

On the Relation between Associative Strength and Automatic Behavior

Ap Dijksterhuis

University of Nijmegen, Nijmegen, The Netherlands

Henk Aarts

University of Leiden, Leiden, The Netherlands

John A. Bargh

New York University

and

Ad van Knippenberg

University of Nijmegen, Nijmegen, The Netherlands

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In two experiments the relation between past contact, stereotypic associative strength, and stereotype activation effects on memory performance was investigated. It was hypothesized that, for some stereotypes, contact can lead to the development of stronger stereotypical associations. Associative strength, in turn, was expected to determine stereotype activation effects on behavior (in this case, memory performance). In Experiment 1, it was shown that people who reported to have had much previous contact with elderly people performed worse on a memory (free recall) test after being primed with the stereotype of the elderly. People who reported to have had little previous contact did not show any effects of priming. In Experiment 2, we confirmed that this effect is mediated

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Address correspondence and reprint requests to Ap Dijksterhuis, Department of Social Psychology, University of Nijmegen, P.O. Box 9104, 6500 HE Nijmegen. E-mail: dijksterhuis@psych.kun.nl.

by associative strength. People who reported to have had a lot of contact with the elderly had developed an association between the category elderly and the attribute "forgetfulness." The strength of this association, in turn, predicted the degree of memory impairment after activation of the category elderly. © 2000 Academic Press

As far as I am concerned, there are three good things about getting older. I can sleep sitting up, I can watch *Morse* repeats over and over without knowing how they are going to finish, and I can't remember the third thing.

—Bill Bryson

For many, the idea that our actions are the consequence of our intentions, or our will, is reassuring. We are in control and we do what we *want* to do. Comforting as it may be, this idea is not entirely correct. The importance of our intentions and goals notwithstanding, percepts derived from our (social) environment claim a prominent position in the board of behavioral directors as well. Sometimes we do what we want, but oftentimes we just do what we see.

One way in which our social environment directs our actions is through cognitive constructs such as personality traits and social stereotypes. The perception of an individual usually leads to the activation of traits (Gilbert, 1989; Winter & Uleman, 1984) or stereotypes (Bargh, 1994; Devine, 1989) and the activation of these constructs affects our behavior. The perception of elderly people tends to make us slow (Bargh, Chen, & Burrows, 1996), and forgetful (Dijksterhuis, Bargh, & Miedema, 2000), the perception of African-Americans tends to make us hostile (Bargh et al., 1996; Chen & Bargh, 1997), and the perception of college professors tends to make us smart (Dijksterhuis & van Knippenberg, 1998; for other demonstrations of this phenomenon, see Carver, Ganellen, Froming, & Chambers, 1983; Dijksterhuis & van Knippenberg, 2000; Dijksterhuis, Spears, et al., 1998; Levy, 1996; Macrae et al., 1998; Macrae & Johnston, 1998).

In most of the experiments that demonstrate the influence of cognitive constructs on overt behavior, social categories were used as priming stimuli. As a large literature shows, activation of a category leads to activation of stereotypes (Blair & Banaji, 1996; Devine, 1989; Dovidio, Evans, & Tyler, 1986; Dijksterhuis & van Knippenberg, 1996; Macrae, Stangor, & Milne, 1994) and activation of these associated stereotypes cause what we may call behavioral adjustment. They do not elicit "new" behavior (as opposed to for instance goals), instead, they adjust ongoing behavior. That is, activation of the construct slow does cause behavior one is—for whatever reason—already engaging in to be performed more slowly.

It has not only been demonstrated that activated traits or stereotypes adjust ongoing behavior, it is also known that the correspondence between the degree of category activation and the size of the behavioral effects is linear. The more we activate a category, the more the associated stereotype will be activated and

the stronger the effects on behavior will be. Dijksterhuis & van Knippenberg (1998) for instance, showed that activating the category "professors" for 9 min led to greater effects on a test that assessed general knowledge than activating this category for only 2 min. In sum, the higher the degree of activation of a trait or stereotype, the more pronounced the behavioral effects will be.

