incorrect responses were considered false alarms. Again, the drawing of inferences, which is of most central interest here, involves only the measure of situation model memory.

Preliminary analyses

Irrelevant text task. On the irrelevant text task, younger adults were less disrupted by the irrelevant text ($M = 1.59$ ratio) than were the older adults ($M = 2.04$ ratio), $F(1, 117) = 53.63$, $MSE = .11$, $p < .001$. Thus, the older adults had more difficulty keeping irrelevant information from entering the stream of processing. These findings are consistent with those of Connelly et al. (1991), documenting poorer inhibitory ability among older than younger adults.

Explicit prejudice and motivation to be non-prejudiced. The ATBS was coded such that higher numbers indicate greater liking for Blacks. For this scale, the younger adults scored higher ($M = 4.4$) than the older adults ($M = 3.9$), $F(1, 117) = 24.30$, $MSE = .25$, $p < .001$, suggesting that older adults were more overtly prejudiced than younger adults. For the EMS and IMS scales, higher numbers indicate greater external and internal motivation (respectively) not to be prejudiced. Younger adults scored similarly on the EMS ($M = 2.6$) to the older adults ($M = 2.5$), $F < 1$. Younger adults scored slightly higher on the IMS ($M = 4.5$) than older adults ($M = 4.3$), but this difference was only marginally significant, $F(1, 117) = 3.03$, $MSE = .41$, $p = .08$. IMS and EMS scores were then entered as covariates in an analysis of covariance that examined the impact of age on ATBS scores. Consistent with the notion that older adults are more prejudiced than younger adults in a manner largely independent of age differences in motivation to be non-prejudiced, this ANCOVA revealed that the effect of age on prejudice remained significant, $F(1, 115) = 22.61$, $MSE = .22$, $p < .001$ These findings are consistent with earlier research demonstrating that older adults are more prejudiced than younger adults despite relatively equivalent levels of motivation to be non-prejudiced (von Hippel et al., 2000).

Primary analyses

Situation model A′ scores. To assess the impact of Aging and Stereotype processing on situation model performance, separate 2 (Age) × 2 (Story Type) × 2 (Condition: Stereotype vs. Neutral) mixed-model ANOVAs (the first variable was between subjects and the others were within) were conducted. The Story type variable was included because two of our stories concerned Blacks and the other two did not, and our explicit measure of prejudice was directed toward Blacks. An absence of any interactions with Story

Type would indicate that this factor did not have a meaningful impact on the pattern of results.

For the situation model measure, the older adults outperformed the younger adults, $F(1, 117) = 29.34$, $MSE = .042$, $p < .001$, which is consistent with previous research (Radvansky et al., 2001). There was also a main effect of Condition, $F(1, 117) = 43.99$, $MSE = .034$, $p < .001$, with performance being greater for the neutral items than the stereotype items. This indicates that people were less willing, overall, to accept the inferences based on the stereotypes. It should be noted that the Age × Condition interaction was not significant, $F < 1$. This means that the older adults were overall more likely to draw and use inferences to make their memory decisions compared to younger adults. Importantly, this includes the stereotype items, so that the older adults were drawing inferences based on those stereotypes to a higher degree than the younger adults, and incorporating those into their situation models, consistent with our predictions. None of the other effects or interactions were significant. Finally, it should be noted that none of the interactions involving Story Type were significant, suggesting that our findings generalize to a variety of different stereotypes. Thus, the results for the recognition test signal detection analyses are collapsed across story type and summarized in Table 1.

To test whether an increase in stereotypic inferences emerged among older adults above and beyond the overall increase in neutral inferences, an analysis of covariance was done, with stereotypic inferences as the dependent variable and neutral inferences as the covariate. Consistent with the hypothesis that older adults make more stereotypic inferences independently of their tendency to make greater inferences in general, this analysis revealed a significant age difference in stereotypic inferences, $F(1, 116) = 12.61$, $MSE = .03$, $p < .001$.

