Research Report

Age, Race, and Implicit Prejudice

Using Process Dissociation to Separate the Underlying Components

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ABSTRACT—*Older adults express greater prejudice than younger adults, but it is not clear why. In a community-based sample, we found that older White adults demonstrated more racial prejudice on an implicit measure, the race Implicit Association Test, than did younger adults. Process-dissociation procedures indicated that this difference in implicit prejudice was due to older adults having less control of their automatic prejudicial associations rather than stronger automatic prejudicial associations. Furthermore, this age difference in control was mediated by age-related deficits in inhibitory ability. White participants showed stronger automatic prejudicial associations than did Black participants.*

Age differences in prejudice are well documented but poorly understood. Compared to younger Americans, older Americans have more negative attitudes toward a variety of different groups (Firebaugh & Davis, 1988; von Hippel, Radvansky, & Copeland, 2008; Wilson, 1996), but there are competing explanations for this effect. On the one hand, it might be the case that older adults express more prejudice because they were socialized in more prejudiced times (Schuman, Steeh, Bobo, & Krysan, 1997). On the other hand, due to their poorer inhibitory control than younger adults (Hasher, Zacks, & May, 1999; Radvansky, Zacks, & Hasher, 2005), older adults might have greater difficulty inhibiting their unintentionally activated stereotypes and prejudicial thoughts (von Hippel, Silver, & Lynch, 2000). The evidentiary basis for this latter possibility is relatively thin, however, because it relies exclusively on age differences in

explicit stereotyping and prejudice (Henry, von Hippel, & Baynes, in press; von Hippel et al., 2000). Thus, it may be the case that inhibitory deficits influence nothing more than the willingness to express stereotypical attitudes and prejudice.

One way to examine this possibility is to assess whether older adults show greater implicit prejudice[1] than younger adults, and research suggests that they do (Nosek, Banaji, & Greenwald, 2002). However, whether age differences in implicit prejudice are related to inhibition remains an open question. Furthermore, although implicit measures remove the self-report component of explicit measures, performance can nevertheless reflect both automatic and controlled processes (Jacoby, 1991; Payne, 2001). As a consequence, age differences on implicit measures could reflect differences in automatic associations (as suggested by theories based on age-related socialization experiences), control of those associations (as suggested by theories based on age-related inhibitory control), or both.

Fortunately, there are procedures available for separating the automatic and controlled components of implicit measures. One of these is the process-dissociation procedure (PDP; Jacoby, 1991, 1998), which relies on altering the task demands so that automatic and controlled processes sometimes lead to the same response and sometimes to opposing responses. The logic underlying PDP is that when automatic and controlled processes both lead to the same response, performance can be considered a blend of both types of processes. In contrast, when controlled processes lead to one response and automatic processes lead to another, performance can be considered the presence of one type of process in the absence of the other. The result is two

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[1]We use the term *implicit prejudice* to refer to implicit attitudes toward members of different groups. Although prejudice is typically conceived as a negative attitude, at this point one can only assess an individual's relative position on the continuum from positive to negative, as defining a particular individual as implicitly prejudiced is not yet possible (Blanton & Jaccard, 2006).

equations with two unknowns (the contribution of automatic and controlled processes), which allows for the algebraic estimation of these two processes (see the appendix) whenever task demands can be manipulated to cause automatic and controlled processes to sometimes work together and sometimes work in opposition.

Such alternating task demands are a hallmark of most implicit measures of prejudice. For example, in the Black/White version of the Implicit Association Test (IAT; Greenwald, McGee, & Schwartz, 1998), participants categorize Black names on the same key as negative attributes and White names on the same key as positive attributes, and then switch this pairing. For a person who has automatic associations between Blacks and negativity, the first set of categorizations would cause automatic associations and controlled processes to lead to the same response and the second set would cause automatic associations and controlled processes to lead to the opposite response. Because PDP is based on the premise that automatic influences drive responses whenever controlled processes fail, and because the IAT is sufficiently difficult that controlled responding is often imperfect, PDP analyses can be used to assess the degree to which automatic and controlled processes contribute to differences in implicit prejudice.[2]

