Age-Related Priming Effects in Social Judgments

Thomas M. Hess, Karen A. McGee, Stephen M. Woodburn, and Cheryl A. Bolstad
North Carolina State University

Two experiments investigated adult age differences in the impact of previously activated (and thus easily accessible) trait-related information on judgments about people. The authors hypothesized that age-related declines in the efficiency of controlled processing mechanisms during adulthood would be associated with increased susceptibility to judgment biases associated with such information. In each study, different-aged adults made impression judgments about a target, and assimilation of these judgments to trait constructs activated in a previous, unrelated task were examined. Consistent with the authors' hypotheses, older adults were likely to form impressions that were biased toward the primed trait constructs. In contrast, younger adults exhibited greater awareness of the primed information and were more likely to correct for its perceived influence, especially when distinctive contextual cues regarding the source of the primes were available.

Effective functioning in social situations is in part dependent on making accurate assessments of others based on available information, such as appearance, behavior, and group membership. An interesting finding that has emerged from research on social cognition is that such assessments are not only based on the conscious efforts of the individual in thinking about others but also on unconscious processes associated with the relative accessibility of relevant interpretative structures. The finding that available knowledge structures influence perception and comprehension is certainly not new within the field of cognitive psychology. What is relatively new and interesting, however, is the fact that specific experiences of the individual relating to both the frequency and recency of activation affects the accessibility of specific structures, and that heightened accessibility of a specific structure may have unintended influences on subsequent cognitive operations (e.g., Greenwald & Banaji, 1995). For example, research has demonstrated that previous exposure to specific trait or evaluative information can bias people's judgments about a target person to be consistent with this information (e.g., Higgins, Rholes, & Jones, 1977; Srull & Wyer, 1980), a process referred to as assimilation. This appears to occur when accessible information is unintentionally activated by relevant cues in the current context without the perceiver's awareness.

It is important to note that the impact of previous exposure is modified by factors such as awareness, concurrent processing demands, and motivation. Thus, for example, if conscious of the previously activated, or primed, information while performing a subsequent task, a person may seek to correct for its influence. This may be done by excluding this information from consideration or by biasing judgments in the opposite direction from the primed information, an effect referred to as contrast (e.g., Lombardi, Higgins, & Bargh, 1987; Martin, Seta, & Crelia, 1990; Strack, Schwarz, Bless, Köbler, & Wänke, 1993). Thus, even though activation of information due to heightened accessibility may occur without intent, the impact of the activated information can be brought under the control of the individual.

Findings of this type have led Bargh (1994) to emphasize the multidimensional nature of automaticity in understanding such influences in social cognition. Traditionally, automatic and controlled processes were thought to vary simultaneously along four dimensions dealing with awareness, intentionality, controllability, and efficiency. (Automatic functions tend to be low on the first three dimensions and high on the last.) Bargh argued, however, for the separability of these four dimensions, asserting that most complex social—cognitive tasks consist of a combination of automatic and controlled features. For example, although individuals may be unable to prevent processing of certain types of information (e.g., evaluative content), they can become aware of its influence and attempt to control it. In a similar manner, the activation of automatic processes may be intentional in that certain types of automatic processing only occur within the context of subject-initiated activities (e.g., spontaneous trait inferences are more probable when individuals have the goal of forming an impression from a set of behaviors rather than of remembering them; Bassili & Smith, 1986).

A central question for the study of aging and social cognition concerns the extent to which automatic and controlled aspects of functioning change with age, resulting in differential susceptibility to priming effects. Although automaticity has rarely been studied in terms of the four dimensions suggested by Bargh (1994), research on cognition suggests that many automatic influences on social—cognitive functioning should remain intact across adulthood. Studies of semantic priming and implicit memory (for review, see Howard, 1996), which represent examinations of the unconscious influence of previously experienced
information on subsequent performance, have obtained minimal age effects relative to those observed in more explicit assessments of memory. For example, Mitchell, Brown, and Murphy (1990) found that previous stimulus exposure facilitated picture-naming times for both young and older adults to the same degree. Although most of these studies have dealt with word-level or pictorial information, the processes underlying performance may be similar to those involved in implicit priming of social judgments (Smith & Branscombe, 1988), leading to a prediction of age constancy in potential susceptibility to such automatic priming influences.

Age differences in social–cognitive functioning may be present, however, when we consider processes toward the controlled end of the four dimensions. There is evidence that age is negatively associated with the awareness and control of automatic influences. For example, in studies of implicit memory, younger adults are often observed to be more likely than older adults to note and take advantage of the relationship between the original presentation of the stimuli and the indirect testing situation (e.g., Light & Albertson, 1989; Rybash, 1994), although the linkage between awareness and performance is not always straightforward (e.g., Howard & Howard, 1992). The ability to make this link can impact on performance in at least two ways. First, if the previous information is useful in the current situation, an individual can consciously attempt to access it to facilitate performance. Conversely, if the previous information has perceived deleterious effects on performance, individuals may override its influence by consciously attempting to control it.