To examine the relation between memory and the various individual difference measures, we performed a series of correlations. These correlations are reported in Table 2. One of the first things to note is the lack of significant relations between memory for stereotypic information and the explicit prejudice measure, although this may be due, in part, to the fact that not all of our stories were about Blacks. Additionally, inconsistent with predictions, the inhibition measure derived from the irrelevant text task was not related to performance on the situation model level. The absence of this effect will be considered more fully in the general discussion. In general, the lack of correspondence between the individual difference and performance measures suggests that situation model measure age differences in the making of stereotypic inferences is not due to different levels of explicit prejudice, nor to age-related changes in speed of processing or working memory capacity, or general age differences in verbal ability or education. Finally, no interactions emerged between motivation to be non-prejudiced and the inhibition measure or between motivation to be non-prejudiced and age in predicting any of the outcome variables.

Table 1
Recognition discrimination scores (A′) with standard deviations in parentheses. For A′, a score of .5 indicates chance discrimination (all values were significantly different from chance) and 1 indicates perfect discrimination.

	Stereotype	Neutral
Experiment 1		
Young	.57 (.17)	.73 (.15)
Old	.69 (.16)	.79 (.14)
Experiment 2		
Young	.57 (.18)	.73 (.14)
Old	.66 (.20)	.77 (.14)

Table 2
Pearson correlations between the recognition measures in the Neutral and Stereotype conditions, and the various individual difference measures.

	Stereotype	Neutral
Experiment 1		
Age	0.303*	0.191*
Education (years)	−0.040	0.063
Vocabulary	0.024	0.305*
Speed	−0.262†	−0.060
Working memory span	−0.174†	0.030
Irrelevant text	0.130	0.049
Attitudes toward Blacks	−0.105	−0.303*
IMS	−0.020	0.007
EMS	−0.002	−0.084
Experiment 2		
Age	0.258*	0.140
Education (years)	0.001	0.108
Vocabulary	−0.079	0.017
Speed	−0.292*	−0.036
Working memory span	−0.127	−0.092
Irrelevant text	0.262*	0.263*
Black thermometer	−0.027	0.097
White thermometer	−0.010	0.038

* $P<.05$.
† $P<.10$.

Discussion

Experiment 1 revealed that older adults had greater memory than younger adults for stereotypic inferences at the situation model level as measured by our signal detection analysis. This was revealed by significantly greater memory strength among older adults for stereotype-consistent situation models. This finding supports our suggestion that older adults are more likely to make stereotypic inferences during comprehension, and that this stereotyping carries over into their later memory for that information. Although these results were not correlated with our inhibition measure, they are consistent with the idea that older adults draw and maintain a wider range of inferences (both stereotypic and neutral) as part of their later memory-retrieval process as opposed to using their memory for what was actually encountered. This is also consistent with previous studies (e.g., Radvansky et al., 2001) that have consistently shown that older adults draw more inferences and are worse at remembering the specific ideas explicitly mentioned in the text.

It should also be noted that these results were not related to our explicit measures of prejudice. As such, they cannot be explained away as yet another expression of overt prejudice on the part of older adults. Instead, this appears to be a more general phenomenon of aging. This implies that some of the people drawing these stereotypic inferences and reporting them later as having been read before are, in fact, non-prejudiced people. As such, these older adults may be relying on stereotypes despite their best intentions to the contrary.

Experiment 2

The aim of Experiment 2 was to conceptually replicate the primary findings of Experiment 1 using a different dependent measure. In Experiment 1, inference-making was assessed using recognition after reading was completed. In Experiment 2, a lexical decision probe was used. Specifically, people were interrupted at different times during reading with a lexical decision task. On the critical trials, the target was either (a) a word related to a potential stereotypic inference at that point (Stereotype Condition), (b) a word related to a non-stereotypic inference (Neutral Condition), or (c) an unrelated, control word (Control Condition).

If people are drawing inferences at the point the probes occur, they should be faster in the neutral condition of the lexical decision task than in the control condition. Moreover, if people are suppressing stereotypic inferences, then they should be slower in the lexical decision task in the stereotype condition than in the control condition. But if people have difficulty suppressing stereotypic inferences then they should be faster, or the same speed as the control condition. With regard to the effects of aging, if older adults have greater difficulty suppressing inappropriate inferences, then it is expected that they will show smaller inhibition effects for the stereotypic items relative to the younger adults, taking into account baseline differences in activation of non-stereotypic items. The advantage of this method is that it more directly assesses the operation of inhibition at the point of encoding. That is, if response times in the stereotype condition are slower than the control condition that would provide more direct evidence of the operation of inhibition at the point of comprehension. Failure to observe such a pattern would be evidence that such an inhibitory process is not functioning.