If age differences in implicit prejudice reflect differences in socialization, then they should emerge in the automatic component of the IAT; compared to younger adults, older adults should have stronger automatic associations between Black faces and negative attributes. In contrast, if age differences in implicit prejudice reflect differences in inhibitory control of prejudicial thoughts, then they should emerge in the controlled component of the IAT; older adults should have greater difficulty than young adults in controlling their automatic associations between Black faces and negative attributes in an effort to respond accurately. Furthermore, if age differences on the control component reflect inhibitory losses, then these age differences in control of automatic associations should be mediated by inhibitory losses. The goal of the current experiment was to test these competing hypotheses.

A secondary goal of the current research was to assess whether the PDP approach to the IAT could also provide evidence about race differences in implicit prejudice. Unlike age differences, race differences in the IAT (see Nosek et al., 2002) are likely to reflect differences in automatic associations rather than controlled processes. By virtue of the de facto segregation common in the United States, Blacks and Whites are likely to have far more positive experiences with members of their own race than with members of the other race. Thus, if the inhibitory

account of age differences in prejudice is correct, then age and race differences should have competing sources; the age effect should manifest itself on the control component of the IAT, and the race effect should manifest itself on the automatic component.

METHOD

Participants
One hundred twelve people between the ages of 40 and 91 (mean age = 67.22 years, SD = 13.49 years), of whom 32 were Black and 80 were White, were recruited from various community organizations in Columbus, Ohio, and reimbursed \$10 for their participation. One participant was removed from the sample for being an influential outlier (with a DFBETA score about twice as large as that of the other participants; Cohen, Cohen, West, & Aiken, 2003).

Materials and Procedure
The experiment was run on laptop computers in common rooms where participants were recruited. In a counterbalanced order, participants completed a Black/White version of the IAT, the Internal Motivation to Respond Without Prejudice Scale (IMS; Plant & Devine, 1998), and a measure of inhibitory ability, the reading-with-distraction task (Connelly, Hasher, & Zacks, 1991). They then completed a measure of processing speed.

For the IAT, participants were told that they would be doing a categorization task in which they would classify words and images into groups, and that they should try to classify the items as quickly and accurately as possible. Participants categorized four types of stimuli (i.e., photos of Black and White male faces, and pleasant and unpleasant words) using two response keys (*e* or *i*). The race stimuli included black and white photographs of six Black and six White faces, which were categorized as Black or White. The pleasant and unpleasant words were *peace*, *love*, *wonderful*, *laughter*, *happy*, *pleasure*, *friend*, *joy*, and *terrible*, *awful*, *failure*, *nasty*, *evil*, *horrible*, *war*, and *agony*, respectively, which were categorized as positive or negative.

Participants first completed 60 trials in which they practiced the various categorization combinations. Next, they completed 40 critical trials (the *compatible* block), in which *White* and *pleasant* were associated with one response key and *Black* and *unpleasant* were associated with the other key. The pairings of race and evaluative words were then reversed, and after another 40 practice trials, participants completed 40 *incompatible* trials (i.e., *White* and *unpleasant* were associated with one response key and *Black* and *pleasant* were associated with the other).

For the IMS, participants rated various statements about their motivation to respond to others without prejudice on a 9-point scale (1 = *strongly disagree*, 9 = *strongly agree*). To measure inhibitory control, participants were presented with six paragraphs from Connelly et al. (1991) that were written in italic script; three of these paragraphs contained distracting phrases

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[2]IAT scores have also been successfully decomposed into automatic and controlled processes using the quadruple-process model developed by Sherman and colleagues (Conrey, Sherman, Gawronski, Hugenberg, & Groom, 2005; Sherman et al., 2008). We chose not to use the quadruple-process model because control can be spread across three different parameters in this model, and the goal of the current research was to make the more straightforward comparison of automatic and controlled processes provided by PDP analyses.

interspersed throughout in roman script. The paragraphs were topically unrelated to stereotyping and prejudice, and participants were presented with them one at a time and asked to read them out loud as quickly and accurately as possible while ignoring the roman script. To minimize the impact of processing speed on this measure, the average reading times with distraction were regressed on the average reading times without distraction, and the residual from this regression was used as the indicator of inhibitory ability (the same pattern of results emerges with difference scores or ratio scores).