Research on cognitive skills suggests that as people age, their ability to perform both of these functions may decline. The just-discussed research on implicit memory is a case in point. Studies of source monitoring provide related results, demonstrating that age is negatively correlated with the ability to identify the source of activation (e.g., feeling of familiarity) associated with specific information in memory, resulting in misattributions about source (Bartlett, Strater, & Fulton, 1991; Dywan & Jacoby, 1990; Jennings & Jacoby, 1993). The trouble older adults have in identifying the source of activated information in memory may be attributable in part to age-related changes in controlled processing that affect the ability to efficiently allocate attention to examine the contents of memory. Thus, according to Jennings and Jacoby (1993), age-related problems in awareness may reflect inefficient processing. Finally, recent research demonstrating that aging is associated with decreased ability to inhibit (i.e., control) information once it is activated in working memory (for review, see Zacks & Hasher, 1994) can also be viewed as consistent with this perspective. Thus, existing research and theory suggests that automatic aspects of social–cognitive functioning may persist across adulthood but that aging may be associated with reduced ability to monitor and control these influences. This, in turn, leads to the prediction that increasing age in adulthood will be associated with greater susceptibility to biases in judgments due to automatically activated structures in memory.

Although explicit examinations of automatic influences on social judgments do not exist in the aging literature, at least two studies provide relevant evidence. Hess and Follett (1994) had young and older adults make behavioral predictions about a target person on the basis of a list of descriptive traits. They found that older adults were more influenced by evaluative information activated before presentation of the trait list than were younger adults, who placed relatively greater weight on the frequency with which specific traits occurred in the list in making their judgments. In another study, Hess, Pullen, and McGee (1996) found that older adults were at a disadvantage relative to younger adults in learning a prototype about a fictitious social group when learning relied on controlled processing mechanisms but actually outperformed younger adults when the prototype was based on automatically processed evaluative information. These findings appear to support the notion that increasing age in adulthood is associated with stability in automatic aspects of social–cognitive functioning but with a decline in controlled processing mechanisms.

This report presents the results of two studies that specifically examine the impact of recently activated information on judgments about people. In the first, we adapted a procedure used by Higgins et al. (1977), exposing young and older adults to a series of either positive or negative trait terms in a memory task. In an apparently unrelated task that followed, these same people were asked to form an impression of a target person while reading a paragraph describing his behavior. The behaviors depicted in the paragraph were related to the trait dimensions associated with the primed traits but were ambiguous with respect to their valence. For example, the act of climbing a mountain could be viewed as either adventurous (positive) or reckless (negative). Higgins et al. and others have observed that prior exposure to the trait terms results in assimilation judgments; that is, people exposed to positive primes tend to judge the target in positive terms, whereas those exposed to the negative prime tend to judge the target more negatively. In our study, we expected that the judgments about the target of both young and older adults would be biased in the direction of the unintentionally activated trait information that was primed in the memory task. We were also interested in examining age differences in the ability of individuals to control the impact of the primed information on their decisions. To do this, half of the participants in each age group were warned of the possibility that the information from the memory task might influence their impression judgments. We hypothesized that this would result in less assimilation (i.e., less extreme judgments toward the prime) in younger adults, as they sought to bring the primed information under conscious control. In contrast, this manipulation was expected to have less of an impact on the performance of older adults because of problems in effectively controlling cognitive mechanisms.

Experiment 1

Participants

The young group (M age = 19.7 years, range = 18–29) consisted of 34 men and 16 women who were recruited from psychology classes at North Carolina State University and participated for optional class credit. The older group (M age = 67.0 years, range = 57–75) consisted of 27 men and 21 women from the Raleigh area who responded to newspaper advertisements. Each received $6.00 for participating. There were no differences between groups in self-ratings of health (1 = excel-
Materials

**Priming stimuli.** Two sets of 10 word pairs were developed for the priming task. Six of the word pairs in each set were identical and consisted of nouns that were unrelated to the target trait dimensions. The four remaining word pairs in each set contained one neutral word (identical across sets) and an adjective from the endpoint of one of the four target trait dimensions: adventurous-reckless, independent-aloof, persistent-stubborn, and self-confident-conceited. In the positive-prime condition, these adjectives represented the positive end of these dimensions, whereas in the negative-prime condition, the adjectives represented the negative end. Three practice pairs were also constructed, using words that were unrelated to the target traits. A slide was constructed for each word, with one word in each pair (including the prime words) appearing on a white background and the other appearing on one of four colored backgrounds (green, red, blue, or yellow).