Method

Participants

Forty-eight people were tested in each of the two age groups. The younger adults ranged from 18 to 23 years of age ($M = 19.6$), were recruited from the University of Notre Dame, and received partial course credit. These subjects included 40 who identified themselves as White, one as Black, four as Hispanic, and two as Asian, and one who did not indicate. The older adults ranged from 60 to 83 years of age ($M = 71.1$), were recruited from the community and were paid $10 for their participation. These subjects included 44 who identified themselves as White, three as Black, and one as Asian. The younger adults had less education (*Range* 12–17; $M = 13.3$ years) than the older adults (*Range* 12–20; $M = 15.1$ years), $t(94) = 4.47$, $p < .001$, and the younger adults scored lower on the Shipley vocabulary test (*Range* 26–37; $M = 31.1$) than the older adults (*Range* 25–40; $M = 34.1$), $t(94) = 4.29$, $p < .001$. However, the younger adults scored higher on the speeded pattern comparison task (*Range* 6–26; $M = 19.0$) than the older adults (*Range* 2–21; $M = 10.7$), $t(94) = 9.94$, $p < .001$, and the younger adults scored higher on the Turner and Engle (1989) working memory span test (*Range* 5–54; $M = 15.1$) than the older adults (*Range* 0–23; $M = 8.0$), $t(94) = 4.90$, $p < .001$. All participants were native English speakers.

Materials

The same stories were used as in Experiment 1. The primary difference was the inclusion of three types of lexical decision probes. *Neutral probes* referred to non-stereotypic information that could be inferred from the neutral critical sentences in the story, although this information was never actually presented (e.g., the word "winter" for the sample story in the Appendix A). *Stereotype probes* referred to ideas that were consistent with stereotype inferences that could be drawn from the stereotypic critical sentences (e.g., the word "rude" for the sample story). Finally, *Control probes* referred to information unrelated to the story. Each probe occurred in the same location of the story for all subjects. The materials were divided so that for any given probe location, half of the subjects saw a word, and the other half saw a non-word. Non-words were created by changing one letter from the word probes. For example, the word "low" would be changed to "lon". Each person saw equal numbers of the various probe types, thus condition was manipulated within participants.

The mean frequency of these probe words, according to the MRC Psycholinguistic Database norms, were 73.4, 64.2, and 64.8 per million, for the Neutral, Stereotype, and Control conditions, respectively. These values were not significantly different, all $ts < 1$. In addition, the mean number of syllables for the words in all conditions was 1.5.

Procedure

The procedure was similar to Experiment 1 except that in this experiment the reading task was occasionally interrupted with lexical decision probes at critical locations. The task was to indicate whether a given probe was a word by pressing one of two buttons on a computer mouse which was held in the right hand. In addition, we included the recognition test from Experiment 1 as well as two new measures of explicit prejudice. These were Black and White feeling thermometers in which people were asked to rate how warmly they felt toward Blacks and Whites, on a 0 (cold) to 100 (warm) scale. These measures were used in place of the ATBS to assess whether a measure of prejudice more closely focused on affect might be more likely to reveal a relationship with the on-line measure of stereotype inhibition.

Results

Preliminary analyses

Thermometers. In terms of the Black thermometer, older adults scored significantly higher ($M = 81.2$) than the younger adults ($M = 72.3$). Similarly, for the White thermometer, older adults scored higher ($M = 85.6$) than the younger adults ($M = 81.4$). These data were submitted to a 2 (Age) × 2 (Condition: Black vs. White) mixed-model ANOVA. While there were significant main effects of Age, $F(1, 93) = 3.95$, $MSE = 545$, $p = .05$, and Condition, $F(1, 93) = 17.29$, $MSE = 134$, $p < .001$, the interaction was not significant, $F(1, 93) = 1.70$, $MSE = 134$, $p = .20$. Thus, there was a bias for the older adults to respond more positively, and for our participants to prefer whites, but there was no significant difference in preference for Whites over Blacks expressed by the two age groups.