To measure processing speed, participants completed a speeded figure comparison task (Salthouse & Babcock, 1991). Participants viewed 30 pairs of figures on a computer, 1 pair at a time, and indicated as rapidly as possible whether the figures were the same or different. Response speed was scored as the average speed across the last 29 trials.

RESULTS

Response times on the IAT were trimmed as recommended by Greenwald et al. (1998) and then log-transformed; a difference score was then created by subtracting the average in the compatible blocks from the average in the incompatible blocks. An analysis of variance on the log IAT score revealed the expected race effect, with Whites showing a larger IAT effect ($M = .37$, $SD = .23$) than Blacks ($M = -.05$, $SD = .26$), $F(1, 110) = 67.73$, $p < .001$, $d = 1.69$. Furthermore, although the absolute value of the IAT must be interpreted with caution (Blanton & Jaccard, 2006), Whites' IAT scores differed significantly from zero, $t(78) = 13.95$, $p < .001$, $d = 1.57$, whereas Blacks' IAT scores did not, $t(31) = -1.05$, $p = .30$, $d = 0.19$.

To test whether the predicted age effects emerged on the IAT, a partial correlation was computed between participants' IAT scores and age while controlling for speed, because older adults tend to be slower, and slower responses can inflate IAT scores (Hummert, Garstka, O'Brien, Greenwald, & Mellott, 2002). This analysis revealed that, among Whites, older adults showed greater racial prejudice on the IAT ($pr = .24$, $p < .03$). Among Blacks, in contrast, no significant effect emerged for age ($pr = -.16$, $p > .35$).

To further examine the source of the race effect on the IAT, automatic and controlled estimates were calculated from errors on the IAT. As can be seen in Table 1, participants' error rates averaged 7% across the two components of the IAT. This error rate is similar to that reported by Conrey, Sherman, Gawronski, Hugenberg, and Groom (2005) in their quadruple-process modeling of the IAT (average error rates ranged from 5% to 7% in the experiments in which they did not impose a response time window) and that reported by Payne (2001) in his PDP modeling of the "weapons effect" (average error rates ranged from 6% to 8% in the experiment in which he did not impose a response-time window). PDP analyses were conducted with all participants, including the 3 Blacks and 10 Whites who made no errors

TABLE 1

Percentage of Errors in the Implicit Association Test as a Function of Participant's Race and Pairing of Race and Valence on the Response Keys

| | Response-key pairing | | | | | |
| | Black-negative/ White-positive | | | Black-positive/ White-negative | | |
Participant's race	M	SD	Range	M	SD	Range
Black	7.58	10.80	0–40	7.42	9.78	0–42
White	3.45	5.28	0–25	10.02	10.08	0–50

on the IAT, following procedures used by Payne (2001) to compute PDP estimates in the absence of error.[3] Consistent with predictions, the automatic estimate was significantly higher for Whites ($M = .69$, $SD = .18$) than for Blacks ($M = .51$, $SD = .22$), $F(1, 110) = 18.96$, $p < .001$, $d = 0.88$. Control estimates were equivalent among Whites ($M = .84$, $SD = .13$) and Blacks ($M = .83$, $SD = .18$), $F(1, 110) = .23$, $p > .60$, $d = 0.09$.