The finding that more activation leads to more pronounced behavioral effects has an important implication. In the experiment alluded to in the previous paragraph, the degree of stereotype activation was the consequence of different degrees of category activation. However, differences in the degree of stereotype activation can also be caused by differences in the strength of the association between a category and a stereotype (see Fazio, Dunton, Jackson, & Williams, 1995; Lepore & Brown, 1997; for a comparable idea in the realm of implicit racial attitudes). For those who do associate professors with intelligence very strongly, category activation should lead to a relatively high degree of stereotype activation, and hence, to relatively large behavioral effects. Conversely, for people who do not associate professors with intelligence, or do so very weakly, category activation should not lead to activation of the stereotype intelligent, and hence, not to intelligent behavior. Associative strength, in other words, should mediate the effects of category activation on behavior.

Do Stereotypic Associations Differ in Strength between People?

Of course, the prediction that associative strength determines the strength of effects of stereotype activation on overt behavior rests on the assumption that stereotypical associations do differ between individuals. There is recent research demonstrating that such associations indeed differ in strength between people. Kawakami, Dion, & Dovidio (1998) recently established that endorsement of a racial stereotype was predictive of automatic activation of this stereotype upon category activation. People who endorsed stereotypes showed significantly greater activation levels than people who did not endorse this stereotype. That is, people who endorsed the stereotype have, on average, stronger associations. Furthermore, the ease with which people can generate gender stereotypes differs as a function of prejudice level (Dijksterhuis, Macrae, & Haddock, 1999). People who scored low on sexism found it harder to list female stereotypes than people who scored high on sexism. This implies that stereotypes are more accessible for some than for others, which may mean that the underlying associations differed in strength. Hence, there is some evidence for variations in associative strength (but see Wittenbrink, Judd, & Park, 1997).

Variations in associative strength can be the result of different processes. Stereotypes can be—at least partly—learned through direct experience or direct contact with group members. Such stereotypes have to be relatively accurate descriptors of real people, as one can only learn a stereotype through direct experience if stereotypical behavior is indeed encountered in real life (the literature on the contact hypothesis suggests that contact can also reduce associative strength; see Brewer, & Brown, 1998, for a recent review). Such stereo-

types of course exist. Although perhaps politically incorrect, the idea is defensible that the elderly are, on average, more forgetful than the average adolescent (Craik, & Jennings, 1992; Hasher, & Zacks, 1988; Hess, 1994; Howard, 1996; Salthouse, 1991; Schwarz, Park, Knauper, & Sudman, 1999). Since such stereotypes can, at least partly, develop as a result of direct experience, we believe that at least part of the variance in the strength of such stereotypical associations can be accounted for by direct experience.

The way contact leads to the development of these stereotypes may ensue through associative learning. The perception of an elderly person leads to categorization ("She is old"). The perception of a specific action ("Smells like something's burning . . . She must have forgotten to take the cake out of the oven") elicits the underlying trait ("She is forgetful"; cf. Winter & Uleman, 1984). In combination, these automatic effects may lead to the formation of an association ("elderly are forgetful"). Sherman (1996; see also Sherman & Klein, 1994) demonstrated such effects. When participants are confronted with behavioral descriptions of group members, they establish associations between this social category and the traits implied by these behavioral descriptions. Recently, Dijksterhuis and van Knippenberg (1999) further investigated the development of such stereotypical associations. Participants were presented with behavioral information about "Group K." This information had implications for several underlying traits. When the implications were consistent (e.g., when all members of Group K performed relatively friendly actions), associations developed. Both Sherman (1996) and Dijksterhuis and van Knippenberg (1999) show that people can develop stereotypical associations on the basis of concrete behavioral information surprisingly fast.¹

Now if direct experience can indeed determine associative strength, it follows that it can also determine behavioral effects of category activation: Contact with elderly people leads to the development of an association between the elderly and memory impairment, and more contact leads to a stronger association. The stronger the association, in turn, the stronger the effects of category activation on memory will be.

Overview of the Studies

The presumed relationship between direct experience, stereotype activation, and effects of stereotype activation on behavior are tested in two experiments. In

¹ The development of stereotypes through direct contact can proceed even faster than one may think because once a stereotype has been developed to a certain degree, these stereotypes function as expectations that guide information processing in a stereotype-confirming way. It has been demonstrated that stereotypes bias perception in a stereotype-confirming way (Devine, 1989; Dijksterhuis, & van Knippenberg, 1996; Macrae, Stangor, & Milne, 1994). Furthermore, stereotypes bias the inferences we make in a stereotype-confirming direction (Duncan, 1976; Kunda, & Sherman-Williams, 1993; Sagar, & Schofield, 1980). Finally, stereotypes affect memory in a stereotype-confirming way (Higgins & Bargh, 1987; Snyder & Uranowitz, 1978; Van Knippenberg & Dijksterhuis, 1996).

both experiments, participants are primed with the category of the elderly. As a dependent variable we measure memory performance, based on the stereotype of elderly having impaired memory. The paradigm that is used here has been used earlier and in a previous series of studies we have repeatedly shown that activation of the category elderly indeed leads to deteriorated memory performance (Dijksterhuis, Bargh, & Miedema, 2000; see also Levy, 1996).