**Target description.** A short vignette about a person named Donald (see Appendix) from Higgins et al. (1977) was used as the target description. The vignette contains behavioral descriptions relevant to the four target trait dimensions and has been shown to elicit spontaneous productions of trait-relevant adjectives from the positive and negative ends of these dimensions equally often when no priming information precedes its presentation. The target description was typed onto a standard-size sheet of white typing paper.

**Trait rating list.** A list of 48 trait words was developed. This list included the eight prime traits (both positive and negative), a trait that was semantically related to each prime (daring, untiring, self-assured, foolhardy, intolerant, boastful, egotistical), and four positive and four negative traits that were semantically unrelated to the primes (grateful, hopeful, skilled, neat, disrespectful, listless, sly, clumsy). These different traits allowed us to assess the specificity of observed priming effects across word-specific, semantic, and evaluative levels. Twenty-four neutral filler traits were also included. The selection of the 40 nonprime traits was based on Anderson's (1968) likability norms. The positive related and unrelated traits were selected from the 185 most liked trait terms in this list, whereas the negative related and unrelated traits were selected from the 185 least liked terms. The 24 filler traits were selected from the mid-range of the list.

Procedure

Participants were tested individually or in groups of 2 to 5. Before each test session, the instruction condition and prime type were determined by the experimenter. Within each instruction condition, there were 12 older and 12 younger adults assigned to each prime type, except for the informed instruction condition, where there were 13 younger participants in each prime condition. Participants were told that they were going to participate in two different studies, the first of which was a memory study reflecting the experimenter's interests and the second of which was an impression formation study, representing a professor's interests. Before being given these two tasks, participants were given the Wechsler Adult Intelligence Scale—Revised (WAIS-R; Wechsler, 1981) Digit-Span and Digit-Symbol Subtests, both of which were adapted to a group testing procedure. (We do not discuss the former because of problems with participants following directions.)

Participants were then given the priming task, modeled after one used in previous studies (e.g., Higgins et al., 1977; Sherman, Mackie, & Driscoll, 1990). Ten slide pairs were presented, with the first slide in each pair containing a word on a white background and the second containing a word on a colored background. The prime words were always presented in the second, fifth, seventh, and ninth word pairs, with the order of the primes randomly determined for each session. Instructions were given to remember the word on the first slide and the color of the second slide, and to report them in writing in reverse order (i.e., color first and then the word). Each slide in a pair was presented for 5 s. After the second slide had been presented, participants had 10 sec to write down their responses. This procedure helped to ensure that the prime words would be retained in memory for at least 10 s, enhancing the potential for increased accessibility to the associated trait constructs. The other aspects of the task were unrelated to the purpose of the study and were intended to mask the true intent of the task.

Following completion of this task, participants in the informed instruction condition were told of the potential judgment bias introduced by the priming task to draw attention to the trait-relevant information contained in the memorization task. They were also instructed to minimize the influence of the words from the memory task on their own judgments in the impression task. All participants were then told that they had completed the memory study and that the study on impression formation would now begin. Participants turned to the next page in their booklets and were given 90 s to read the "Donald" vignette and form an impression of him. Afterwards, they were asked to write the one word that best described Donald at the bottom of the page. Participants then turned to the next page in their booklet and rated the target on each of the 48 trait words using a 7-point scale (1 = not at all descriptive; 7 = very descriptive). They then attempted to recall the words that they were asked to remember in the priming task. Following this, awareness of the priming manipulation was assessed by having participants provide a written response to the following item: "We want to make sure that nothing in the first part of the test session interfered with your performance in the second part. Therefore, we want to know if you had any thoughts during the various test procedures that led you to think that any one procedure was related to another procedure. If you did, please explain below, naming the procedures and describing the connection that you saw between the two." Finally, all participants completed Vocabulary Test 2 (parts 1 & 2) from the Kit of Factor-Referenced Cognitive Tests (Ekstrom, French, Harman, & Derman, 1976).

Results and Discussion

An alpha level of .05 was adopted for statistical tests throughout this report. To test for age differences in ability as well as unintended biases associated with assignment to conditions, 2 x 2 x 2 (Age Group x Instructions x Prime Type) analyses of variance (ANOVA) were performed on digit-symbol and vocabulary scores. The older adults were superior in verbal ability (M = 27.7, SD = 6.8) when compared to the younger adults (M = 18.1, SD = 4.8), F(1,90) = 70.91, MSE = 32.26, whereas the younger adults had significantly higher digit-symbol raw scores (M = 68.5, SD = 10.6) than the older adults (M = 52.3, SD = 10.7), F(1,90) = 56.77, MSE = 110.68. The only significant effect involving experimental conditions was a main effect of instructions on vocabulary scores, F(1,90) = 5.91, MSE = 32.26. To control for the possible effect of verbal ability on performance, vocabulary test scores are used as covariates in all analyses.