To examine the origins of age differences on the IAT for White participants, we regressed the estimates of control and automatic associations onto age. A significant age effect emerged for control (see Fig. 1) but not for automatic associations ($\beta = .07$, $p > .50$), indicating that increasing age was associated with decreasing control but not stronger automatic associations.[4] To assess whether inhibitory decline mediated this relationship between age and IAT control, we regressed the residual score from the reading with distraction task onto age, and then regressed the control estimate onto age and the residual reading score simultaneously. As can be seen in Figure 1, the results of this analysis suggest that decline in inhibitory ability partially mediates the effect of age on IAT control. A Sobel test revealed that the indirect effect of age on IAT control via inhibition was significant ($z = -2.82$, $p < .01$).

DISCUSSION

The results of this study suggest that age differences in implicit racial prejudice may be due to age-related deficits in inhibitory ability. In the current research, older White adults showed greater implicit racial prejudice than younger White adults, and this age difference reflected losses in control over automatic associations rather than stronger associations themselves. In contrast, the difference that emerged on the IAT between White

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[3]When PDP analyses were conducted without the 13 participants who made no errors on the IAT, all of the results reported here remained significant.

[4]An interaction also emerged between IMS and control ($\beta = -.36$, $p = .001$), such that participants high in motivation not to be prejudiced showed a smaller IAT effect on the log reaction time measure when they had high control than when they had low control ($\beta = -.54$, $p < .01$), whereas low-motivation participants did not show a difference on the IAT as a function of control ($\beta = .18$, $p > .15$). This finding provides further support for the PDP approach, in that the PDP estimate of control (based on errors) predicted levels of implicit prejudice (based on reaction time) among participants who desired to be nonprejudiced (based on self-report).
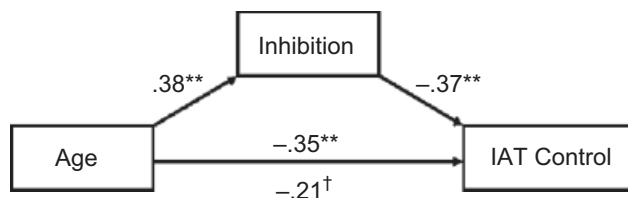
Fig. 1. Mediation of the effect of age on the control component of the Implicit Association Test (IAT) via inhibition among White participants. Path coefficients are standardized regression weights. The path coefficient above the line from age to IAT control represents the direct effect without the mediator in the model. The path coefficient below the line from age to IAT control represents the direct effect with the mediator in the model. Statistical significance of the coefficients is indicated, $^{\dagger}p < .10$, $^{**}p < .01$.

and Black participants reflected stronger associations between White and good, and between Black and bad, among Whites as compared to Blacks. Thus, age and race differences in implicit prejudice appear to have different sources.

Just as important, the age differences in control that emerged among White participants were partially mediated by age differences in inhibition. These results are consistent with prior research indicating that PDP control is associated with executive control processes (Amodio et al., 2004; Payne, 2005), and also with prior research indicating that age effects on PDP control of memory are associated with inhibitory deficits (Hedden & Park, 2003). Thus, the current results suggest that age differences in prejudice run deeper than mere differences in willingness to express prejudice, but at the same time do not reflect stronger negative associations among older adults. Rather, these findings suggest that older adults have more difficulty than younger adults in putting the brakes on their automatic prejudicial responses.

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APPENDIX: SEPARATING AUTOMATIC AND CONTROLLED PROCESSES WITH PDP

In a congruent condition, responding based on automatic associations or controlled processing (i.e., on the basis of the prescribed key instructions) will lead to a correct categorization. This rela-tionship is expressed mathematically in the following equation:

$$P(\text{correct}|\text{congruent}) = C + A(1 - C)$$

Therefore, the probability of responding correctly on congruent trials is the probability of controlled thinking (C) plus the probability of an automatic association when control fails, $A(1 - C)$. In the incongruent conditions, automatic influences (A) and controlled thinking (C) should lead to contradictory responses. Errors result to the extent that control fails, and people respond based on their automatic associations. Mathematically, this is written as

$$P(\text{error}|\text{incongruent}) = A(1 - C)$$

The two sets of equations can then be used to algebraically derive estimates of each process (Jacoby, 1991, 1998; Payne, 2001).