Our choice for the stereotype used in the two current studies is based on two considerations. First, the stereotype of elderly as showing impaired memory functioning is at least to some degree accurate. A vast body of literature (see earlier mentioned references) documents this. Although the elderly certainly do as well as others on some tasks, elderly score consistently lower than others on other memory tasks, such as free recall tasks. Second, given that associative strength differs between people as a function of frequency of direct experience or contact, differences between people in frequency of contact are needed to be able to find differences in associative strength. In our view, it is likely that contacts of undergraduate students (the participants in the experiments) with elderly differ in frequency between individuals.

In the both experiments, participants are divided into two groups: Participants who reported to have had a lot of contact with elderly people versus participants who had little contact with elderly people. It is hypothesized that activating the category of the elderly will lead to impaired memory performance among participants with a lot of contact but not (or to a lesser extent) for people who had little contact. In the second experiment, we also test the mediating role of associative strength. It is hypothesized that participants with a lot of contact with elderly people will have developed a strong association between the category elderly and the attribute "forgetfulness" and that associative strength predicts strength of the behavioral effects after category activation.

EXPERIMENT 1

Method

Participants and design. Seventy-five undergraduates from the University of Nijmegen were randomly assigned to one of two conditions: They were either primed with the category of the elderly or not. Participants received Dfl. 5 (about \$2.50) as compensation.

Procedure and stimulus materials. Upon entering the laboratory, participants were seated in cubicles containing a computer. Participants were told that they would participate in two unrelated experiments: One in which the social life of undergraduate students was investigated and one in which word recognition was investigated. After this brief introduction, the experimenter started the computer program and left the cubicle. The first task was conducted to assess the amount of contact participants had with the elderly and we asked them the question, "How much time do you generally spend among the elderly?" and participants could indicate their answer on a 9-point scale ranging from *very little time* (1) to

very much time (9). In order not to raise any suspicion among the participants, we asked them eight questions about the time they spend among different social groups, such as family members and high school friends. The order of the questions was fixed and the critical question about time spend among the elderly was always in fifth position.

After this short task, participants were presented with a word-recognition task. They were told that they would be presented with 30 letter strings appearing one by one on the screen. Half of these letter strings were existing words (e.g., bike) while the other half were nonsense words (e.g., gtwws). We told participants that their task was to indicate as fast as possible whether a string was an existing word or not by pushing a “yes” or a “no” button.

These 30 words were preceded by subliminal primes. In the elderly prime condition, each letter string was preceded by a word related to the elderly (but not specifically to forgetfulness, e.g., old, gray, and bingo). In the control condition, these words were replaced by words unrelated to the elderly stereotype. All prime words were presented for 17 ms and masked by a row of X's (“XXXXXXXXXX”). This row remained on the screen for 225 ms and was immediately followed by the target word. The target word remained on the screen until participants responded. Between trials, there was a 1500-ms pause. In both conditions, 15 different prime words were used and all these words were used twice. Participants were randomly allocated to one of the two conditions by a computer program.

After participants finished the word-recognition task, they were presented with a surprise free recall task. They were asked to open an envelope that was placed behind the computer. This envelope contained an empty sheet of paper and participants were asked to recall as many of the existing words from the word-recognition task as possible. Participants were given 3 min to complete the task.

After completion of the surprise recall task, participants were instructed to return to the experimenter. Subsequently, they were thanked, paid and debriefed.

Results and Discussion

First, we divided participants into two groups: Participants with little contact with the elderly versus participants with a lot of previous contact with the elderly. This division was based on a median split on the answers to the question “How much time do you spend among the elderly?” The distribution was heavily skewed, as most participants indicated to have had limited contact with the elderly. Participants who indicated either 1 or 2 were classified as having had little contact ($N = 41$), while participants who indicated 3 or higher ($N = 34$) were classified as having had a lot of contact.