Irrelevant text task. On the irrelevant text task, younger adults were less disrupted by the irrelevant text ($M = 1.50$ ratio) than were the older adults ($M = 1.93$ ratio), $F(1, 93) = 28.74$, $MSE = .15$, $p < .001$. Thus, as in Experiment 1, older adults had greater difficulty keeping irrelevant information from entering the stream of processing.

Primary analyses

Lexical decision. The response time data were trimmed using Van Selst and Jolicoeur's (1994) procedure, which trims data as a function of the number of standard deviations a datum is from the mean, taking sample size into account. The response time data are presented in Fig. 1. The response time and error rate data for the word stimuli were submitted to a 2 (Age) × 2 (Story Type) × 3 (Condition) mixed-model ANOVA. There were main effects of Age, $F(1, 94) = 47.83$, $MSE = 1{,}550{,}527$, $p < .001$, and Condition, $F(2, 188) = 10.45$, $MSE = 81{,}118$, $p < .001$, as well as a significant Age × Condition interaction, $F(2, 188) = 3.26$, $MSE = 81{,}118$, $p = .05$.

To address this interaction, the younger and older adults' data were analyzed separately. The main effect of Condition was significant for both the younger and older adults, $F(2, 94) = 12.24$, $MSE = 24{,}530$, $p < .001$, and $F(2, 94) = 5.90$, $MSE = 137{,}706$, $p = .01$, respectively. The Neutral vs. Control comparison showed significant facilitation for the younger, $F(1, 47) = 15.63$, $MSE = 12{,}330$, $p < .001$, and the older adults, $F(1, 47) = 8.22$, $MSE = 197{,}369$, $p = .006$, suggesting that people in both age groups were sensitive to story context and activated related concepts in memory, as would be expected.

Importantly, for the Stereotype vs. Control comparison, for the younger adults there was a significant suppression effect, $F(1, 47) = 4.38$, $MSE = 25{,}289$, $p = .04$, with people responding more slowly to the stereotype-consistent probes than the control items.

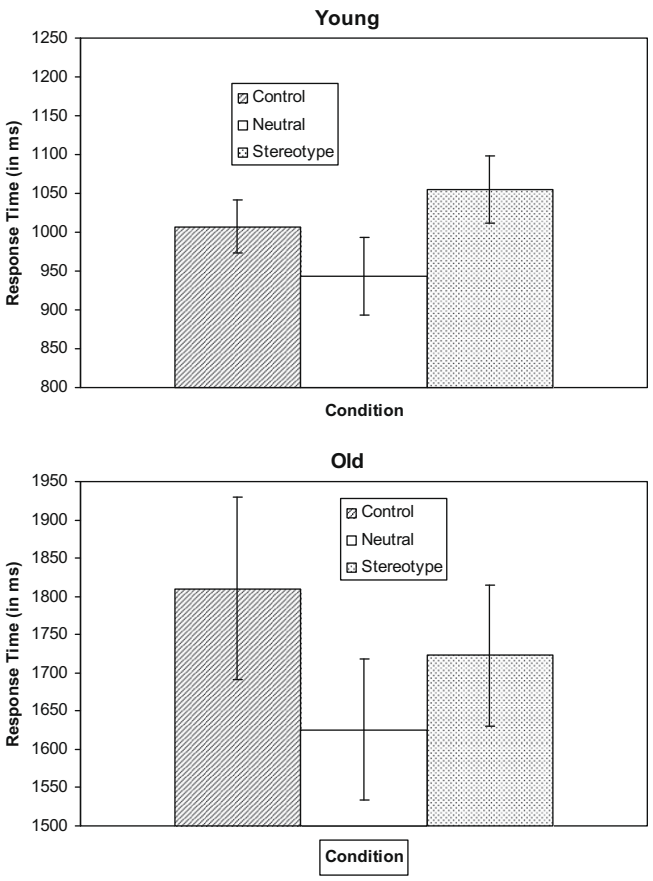

Fig. 1. Lexical decision response times for Experiment 2 separated out by age group. Control probes were unrelated to the text, Neutral words were related but did not refer to stereotypical information, and Stereotype probes referred to stereotypic inferences that could have been drawn from the text.