Descriptor Words

The one-word descriptors produced by participants were coded on the most relevant of the four target trait dimensions, using a 6-point scale, with 6 representing the positive end of...
the primed dimension and 1 representing the negative end. Descriptor words corresponding to prime words (i.e., the actual primes and close synonyms) were assigned a rating at either end of the scale. For example, adventurous was coded as 6 and reckless was coded as 1. Descriptors that were evaluatively and semantically similar to the prime were given ratings of either 5 or 2. For example, careless is similar in both meaning—although not synonymous—and valence to reckless and therefore was assigned a rating of 2, whereas courageous is similar in meaning and valence to adventurous and was assigned a rating of 5. When possible, information from Goldberg’s (1990) Big-Five Factors of personality were used to confirm trait valence and trait meaning. For example, within the Big-Five Factors, daring is categorized as an evaluatively positive trait represented on the same endpoint of the power dimension as adventurous, and so it was assigned a rating of 6. Nevertheless, there were several cases where, according to the dictionary, a descriptor that was produced shared some aspects of meaning with both ends of the trait dimensions (e.g., daredevil). In these cases, individual ratings from the trait-rating task were used to help disambiguate the participant’s intent. Thus, for example, daredevil was assigned a 1 if the participant gave higher trait ratings to reckless than to adventurous, whereas a 6 was assigned if the opposite pattern occurred. Descriptor labels that could not be classified as being synonymous with or semantically related to any primes were assigned either a 3 (negative) or 4 (positive) rating based on their valence. The descriptors from the entire sample were initially coded by two raters (interrater agreement = 91%), with all disagreements being resolved through discussion.

A 2 X 2 X 2 (Age Group X Instructions X Prime Type) analysis of covariance (ANCOVA), with vocabulary score as a covariate, was performed on the assigned ratings for the descriptor words. The predicted main effect due to prime was significant, F(1, 89) = 18.96, MSE = 3.26, with participants in the positive prime condition providing target descriptors that were more positive (M = 5.01) than those of participants in the negative prime condition (M = 3.42). As expected, the Age X Prime interaction was also significant, F(1, 89) = 12.47, MSE = 3.26, because of the greater impact of prime type in the old group than in the young (see Figure 1). Specifically, older adults provided descriptors that were biased in the direction of the prime to which they were exposed (positive: M = 5.4; negative: M = 2.5), F(1, 43) = 32.05, MSE = 3.07, whereas there was no impact of prime type on young adults’ descriptors (F < 1), with descriptors being somewhat positively biased (i.e., above the midpoint [3.5] of the scale) with both positive (M = 4.6) and negative (M = 4.3) primes. Comparisons between age groups were consistent with these observations in that significant age effects were only observed in the negative prime condition, F(1, 44) = 5.15, MSE = 3.26, in which the older adults’ descriptors were more negative than those of the young adults. We interpret these between-groups differences as indicating that older adults were more likely than young adults to exhibit assimilation effects in their responses, suggesting increased susceptibility to unconscious influences with age.

The positive bias found in the ratings of the young adults could be seen as problematic in interpreting the nature of obtained priming effects. For example, one could view these results as indicating that assimilation is occurring with positive primes and contrast with negative primes. This bias, however, is consistent with past priming research (e.g., Wyer & Budesheim, 1987; Wyer & Unverzagt, 1985) that has found correction to be greater with negative than with positive primes. This effect presumably reflects a tendency toward assuming that people are basically good and that severe adjustments to judgments are necessary only when negative biasing information is present (Strack et al., 1993). Thus, consistent with this past research, we interpret the lack of difference between the two prime conditions in the young group to be suggestive of greater use of corrective procedures in constructing judgments.

The null priming effect in the younger adults could also indicate that prime exposure had no impact on their behavior. To explore this possibility, we tested an additional group of 25 younger adults using the same procedure, but substituting neutral nouns for the prime words in the priming task. The mean rating for descriptors in this group (3.8) was just above the midpoint of the rating scale. Note that this rating was also lower than those in the other two prime conditions, although only the neutral versus positive prime comparison proved to be significant, F(1, 48) = 4.75, MSE = 3.66. Thus, it does appear that prime exposure is influencing the judgments of younger adults, but in a different manner than observed for the older adults.

We had also predicted that instructions designed to increase the awareness of potential judgment biases would result in less assimilation than if such instructions were not presented, and that the effect would be especially strong for the young adults, who are thought to demonstrate greater proficiency in controlled processing. However, no significant effects due to instructions were obtained, suggesting that our awareness manipulation was ineffective; for example, a three-way interaction, F(1, 89) = 1.45, p = .24. This suggestion is supported by our analysis of responses to our awareness assessment, in which we identified those participants who reported being aware or unaware of a relationship between the memory and impression formation tasks (e.g., words in the memory list could be used to describe
Donald). There was no difference in the percentage of participants reporting awareness between instructional conditions (informed: 23%; uninformed, 22%), nor was there a difference between age groups (young: 26%; old: 18%).