Second, we counted the number of words recalled correctly for each participant. These scores were subjected to a 2 (prime: elderly prime versus no prime control) \times 2 (contact with the elderly: a lot versus a little) ANOVA. The only effect emerging was the predicted two-way interaction [$F(1, 71) = 4.06, p <$

TABLE 1
Number of Words Recalled Correctly (Experiment 1)

Prime	Contact	
	Little	Much
No prime	5.4	5.7
Prime	5.7	3.7

.05]. The relevant means are given in Table 1. Under priming conditions participants with a lot of previous contact recalled less than participants with no or little previous contact [$F(1, 71) = 4.08, p < .05$], while this difference was absent under no-prime control conditions [$F(1, 71) = .01$]. Also, for people who reported a lot of previous contact, priming the stereotype of the elderly led to poorer recall in comparison with participants who were not primed with this stereotype [$F(1, 71) = 3.36, p < .08$]. For participants with little previous contact, stereotype activation did not affect memory performance [$F(1, 71) = .17$].

EXPERIMENT 2

Although Experiment 1 supported our prediction, it did not shed light on the proposed mediating mechanism. We posited the idea that contact affects associative strength and that associative strength predicts behavioral effects of stereotype activation. While Experiment 1 indeed established the predicted relation between previous contact and stereotype activation effects on behavior, it did not speak to the mediating role of associative strength. The second experiment is designed to test this mediating process.

Method

Participants and design. Forty undergraduates from the University of Nijmegen were randomly assigned to one of two conditions: They were either primed with the stereotype of the elderly or not. Participants received Dfl. 5 (about \$2.50) as compensation.

Procedure and stimulus materials. After participants entered the lab, they were seated in cubicles containing a computer. They were told that they were going to participate in several unrelated pilot studies. First, we measured the amount of previous contact participants had with elderly people (in the same way as in Experiment 1). Second, we measured associative strength. More specifically, we measured how strongly the attribute "forgetfulness" was associated with the elderly. This was done with a short lexical decision task. Participants were requested to respond as fast as possible to 12 words appearing one by one on the computer screen. Half of these words (6) were existing words, the other half were nonexisting words. Of the existing words, 3 were related to forgetfulness [forgetful, forgetting, and memory loss ("memory loss" is a single word in Dutch)].

The 3 other words were unrelated to forgetfulness and unrelated to the elderly stereotype. These 6 words were all preceded by the prime “elderly.” These primes were presented subliminally (17 ms) and masked by a string of X’s (“XXXXXXXXXX”). This mask remained on the screen for 225 ms and was immediately followed by the target word. The target word remained on the screen until participants responded by pushing a “yes” or a “no” button. By means of this lexical decision task, we were able to measure the strength of the association between elderly and the attribute memory impairment. The mean reaction time on the three “forgetfulness” trials is indicative for the strength of this association. By subtracting the mean reaction time of these three trials from the mean reaction time on the three control trials, we were able to control for individual differences in response latencies. In this case, using control trials is even more important than under other circumstances, as it has been shown that activation of the category elderly leads to slower response latencies (see, e.g., Dijksterhuis, Spears, & Lepinasse, in press).

After completion of this task, participants received a long filler task. Since the lexical decision task involved the word “elderly” (presented subliminally for six times) and words related to forgetfulness, we deemed it appropriate to include a large filler task to make sure that the semantic priming effects caused by the lexical decision task were wiped out. Therefore, participants completed a translation of the Ambivalent Sexism Inventory (Glick & Fiske, 1996) including a quick predictive validity test. It took participants on average 14 min to complete the questionnaire.

After completion of the questionnaire, the procedure was almost the same as in Experiment 1. First we administered the second lexical decision task in which we employed our priming manipulation. The only difference with Experiment 1 is that we presented all trials twice. After participants worked their way through the 30 trials, the whole procedure was simply repeated. This was done to make it somewhat easier for participants to recall the words in a later recall task. In the first experiment, it turned out that several participants (6) were not able to recall a single word. After participants finished this task they were given a surprise free recall task. At the end, they were thanked, paid, and debriefed.

Results and Discussion

First, we divided participants into two groups based on a median split on the answers to the question, “How much time do you spend among the elderly?” thus creating a group with little previous contact (score < 3, $N = 23$) and a group with a lot of previous contact (score > 2, $N = 17$).