This is consistent with the idea that younger adults were suppressing this information. In marked comparison, there was a non-significant facilitation effect for older adults, $F(1, 47) = 2.11$, $MSE = 174{,}265$, $p = .15$. Clearly, the older adults are not as effective as the younger adults at suppressing stereotypic inferences; the pattern of the older adults' data is in the opposite direction to the younger adults, showing some evidence of facilitation.

In addition to the effects of primary interest, there was a main effect of Story Type, $F(1, 94) = 14.82$, $MSE = 41{,}201$, $p < .001$. This result was simply due to people being somewhat faster in responding to the probes in the Black stories (1328 ms) than the other stories (1394 ms). Moreover, while there was a significant Story Type × Condition interaction, $F(2, 188) = 9.46$, $MSE = 19{,}823$, $p < .001$, although simple effects tests showed that the effect of Condition was significant for the Black stories, $F(2, 188) = 12.45$, $MSE = 38{,}981$, $p < .001$, and the Other stories, $F(2, 188) = 8.88$, $MSE = 61{,}690$, $p < .001$. Importantly, Story Type did not interact with Age, all *ps* >.20.

The correlations between lexical decision times and the various individual difference measures are presented in Table 3. For both Neutral and Stereotype conditions, the size of the effect was more positive with increasing age. This may reflect general processing speed differences, with older adults processing more slowly and, thereby causing response time effects to be larger. This is paralleled in the correlations with speed and working memory span. None of the correlations involving working memory span were significant. Again, there were no significant correlations with the explicit prejudice measures. As such, the results cannot be attributed to different prejudice levels, but are likely due to more generalized cognitive changes that occur as a result of the natural aging process.

Table 3
Pearson correlations between the recognition response time measures in the Neutral and Stereotype conditions and the various individual difference measures.

	Neutral	Stereotype
Age	0.207*	0.225*
Education	0.069	−0.063
Vocabulary	−0.040	−0.062
Speed	−0.176†	−0.171†
Working memory span	−0.196†	−0.226*
Irrelevant text	−0.170	−0.085
Black thermometer	0.063	0.000
White thermometer	0.035	0.024

For the lexical decision probe task, the average accuracy rate was .98. These accuracy data were submitted to a 2 (Age) × 2 (Story Type) × 3 (Condition) mixed ANOVA. The main effect of Condition was significant, $F(2, 188) = 7.29$, $MSE = .006$, $p = 003$. Performance was better in the Neutral condition ($M = .99$) than the Stereotype ($M = .98$), $F(1, 94) = 4.99$, $MSE = .004$, $p = .03$, and Control conditions ($M = .96$), $F(1, 94) = 10.62$, $MSE = .007$, $p = .002$, and that the latter two were also significantly different, $F(1, 94) = 4.58$, $MSE = .008$, $p = .04$. Overall, performance was generally enhanced by the supporting text context, but more so when stereotype information was not involved. The main effects of Age and Story type were not significant, $F(1, 94) = 1.13$, $MSE = .011$, $p = .29$, and $F(1, 94) = 2.84$, $MSE = .003$, $p = .10$, respectively, nor were any of the interactions, all *ps* > .20.

Situation model A′ scores. The results for the recognition test signal detection analyses are summarized in Table 1. These data were submitted to a 2 (Age) × 2 (Story Type) × 2 (Condition: Stereotype vs. Neutral) mixed-model ANOVA. In general, the data replicated Experiment 1. There was a main effect of Age, $F(1, 94) = 12.76$, $MSE = .054$, $p = .001$, with the older adults having higher scores (.71) than the younger adults (.63). There was also a main effect of Condition, $F(1, 94) = 37.62$, $MSE = .041$, $p < .001$, with scores being higher for the neutral than the (.73) than the stereotype probes (.60). The main effect of Story Type was not significant, $F < 1$, nor were any of the interactions, $Fs < 1.1$. So, like Experiment 1, the older adults were making more inferences overall, including more stereotype inferences. As in Experiment 1, an analysis of covariance assessed whether age differences in stereotypic inferences emerged above and beyond age differences in the general tendency to make neutral inferences. Consistent with the results of Experiment 1, this ANCOVA revealed a significant age difference in stereotypic inferences, $F(1, 93) = 5.04$, $MSE = .03$, $p < .03$.