Another way of examining awareness is based on the Lombardi et al. (1987) suggestion that recall of the priming event (i.e., the primed traits) might be a more accurate reflection of prime awareness than self-reports. They found that recall of one or more prime words was associated with contrast, whereas nonrecall was associated with assimilation. They argued that correction in judgments associated with prime recall reflects consciousness of the priming event. In our study, younger adults did recall a somewhat greater proportion of the prime words (.55) than did older adults (.43). $F(1, 89) = 3.68, MSE = .06, p = .06$. Recall of primes was significantly correlated with self-reported awareness ($r = .30$). However, the vast majority of participants in each age group (96% of the young, 90% of the old) recalled at least one of the prime words. Thus, if we interpret recall of any prime to indicate some level of prime consciousness, most of the participants in this study can be classified as aware, thereby precluding a systematic analysis of consciousness using recall. It is also likely that prime recall is a fallible index of conscious recollection of the prime during the impression formation task: Just because participants recall the primes when requested to does not necessarily mean that they were aware of them during the impression formation task.

If we do use the Lombardi et al. definition of awareness, however, our results are at least partially consistent with our conceptual framework. That is, although older adults exhibited similar levels of prime awareness to those of younger adults, the fact that they were more likely to make judgments consistent with the primes suggests a reduced ability to control the impact of the primed constructs in making impression judgments, even when aware.

**Trait Ratings**

Means were obtained for each of the six categories of trait ratings (i.e., primes, semantically related traits, unrelated traits of both positive and negative valence) provided by participants. The means obtained from these trait ratings were examined using a $2 \times 2 \times 2 \times 3$ (Age Group $\times$ Instructions $\times$ Prime $\times$ Trait Valence $\times$ Trait Type) ANCOVA, with the last two factors within participants and vocabulary score as a covariate. Consistent with our previous hypotheses, we expected assimilation effects for items that were both evaluatively and semantically related to the prime words. In addition, we expected this assimilation effect to be greater in the unaware than in the aware condition, at least for the young adults. Unfortunately, the results appear to provide little support for these hypotheses. Although the impact of trait type was reliable, $F(2, 178) = 23.89, MSE = .78$, with prime words (5.59) and semantically related traits (5.10) receiving higher ratings than unrelated traits (2.76), the expected Prime $\times$ Valence $\times$ Trait Type interaction was not ($F < 1$), nor were there any systematic effects involving instructions. In essence, it appears that the relatively greater endorsement of traits that have a semantic relationship to the primes may reflect judgments of general relevance to the target’s behavior rather than specific influences of the primed traits.

This interpretation was supported by the ratings from the young control (i.e., neutral priming) group, which were very similar to those in the other two prime conditions (see Table 1).

The only significant effect involving age was the Age $\times$ Trait Type interaction, $F(2, 178) = 3.98, MSE = .78$, which reflected the fact that the older adults had significantly higher ratings than the younger adults for semantically related traits, $F(1, 89) = 4.99, MSE = 2.78$, but not for primes or semantically unrelated traits ($Fs < 1$, see Table 1). Although this effect was not anticipated, the fact that older adults were more likely to endorse semantically related words than younger adults may suggest a somewhat greater impact of priming in the older group. The lack of clear-cut effects involving prime type, however, limits the conclusions that we can make.

**Experiment 2**

The results of the first study indicated that older adults are more likely than younger adults to exhibit assimilation effects associated with recently activated trait-related information. This finding is consistent with our conceptual framework that suggests that increasing age in adulthood is correlated with a reduction in the efficiency of controlled processing mechanisms, which in turn negatively affects the ability to identify and control unintended sources of influence. One problematic aspect of Experiment 1, however, has to do with the fact that there was no impact of our instructional manipulation. We had reasoned that age differences in control would be demonstrated by a differential response to the awareness instructions across age groups, with the younger, but not older, adults exhibiting less assimilation with increasing awareness. Instead, little evidence of assimilation was obtained in any condition for the younger adults. Whereas we interpret this latter finding to reflect efficiency in controlled processing, a stronger case for our arguments could be made by showing a shift in the strength of assimilation effects across conditions associated with awareness.