Recall. The recall scores were subjected to a 2 (prime: elderly prime versus no prime control) \times 2 (contact with the elderly: a lot versus a little) ANOVA. The only effect emerging was the predicted two-way interaction [$F(1, 36) = 4.26$, $p < .05$]. As can be seen in Table 2, the findings of Experiment 1 were closely replicated. However, due to the fact that all words were shown twice this time, average recollection was a bit better. As in Experiment 1, people with more

TABLE 2
Number of Words Recalled Correctly (Experiment 2)

Prime	Contact	
	Little	Much
No prime	6.2	6.9
Prime	6.6	4.8

contact with the elderly recalled less words after being primed than primed participants who reported little or no previous contact [$F(1, 36) = 5.92, p < .02$], while this difference was absent under no-prime control conditions [$F(1, 36) = .55$]. Also, participants who reported to have had much contact performed worse under priming than under no-prime control conditions [$F(1,36) = 4.09, p < .05$], while this effect was absent for participants who have had little or no contact [$F(1, 36) = 1.49, ns$].

Associative strength. To assess associative strength, we subtracted the mean reaction time of the three trials related to memory impairment from the mean of the three control trials. Hence, the higher the resulting score, the stronger the association between elderly and memory impairment. Our prediction was that previous contact would affect associative strength in the sense that more previous contact should lead to a stronger association. We subjected the scores to a 2 (prime: elderly prime versus no prime control) \times 2 (contact with the elderly: a lot versus a little) ANOVA. Of course, the factor prime did not have an effect as the priming manipulation was conducted only after associative strength was assessed. Hence, the only reliable effect was the predicted main effect of contact [$F(1, 36) = 4.19, p < .05$]. The score of the people who reported a lot of previous contact was higher (indicating a stronger association) than participants who reported little previous contact ($M = .029$ versus $M = -.025$).²

Mediation. According to our hypothesis, associative strength should mediate the effects of contact on behavioral effects (i.e., memory effects) after stereotype activation. In order to test this relation we investigated potential mediation (only under priming conditions, as under no prime control conditions there is no relation between contact and memory performance, as the stereotype of the elderly is not activated). We performed a 2 (contact with the elderly: a lot versus a little) ANCOVA on the recall scores with the associative strength scores as a covariate. As predicted, the regression of associative strength on the recall scores was reliable [$F(1, 18) = 10.77, p < .005$]. After controlling for this effect, the effect of contact on memory performance had vanished [$F(1, 18) =$

² These means refer to differences in seconds. On average, participants who reported to have had a lot of previous contact reacted .029 s (29 ms) faster to the critical trials ($M = 579$ ms) than to the control trials ($M = 608$ ms). Participants who reported little contact were .025 s (25 ms) slower on the critical trials ($M = 555$ ms) than on the control trials ($M = 530$ ms).

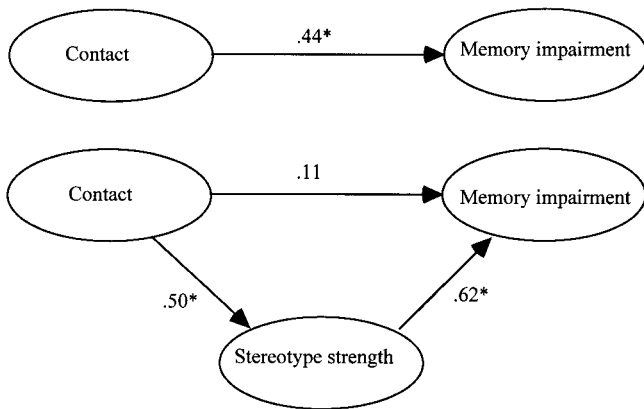


FIG. 1. Path analysis (priming condition only). Asterisks indicate $p < .05$.

.30; note that the F was 5.92, see above]. These findings were corroborated in a path analysis (see Fig. 1).

GENERAL DISCUSSION

In two experiments, support was obtained for the predicted relation between past contact with group members, associative strength, and automatic behavior. We hypothesized that contact leads to the development of stereotypes. Several encounters with elderly people who leave cakes in ovens for too long or who are not able to recall that you visited them the day before lead to the formation of a mental association between the social category “elderly” and the attribute memory impairment. This association, in turn, has behavioral consequences once the social category of the elderly is activated: One starts to display memory impairment oneself. The conclusion is that more past contact leads to behavioral (or memorial) changes during present contact.