According to our account, an absence of suppression during comprehension should lead to increased acceptance of stereotype-consistent inferences on the memory test. To assess this prediction, we used the difference between the Stereotype and Control probes on the lexical decision task as an index of suppression during comprehension, with greater suppression corresponding to a negative difference score, and facilitation corresponding to a positive difference score. We used the situation model A′ scores for our measures of memory. Correlation analyses revealed that there was a marginally significant relationship between lexical decision performance and the stereotype situation model level A' score, $r = .19$, $p = .07$, but not between the lexical decision index and the neutral A′ score, $r = .07$, $p = .49$. These data provide suggestive evidence that people who exhibited more positive lexical decision index scores (more facilitation, less inhibition) showed a corresponding increased probability of accepting stereotype-consistent inferences later on as having actually been stated, consistent with our theoretical perspective.

The correlations with memory test data and the various individual difference measures are presented in Table 2. Again, like the memory data of Experiment 1, there were no significant correlations with our explicit prejudice measures. As such, the lexical decision and memory findings are unlikely to be caused by different levels of prejudice. Instead these changes appear to be due to general age-related changes in cognitive processing. However, as in Experiment 1, performance on the irrelevant text task did not correlate differentially with the lexical decision times or memory performance in the stereotype and neutral conditions.

Discussion

The results of Experiment 2 were consistent with those of Experiment 1 in terms of the performance of older and younger adults on the inference items. Specifically, older adults were more likely than younger adults to draw stereotypic inferences, as indicated by the memory scores and lexical decision times. The lexical decision times in Experiment 2 lend greater confidence to the idea that these stereotypic inferences were being drawn during comprehension by older adults, and not just during a later memory test.

It is also worth noting that there was a clear inhibitory effect of the stereotypic inferences among the younger adults. If stereotypic information had not been activated initially there would not have been any difference between the stereotype and control probes. This finding supports the idea that stereotypic inferences initially become activated, and then, after being identified as unwanted, are inhibited. In contrast, for the older adults, there was not only no inhibition effect, but there was even a slight (albeit non-significant) facilitation effect. Perhaps the older adults are not trying to inhibit stereotypic inferences, but that possibility seems unlikely given the findings with the feeling thermometers although, again, not all of our stories were about Blacks. Instead, it seems likely that, at some level, older adults are attempting to inhibit these stereotypic inferences, but are less successful at doing so. Nevertheless, the individual difference measure of inhibition based on the reading with distraction task did not predict lexical decision times or stereotypic memory, thereby failing to disambiguate this issue.

Experiment 3

One concern with Experiment 2 is that the results of the lexical decision task may be an artifact of characteristics of the particular words used, as the stereotypic words were different from the neutral ones. The aim of Experiment 3 was to rule out this possible alternative explanation. In this control experiment we presented the lexical decision task in the absence of any story context. If the same effect is observed, then the results of Experiment 2 are due to an artifact. However, if there is no significant difference then we can be more confident that the observed effects were due to inferences people were drawing during comprehension of the stories.

Method

Participants

Thirty-two younger adults and 22 older adults were tested. The younger adults ranged from 18 to 22 years of age ($M = 19.3$), were recruited from the University of Notre Dame and received partial course credit. The older adults ranged from 62 to 78 years of age ($M = 68.7$), were recruited from the South Bend community and were paid for their participation. All participants were native English speakers. Two additional younger adults were dropped from the data analysis, one for not being a native English speaker and the other for excessively long response times.

Materials and procedure

The 36 words and 36 non-words from Experiment 2 were used in this study. To parallel Experiment 2, these words were divided into two sets, with half of the participants getting one set and the half getting the other. People were presented with the letter strings one at a time in the center of a computer monitor. The letter strings were presented in a random order in white on a black background. The task was to indicate whether the string was an English word or not. Responses were made by pressing one of two buttons on a computer mouse. The left button was pressed for "Yes" and the right button for "No." After each response, the screen was blank with a 400 ms delay before the next trial was presented. No feedback was provided. In addition, there were 10 practice trials to familiarize the participants with the procedure.