One problem with the procedure of the first study may have been the subjective nature of the awareness instructions and self-reports. In this experiment, we attempted to manipulate awareness through a variation in task characteristics rather than through instructions to the participants. To do so, we used a procedure developed by Martin (1986) in which participants were given a blatant priming task that is either completed before

<table>
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<th>Prime</th>
<th>Related</th>
<th>Unrelated</th>
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<td>Neutral</td>
<td>5.32</td>
<td>4.76</td>
<td>2.19</td>
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*Note.* Higher ratings indicate greater descriptiveness.
or interrupted by the impression formation task. Martin found that young adults made assimilation judgments when the primed task was interrupted, and contrast judgments when it was completed. He hypothesized that interruption of the priming task results in perseveration of thought relating to the goals of that task (a type of Zeigarnik [1938] effect), making it difficult to control their influence. One could also think of these effects as due to problems in source monitoring. When the priming task is interrupted, the context associated with the primed information may be more difficult to identify because of the melding of the priming and impression formation tasks. Thus, participants are more likely to mistakenly attribute activation associated with primed traits to the impression formation task, resulting in assimilation of judgments to the primed traits. In contrast, completion of the primed task allows the individual to more accurately identify the context associated with the primed information and, subsequently, to control or correct for its influence.

We expected to replicate Martin’s (1986) results with the younger adults in our study. Consistent with our conceptual framework, we also hypothesized that increasing age would be associated with a reduction in the ability to control the influence of the primed information, resulting in decreasing evidence of correction in the completed task condition. In other words, we predicted that older adults would exhibit judgments biased in the direction of the primes in both the completed and interrupted task conditions, whereas younger adults would be more likely to exhibit such biases in the interrupted condition than in the completed one. We also tested a group of middle-aged adults to get a better idea of the age course of any obtained effects.

**Method**

**Participants**

Participants were recruited and compensated using the same methods as in Experiment 1. The young group consisted of 15 men and 25 women (M = 21.7, range = 18–37) with a mean of 13.7 years (SD = 1.8) of education. Thirty-six of these individuals were students at NCSU. The middle-aged group consisted of 16 men and 28 women (M = 50.0, range = 42–59) with a mean of 16.3 years (SD = 2.1) of education. The older group comprised 18 men and 26 women (M = 68.2, range = 60–78) who possessed a mean of 15.8 years (SD = 2.3) of education. Middle-aged participants rated their health as being significantly better (SD = 2.3) of education.

**Materials**

**Priming task.** Following Martin’s (1986) procedure, sentences were constructed to prime either a positive or negative evaluation. Each took a two-clause form in which the first clause was either, “When I am feeling this good” or “When I am feeling this bad.” The second clause contained general mood-relevant information that was consistent with the first (e.g., “... even the smallest things in life are a great pleasure,” for the positive evaluation condition). Four sentences of this type were developed for each prime condition. Eight additional sentences of the same form were developed, one for each of the eight prime words used in Experiment 1 (e.g., “When I am feeling this good, I am persistent in achieving my goals”).

Each sentence was printed on a separate page of the test booklet, with three lines underneath for participant responses. Booklets contained either six positive priming sentences or six negative priming sentences. The first two and last two sentences were the four general evaluation items. The two sentences in the middle list positions contained the specific prime words, with booklets being prepared that represented every possible pairing of the four prime words in each evaluation condition. Each of these sets of items was used in both the interrupted and completed task conditions. In addition, booklets used in the interrupted condition contained four additional pages of priming sentences to lend face validity to the interruption task. We included only two specific trait primes to see if activation of the trait itself (rather than just evaluative priming) was necessary for priming along the applicable trait dimensions.

**Target description.** The same vignette used in Experiment 1 was used here.

**Trait ratings.** The trait rating list included eight 7-point scales with anchor terms at either end. The first four scales assessed the target-relevant behavioral trait dimensions from the priming task (e.g., reckless—adventurous); the last four scales assessed nonapplicable behavioral trait dimensions: crude—polite, greedy—generous, phoney—sincere, and deceitful—trustful. Use of these additional dimensions allowed us to determine whether priming effects were of a general evaluative nature or were specific to the target-relevant trait dimensions. Based on our experiences in Experiment 1, dimensions rather than individual traits were used for these ratings so that we could get a more precise assessment of priming beyond simple semantic activation or relevance effects. For all scales, terms with negative affective valence were used to anchor the left–low end of the dimensions. Numbered spaces for participants to record their answers to the awareness questions were provided below the trait rating scales.

**Procedure**

Participants were tested individually or in groups of 2 to 5 people and told the purpose of the study was to examine the way people think in social situations. Assignment to task conditions was determined by the experimenter before each session, with only one condition—interrupted or completed—being tested in each session. Participants were randomly assigned to prime conditions within sessions. Participants were told that the first task was a social empathy task in which their ability to identify what another person is feeling would be assessed. They were instructed to read the sentence on each page, identify the mood portrayed, and then write an original statement in the first person expressing the same feeling. The experimenter paced the participants through the task, allowing 1 min for each sentence. Participants in the interrupted condition were stopped by the experimenter after 6 sentences (pages), at which point they were told that they would have to complete the remaining 4 pages later in the session. In the completed task condition, participants were told that the social empathy task was finished after completing 6 pages and that they would go on to the next task.