The establishment of past contact as a determinant of stereotype activation effects on behavior is important, as it is the first mediator of automatic behavior documented so far. Behavior is, partly, socially controlled but not everybody is affected the same way. According to our analysis, the critical determinant is associative strength. An attribute that is not present in one’s cognitive repertoire does not elicit behavioral effects. If, on an implicit level, memory impairment is not associated with the elderly, activation of the stereotype of the elderly will not lead to a display of impaired memory.

How Are People Made Forgetful?

The finding that activation of the concept of “forgetfulness” mediates actual performance on a free recall task does only shed light on the first step in the process that starts with activation of a social category and that eventually leads to poorer free recall. Activating the category elderly leads to activation of the

concept of forgetfulness, but what happens next? What impedes memory performance of primed participants?

First of all, we have findings published elsewhere (Dijksterhuis, Bargh, & Miedema, 2000) that show that the differences in memory performance between primed participants and no-prime controls should be attributed to impaired retrieval and not to impaired encoding. In two studies, we primed some participants with the elderly stereotype while providing them with material they were asked to recall later on (as it is done in the experiment reported herein). However, some participants were told (after encoding) that they were primed with the concept of "elderly" and that this might affect their memory performance in the recall task. These participants were able to "correct" for the influence of the prime in that they showed no poorer recall compared to no-prime control participants. In another experiment we gave participants not only a free recall task but also a recognition task.³ In this experiment, it was shown that elderly-priming negatively affected recall, but not recognition. Recognition performance was the same among primed participants and no-prime control participants. These findings clearly show that it is retrieval processes that are being impaired, not encoding.

So what happens during retrieval? It is important to establish which concept or which behavioral representation is activated by the elderly prime. The concept of "forgetfulness" mediates poor recall, but this concept is psychologically rather meaningless. "Forgetfulness" is a lay term to denote memory impairment, but people do not literally forget things. Information is not erased upon priming participants with the elderly. Hence, one may translate forgetfulness into a more psychologically meaningful term, namely "difficulty to remember" or "difficulty to retrieve."

Assuming that the representation that is activated is something of the sort of "difficulty to remember," one may gain insight into the underlying process by looking more closely at what causes difficulty of retrieval among elderly. As is known from other literatures (e.g., Hasher & Zacks, 1988), elderly show poorer memory not so much because they are not able to retrieve what they want to retrieve, but because they do not inhibit alternatives. In concrete terms, if an elderly person finds it hard to recall her phone number, it is not because she cannot retrieve it, but because she retrieves multiple phone numbers (old phone numbers or phone numbers of friends). This in turn makes selection among these alternatives a more difficult affair, simply because the probability that a "wrong" memory will eventually be selected becomes higher the more "wrong" memories are retrieved. Furthermore, selection itself may take longer (as there is more to select from) and elderly engaging in such a difficult selection process may come across as confused ("Now was this Henk's phone number or was it John's?"). Observers may notice this, and this observed confusion may get associated with

³ This experiment is reported in Dijksterhuis, Bargh, & Miedema, (2000), but the recognition data themselves were not reported.

the elderly. As a result, primed participants may themselves start to behave like this and engage in more confused and hesitant selection.

We have evidence suggesting that this may indeed be what happens among our experimental participants. In most experiments, people primed with the elderly not only recall fewer items that were indeed presented to them, but also more items that were not presented to them (see Dijksterhuis, Bargh, & Miedema, 2000; in the current experiments, trends pointing at this effect did not reach significance). In other words, participants truly behaved like elderly people in the sense that they made more selection errors. Again, it is possible that activation of “cannot remember” is associated mentally with the mechanism that is usually responsible for poor memory, namely poor selection among a lot of wrong memories. This rests on the assumption that people indeed have this association, but, of course, such an association can be learned the same way as the association between elderly and forgetful itself; that is, through associative learning.⁴

This possible mechanism is certainly speculative, and there are likely other candidate explanations for the present findings. Still, we hope we provided a direction that is useful for future endeavors. Beyond the specific mechanism for the observed memory effects of elderly priming, however, our findings clearly show a mediating role of intergroup contact for the effect of social stereotype activation on behavior, at least when that stereotype contains more than a kernel of truth.