Results and discussion

The response time data were trimmed using the same procedure as Experiment 2 (Van Selst & Jolicoeur, 1994). The response time and error rate data were submitted to 2-way repeated measures ANOVAs for Age and Condition. There were main effects of Age for response time, $F(1, 52) = 41.71$, $MSE = 260{,}675$, $p < .001$, and accuracy $F(1, 52) = 10.50$, $MSE = .003$, $p = .002$, respectively, with older adults slower ($M = 1159$ ms) than younger adults ($M = 631$ ms) and slightly more accurate ($M = .99$) than younger adults ($M = .97$). Importantly, there were no significant effects of stereotype condition for either the response time or accuracy data, all Fs < 1. People were similarly fast with the Control (Young = 626 ms; Old = 1151 ms), Neutral (Young = 627 ms; Old = 1149 ms), and Stereotype words (Young = 641 ms; Old = 1176 ms). People were also similarly accurate with the Control (Young = .96; Old = .99), Neutral (Young = .96; Old = 1.00), and Stereotype words (Young = .97; Old = .99). The interactions with age were also non-significant, both Fs < 1. Thus, these results suggest that the data observed in Experiment 2 are not due to a bias in the memory probes themselves, but in how they relate to the texts that people were actively reading.

General discussion

The results of the current study support the idea that older adults are drawing and maintaining stereotypic inferences to a greater degree than younger adults. In both experiments older adults showed greater memory than young adults for stereotypic inferences. It seems likely that older adults were drawing these inferences while they were reading. These inferences were not removed from the current stream of processing, and were integrated into the situation model representation of the events that were being described. When older adults consulted these inference-laden representations on the memory test, they were more willing to accept statements that conformed to those stereotypic inferences.

Our hypothesis was that older adults were more likely to draw and remember these stereotypic inferences because they were less effective at inhibiting unwanted thoughts. In the present context this took the form of ambiguous sentences in the texts activating schemas in long-term memory that contained the stereotypic information. From these activated schemas, inferences would be generated to fill in gaps left by the text. In many cases, at some level, people would have identified these stereotypic inferences as ones that they would prefer not to make. As a result, this information would need to be inhibited to keep it from being included in final situation model. However, because older adults are less effective at suppressing unwanted thoughts, some of this information remained active. As a result, the older people were more stereotypic in their memory than the younger adults.

This interpretation is bolstered by the lexical decision times from Experiment 2. When people in this experiment were given lexical decision probes, younger adults were slower to respond to the stereotype-consistent probes relative to unrelated controls. This is consistent with the idea that this information has been inhibited to prevent it from entering the current stream of processing. Importantly, and in marked contrast, there was no such inhibition effect for the older adults. Instead there was a nominal facilitation effect, suggesting that this information had been initially activated, and only ineffectively suppressed. Thus, the memory and lexical decision data are consistent with other evidence concerning the role of inhibition in age-related changes in stereotyping and prejudice (Gonsalkorale et al., 2009; Stewart et al., 2009; von Hippel et al., 2000), and furthermore suggest that older adults fail to suppress stereotypic information when it is initially encoded, whereas younger adults succeed at this stereotype suppression. However also not that if a stereotype is explicitly discounted, it is possible for older adults to reduce the effect of unwanted stereotypes (Radvansky, Lynchard, & von Hippel, 2009).

The one major finding that was inconsistent with this account is that the individual difference measure of inhibition was not correlated with either the memory data or the lexical decision times. This is the same measure that mediated the age difference in stereotyping and prejudice in von Hippel et al. (2000), and mediated the age difference in control of automatic bias in Stewart et al. (2009), and thus it is unclear why it did not predict the current set of cognitive responses to stereotypic information. Perhaps the encoding measures in the current research are sensitive to other types of inhibitory processing, or perhaps this finding just represents error variance in the measure of inhibition. Nevertheless, in conjunction with lack of a relationship with the explicit prejudice measures, the current results are still best accounted for by the inhibitory failure model of age differences in stereotyping and prejudice.

In sum, the current research is consistent with the idea that inhibitory deficits contribute to older adults relying on stereotypes more than younger adults, which may lead older adults to be prejudiced despite their intentions to be egalitarian. The current research goes beyond previous data by providing direct evidence that a lack of stereotype inhibition among older adults contributes to greater levels of stereotyping as older adults encode incoming information. Thus, the current findings with the on-line measures of stereotype inhibition increase our understanding of why older adults would report a strong motivation to be non-prejudiced, but then nevertheless show greater stereotyping and prejudice than young adults. The current findings suggest that this effect can be best understood as a failure to inhibit stereotypes at encoding, rather than a failure in other stages of information processing.