Both interrupted and completed participants were then told that the purpose of the next task was to examine their perceptions of other people. Participants were given a minimum of 90 s (more if needed) to read the paragraph about Donald and to form an impression about him. They were then instructed to write the one word that they thought best described the target. Once finished, they were instructed to write a second descriptive word below it. Participants then completed the eight rating scales on the next page by circling the number on each scale that best characterized their impression of Donald.

Awareness of the relation between the priming and impression formation task was then assessed by using a more specific set of questions that we hoped would provide a more accurate assessment than in Experiment 1. The experimenter said the following: “Sometimes people indicate that their performance in this task is influenced by the first task you performed, the social empathy task. I would like you to take a...
moment and think back on the social empathy task.” Participants were then asked the following questions: (a) “Can you think of any way in which the social empathy task might have been connected with the task you just completed?” (b) “Were you aware of this or any other type of connection between the two tasks while you were doing the impression formation task?” and (c) “If you were aware of a connection, did it influence your performance? If so, how?” Participants recorded their responses in numbered spaces at the bottom of the trait-rating page. Participants then completed the vocabulary and digit-symbol tests used in Experiment 1. In addition, they were also given a loaded listening-span task modeled after that of Daneman and Carpenter (1980) to obtain an estimate of working memory efficiency. Sets of sentences were presented auditorially, with participants making a true–false judgment after each sentence. After all of the sentences in a set were presented, they recalled the last words from each of the sentences in that set. Set sizes increased from 2 to 6 sentences, with three sets being presented at each level. A listening-span score was indicated by the highest level at which the participant recalled all of the words correctly from at least 2 of the 3 sets. An additional 0.5 was added to his or her score if perfect recall was achieved for 1 of the 3 sets at the next set level.

Results and Discussion

Vocabulary, digit-symbol, and listening-span scores were examined for age effects as well as unintended biases in assignment to conditions, using 3 X 2 X 2 (Age Group X Task Condition [completed vs. interrupted] X Prime [positive vs. negative]) ANOVAs. Age differences were present for vocabulary scores, F(2, 116) = 27.35, MSE = 58.53, with the young group performing at a lower level (M = 13.4) than either the middle-aged (M = 23.4) or older (M = 24.3) groups. Raw scores on the WAIS-R Digit-Symbol Subtest were found to be negatively associated with age (Ms = 66.5, 57.5, and 46.8), F(2, 116) = 39.99, MSE = 95.12, as were listening-span scores (Ms = 4.5, 3.9, and 3.2), F(2, 116) = 10.42, MSE = 1.54. The only effect involving experimental conditions that emerged was a significant Age X Prime interaction for digit–symbol scores, F(2, 116) = 3.13, MSE = 95.12. To control for the potential impact of this effect, all analyses were conducted by using digit–symbol scores as covariates.

Descriptor Words

To maintain consistency across studies, we used the ratings assigned to descriptor words in Experiment 1 to determine our ratings of the identical terms generated in this study. For those terms that were not produced in Experiment 1, we scored them using the same procedure as in that study. The initial agreement rate on these terms was 88%. Mean ratings for the two descriptors produced by each participant were obtained and examined, using a 3 X 2 X 2 (Age X Task X Prime) ANCOVA. The only significant effects obtained in this analysis were due to prime, F(1, 115) = 12.21, MSE = 2.26, and the interaction between age, prime, and condition, F(2, 115) = 3.62, MSE = 2.26. As expected, ratings in the positive prime condition (M = 4.27) were higher than those in the negative prime condition (M = 3.32). The interaction effect was of primary interest and, consistent with expectations, the impact of task condition decreased with age (Figure 2). Separate Prime X Condition ANOVAs performed within age groups revealed a significant interaction for the young adults, F(1, 35) = 4.67, MSE = 2.39. This was due to descriptors being more consistent with the primed end of the dimension in the interrupted than in the completed condition, although this effect was stronger with the positive prime than

![Figure 2](image-url)
with the negative prime. This pattern of results replicates those of Martin (1986), suggesting that younger adults make judgments in the direction of the primed information when the context associated with this information is uncertain and correct their judgments for the same information when the context is more certain. In contrast, only the prime type effects were significant for the middle-aged, \( F(1, 39) = 6.62, \text{MSE} = 2.27 \), and older adults, \( F(1, 39) = 6.24, \text{MSE} = 2.15 \), with task condition having no reliable impact on assimilation to the prime in these two groups. This result is consistent with our expectation that increased age would be associated with difficulty in controlling the impact of primed information regardless of the clarity of context information associated with source.