REFERENCES

- Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency and control in social cognition. In R. S. Wyer, Jr. & T. K. Srull (Eds.), *The handbook of social cognition: Vol. 2. Basic processes* (pp. 1–40). Hillsdale, NJ: Erlbaum.
- Bargh, J. A., Chen, M., & Burrows, L. (1996). The automaticity of social behavior: Direct effects of trait concept and stereotype activation on action. *Journal of Personality and Social Psychology*, **71**, 230–244.
- Blair, I. V., & Banaji, M. R. (1996). Automatic and controlled processes in gender stereotyping. *Journal of Personality and Social Psychology*, **70**, 1142–1163.
- Brewer, M. B., & Brown, R. J. (1998). Intergroup relations. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (4th ed., Vol. 2, pp. 554–594). New York: McGraw-Hill.
- Bryson, B. (1998). *Notes from a big country*. London: Black Swan.
- Carver, C. S., Ganellen, R. J., Froming, W. J., & Chambers, W. (1983). Modeling: An analysis in terms of category accessibility. *Journal of Experimental Social Psychology*, **19**, 403–421.
- Chen, M., & Bargh, J. A. (1997). Nonconscious behavioral confirmation processes: The self-fulfilling

⁴ One may remark that a deteriorated selection process can be assessed very effectively with a recognition task. When one uses foils that are easy to confuse with the stimuli that were actually presented earlier (e.g., one presents sushi and one uses sashimi as a foil in the recognition task), one should indeed expect primed people to “recognize” an object that was not presented to them more often than no-prime controls. In the recognition task we used (Dijksterhuis, Bargh, & Miedema, 2000), however, we did not find this effect, which is presumably caused by the fact that our foils were not confusing enough.

- nature of automatically-activated stereotypes. *Journal of Experimental Social Psychology*, **33**, 541–560.
- Craik, F. I. M., & Jennings, J. M. (1992). Human memory. In F. I. M. Craik & T. A. Salthouse (Eds.), *The handbook of aging and cognition* (pp. 51–110). Hillsdale, NJ: Erlbaum.
- Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology*, **56**, 5–18.
- Dijksterhuis, A., Bargh, J. A., & Miedema, J. (2000). Of men and mackerels: Attention and automatic behavior. In H. Bless, & J. P. Forgas (Eds.), *Subjective experience in social cognition and behavior* (pp. 36–51). Philadelphia: Psychology Press.
- Dijksterhuis, A., Macrae, C. N., & Haddock, G. (1999). When recollective experiences matter: Subjective ease of retrieval and stereotyping. *Personality and Social Psychology Bulletin*, **25**, 760–768.
- Dijksterhuis, A., & van Knippenberg, A. (1996). The knife that cuts both ways: Facilitated and inhibited access to traits as a result of stereotype activation. *Journal of Experimental Social Psychology*, **32**, 271–288.
- Dijksterhuis, A., & van Knippenberg, A. (1998). The relation between perception and behavior or how to win a game of Trivial Pursuit. *Journal of Personality and Social Psychology*, **74**, 865–877.
- Dijksterhuis, A., & van Knippenberg, A. (1999). On the parameters of associative strength: Central tendency and variability as determinants of stereotype accessibility. *Personality and Social Psychology Bulletin*, **25**, 527–536.
- Dijksterhuis, A., & van Knippenberg, A. (2000). Behavioral indecision: Effects of self-focus on automatic behavior. *Social Cognition*, **18**, 55–74.
- Dijksterhuis, A., Spears, R., & Lepinasse, V. (in press). Reflecting and deflecting stereotypes: Assimilation and contrast in impression formation and automatic behavior. *Journal of Experimental Social Psychology*.
- Dijksterhuis, A., Spears, R., Postmes, T., Stapel, D. A., Koomen, W., van Knippenberg, A., & Scheepers, D. (1998). Seeing one thing and doing another: Contrast effects in automatic behavior. *Journal of Personality and Social Psychology*, **75**, 862–871.
- Dovidio, J. F., Evans, N., & Tyler, R. B. (1986). Racial stereotypes: The contents of their cognitive representations. *Journal of Experimental Social Psychology*, **22**, 22–37.
- Duncan, B. L. (1976). Differential social perception and attribution of intergroup violence: Testing the lower limits of stereotyping of blacks. *Journal of Personality and Social Psychology*, **34**, 590–598.
- Fazio, R. H., Jackson, J. R., Dunton, B. C., & Williams, C. J. (1995). Variability in automatic activation as an unobtrusive measure of racial attitudes: A bona fide pipeline? *Journal of Personality and Social Psychology*, **69**, 1013–1027.
- Gilbert, D. T. (1989). Thinking lightly about others: Automatic components of the social inference process. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 189–211). New York: Guilford.
- Glick, P., & Fiske, S. T. (1996). The ambivalent sexism inventory: Differentiating hostile and benevolent sexism. *Journal of Personality and Social Psychology*, **70**, 491–512.
- Hasher, L., & Zacks, R. T. (1988). Working memory, comprehension and aging: A review and a new view. In G. Bower (Ed.), *The psychology of learning and motivation* (Vol. 22, pp. 193–225). San Diego, CA: Academic Press.
- Hess, T. M. (1994). Social cognition in adulthood: Aging-related changes in knowledge and processing mechanisms. *Developmental Review*, **14**, 373–412.
- Higgins, E. T., & Bargh, J. A. (1987). Social cognition and social perception. In M. R. Rosenzweig & L. W. Porter (Eds.), *Annual review of psychology* (Vol. 38, pp. 369–425). Palo Alto, CA: Annual Reviews.
- Howard, D. V. (1996). The aging of implicit and explicit memory. In F. Blanchard-Fields & T. M.