Acknowledgments

We would like to thank Seth Allen, Amanda Caravalho, Kate DiNardo, Melissa Ferrello, Kathleen Logisz, Nick Lynchard, Tiffany Milligan, and Brian Stouffer for their assistance in collecting the data. This research was supported in part by Grant R01 17842 from the National Institute of Aging. Please address all correspondence regarding this paper to: G.A. Radvansky, 218-C Haggar Hall, Department of Psychology, University of Notre Dame, Notre Dame, IN 46556. Email may be sent via the internet to: gradvans@nd.edu.

Appendix A

Sample story discussed in Experiments 1 and 2, with critical sentences in bold, and stereotypic inference driving sentences underlined as well. The critical inference probe words used for the Stereotype and Non-stereotype conditions in Experiment 2 are in parentheses.

A.1. At Christmas time

It had been a mild autumn and winter. The weather had been perfect. It looked like it was going to be a great holiday season. Tonight was the night of the annual family Christmas party. **Jamal came in the back door, arriving late** (LATE). The back door had been left unlocked this evening. It also didn't squeak like it normally did. Someone must have oiled the hinges. **Everyone was seated at the dining room table** (MEAL). The house was already abuzz with chatter and laughter. **Susan, the family friend, was the first to see Jamal walk in** (VIEW). Susan was a nun at the local hospital. She was clearly unhappy about the amount of alcohol being served, although the rest of the guests were enjoying themselves. **Susan's face brightened when she saw that Jamal had finally arrived** (EXCITED). Moments later Jamal seated himself. He waved to everyone. He also made sure to flash his winning smile. **Jamal made a point of sitting next to his mother, Pearl** (FAMILY). Then, his brother Malik, came into the room bearing an enormous turkey. Jamal watched with anticipation (HUNGRY). Malik was having trouble carrying the large turkey into the room. **Susan saw that Jamal didn't help** (LAZY). The turkey looked great, and it tasted wonderful too. However, it soon became apparent that something was amiss. **Pearl had not put the stuffing into the turkey when she cooked it** (FORGOT). But no one seemed to mind. Pearl quickly microwaved the stuffing, which tasted just fine. The conversation tended to die down while people ate, but by the time dessert was served several conversations had again started up around the large table. Jamal and his brother Malik reminisced about high school. Malik talked about how his brother almost never seemed to be home. **Jamal was always at his after school activities** (SPORTS). Malik would always be ready with a trick on him when he came home. **Other people looked at them as they shared several laughs** (LOUD). Jamal turned his attention to Cousin Sharon. She was talking about her son Malcolm's application to college. **Malcolm wasn't surprised when he received his SAT scores** (LOW). She wondered whether he would get into a good college. **Jamal reassured his cousin Sharon** (WORRY). He said that things would work out one way or another. Sharon replied that it was easy for Jamal to be so casual. **Jamal didn't have any kids** (ALONE). This was true, but Jamal reminded Sharon that at least Malcom wasn't trying to make a living like her eldest son, Deon. **Deon was always playing sports** (ATHLETE). Soon, someone interrupted to suggest that they turn on the television. Apparently there was a special live showing that evening of "The Night Before Christmas". The local community theater was putting it on. **Pearl's brother had been given a minor role** (ACTOR). Everyone was excited to see him. This turned out to be a bad idea. The guests quickly became uncomfortable. They watched him struggle with his lines. **It seemed like Pearl's brother didn't really understand his character** (DUMB). However, they had no choice but to watch the show. Everyone was relieved when the evening finally drew to a close.

Examples of critical recognition test sentences

Stereotype:

- Verbatim: Malcolm wasn't surprised when he received his SAT scores.
- Paraphrase: When Malcolm's SAT scores came, he wasn't surprised by his scores.
- Inference: Malcolm had scored low on the SAT.
- Wrong: Malcolm had not taken the SAT yet.

Neutral:

- Verbatim: Susan's face brightened when she saw that Jamal had finally arrived.
- Paraphrase: Susan's face lit up when she saw that Jamal had arrived at last.

– Inference: Susan had been waiting for Jamal to arrive.
– Wrong: Susan scowled when Jamal walked into the house.

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