- Hess (Eds.), *Perspectives on cognitive changes in adulthood and aging* (pp. 221–254). New York: McGraw-Hill.
- Kawakami, K., Dion, K. L., & Dovidio, J. F. (1998). Racial prejudice and stereotype activation. *Personality and Social Psychology Bulletin*, **24**, 407–426.
- Kunda, Z., & Sherman-Williams, B. (1993). Stereotypes and the construal of individuating information. *Personality and Social Psychology Bulletin*, **19**, 90–99.
- Lepore, L., & Brown, R. (1997). Category and stereotype activation: Is prejudice inevitable? *Journal of Personality and Social Psychology*, **72**, 275–187.
- Levy, B. (1996). Improving memory at old age through implicit self-stereotyping. *Journal of Personality and Social Psychology*, **71**, 1092–1107.
- Macrae, C. N., Bodenhausen, G. V., Milne, A. B., Castelli, L., Schloerscheidt, A. M., & Greco, S. (1998). On activating exemplars. *Journal of Experimental Social Psychology*, **34**, 330–354.
- Macrae, C. N., & Johnston, L. (1998). Help, I need somebody: Automatic action and inaction. *Social Cognition*, **16**, 400–417.
- Macrae, C. N., Stangor, C., & Milne, A. B. (1994). Activating social stereotypes: A functional analysis. *Journal of Experimental Social Psychology*, **30**, 370–389.
- Salthouse, T. A. (1991). *Theoretical perspectives on cognitive aging*. Hillsdale, NJ: Erlbaum.
- Sagar, H. A., & Schofield, J. W. (1980). Racial and behavioral cues in black and white children's perceptions of ambiguously aggressive acts. *Journal of Personality and Social Psychology*, **39**, 590–598.
- Schwarz, N., Park, D., Knauper, B., & Sudman, S. (Eds.). (1999). *Cognition, aging, and self-reports*. Philadelphia: Psychology Press.
- Sherman, J. W. (1996). Development and representation of stereotypes. *Journal of Personality and Social Psychology*, **70**, 1126–1141.
- Sherman, J. W., & Klein, S. B. (1994). The development and representation of personality impressions. *Journal of Personality and Social Psychology*, **67**, 972–983.
- Snyder, M., & Uranowitz, S. W. (1978). Reconstructing the past: Some cognitive consequences of person perception. *Journal of Personality and Social Psychology*, **36**, 941–950.
- Van Knippenberg, A., & Dijksterhuis, A. (1996). A posteriori stereotype activation: The preservation of stereotypes through memory distortion. *Social Cognition*, **14**, 21–53.
- Winter, L., & Uleman, J. S. (1984). When are social judgments made? Evidence for the spontaneousness of trait inferences. *Journal of Personality and Social Psychology*, **47**, 237–252.
- Wittenbrink, B., Judd, C., & Park, B. (1997). Evidence for racial prejudice at the implicit level and its relationship with questionnaire measures. *Journal of Personality and Social Psychology*, **72**, 262–274.