To examine age differences in self-reports of external influences on the impression formation task, we used the responses to our awareness assessment to develop a 4-point scale that measured the degree of reported awareness. If no perceived linkage between tasks, spontaneous or ad hoc, was indicated, a score of 1 was assigned to the participant. If a linkage relating to potential priming effects between tasks could be identified on reflection, a 2 was assigned. A 3 was assigned if the participant spontaneously noticed a linkage during the task but said it did not influence his or her performance, and a 4 was assigned if the participant said it did influence his or her performance. These scores were examined by using a 3 X 2 X 2 (Age X Task X Prime) ANCOVA, with the only effect being due to decreasing awareness with increasing age (Ms = 1.6, 1.3, and 1.1 for the young, middle-aged, and old, respectively), \( F(2, 115) = 4.07, \text{MSE} = .36 \). It was interesting that no effects due to task were observed, again suggesting that after-the-fact self-reports of awareness may not be accurate indexes of participants' thought processes during the impression formation task. Nonetheless, the significant age effect does provide support for our contention that awareness of priming effects decreases with age.

### Trait Ratings

We next examined participants' ratings on the four target-trait dimensions. There were no reliable differences between ratings on the two dimensions involving the traits explicitly mentioned in the empathy task versus the two relevant target dimensions that were not mentioned. Therefore, mean ratings across all four relevant trait dimensions were obtained and examined by using a 3 X 2 X 2 (Age X Task X Prime) ANCOVA. In general, the pattern of performance (Figure 3) is similar to that obtained for the descriptor words, but the effects were not as strong. Specifically, whereas the prime was significant, \( F(1, 115) = 7.07, \text{MSE} = 1.75 \), the expected Age X Prime X Task interaction only approached significance, \( F(2, 115) = 2.81, \text{MSE} = 1.75, p = .065 \). To test specific hypotheses regarding priming effects, however, ANOVAs were performed within age groups. As before, a significant Prime X Task interaction was obtained only for the younger adults, \( F(1, 35) = 4.53, \text{MSE} = 1.24 \), with younger adults' ratings being more consistent with the primed end of the trait dimension in the interrupted task condition than in the completed task condition. The pattern of ratings for the middle-aged adults appears similar to that for the younger adults, but neither the main effect of prime, the interaction, nor the task effects within primes was reliable (ps > .21). In contrast, the older adults did not demonstrate a correction effect in the completed task condition, with their performance being significantly related to prime type only, \( F(1, 39) = 5.70, \text{MSE} = 1.73 \). It is interesting to note that the pattern of performance for the older adults in the positive prime

### Figure 3.

Mean ratings on target trait dimensions in Experiment 2. Higher ratings refer to the positive end of the trait dimensions, and lower ratings to the negative end of the dimensions.
condition is opposite to that observed for the younger adults both here and for the descriptor words (although the comparison between task conditions in the old group was not significant in either case). Rather than reflecting some age-related process, the pattern appears to be due to the atypically low scores for both ratings and descriptor words for 2 of the 12 older adults in the interrupted task condition. When scores for these two participants were excluded, the difference between means was substantially reduced (e.g., from .99 to .46 for trait ratings).

It is interesting that the observed priming effects were specific to the target dimensions previously identified as applicable to the target's behavior and did not generalize across evaluative content, replicating the effects obtained by Martin (1986). If priming produced a general evaluative bias, we would expect to find that attributions would be affected for any trait dimension assessed, rather than just for those that are applicable to the target. When the mean ratings on the four non-target trait dimensions used in this study were examined, however, no significant effects due to age, prime, or condition were obtained, with the mean rating for the entire sample (4.22) hovering close to the midpoint of the rating scale (4).

**General Discussion**

The goal of this research was to examine age differences in the impact of recently activated trait constructs on judgments about people. Drawing on existing research and theory on cognitive aging and social cognition, we hypothesized that age differences would be minimal in the unintentional activation of specific, accessible conceptual structures. We also hypothesized, however, that older adults would be more susceptible than younger adults to unintended biases in judgments related to these activated structures due to age-related changes in the efficiency of controlled processing mechanisms. It was assumed that these mechanisms are essential in helping the individual identify the source of activated information in memory and subsequently control its impact on behavior.

The results of the two experiments that were conducted were generally consistent with our expectations. First, comparing performance across positive and negative prime conditions, older adults were more likely than younger adults to make judgments biased in the direction of the primed trait constructs. In other words, the descriptors produced by older adults were reliably more positive following a positive prime than they were following a negative prime, suggesting a failure to either identify the source of the primed information or control its impact. Although younger adults also exhibited prime-related biases, these effects were more specific with respect to the contexts in which they occurred. For instance, younger adults were most likely to exhibit biases toward the primes in situations where contextual information associated with the primed information was distinct (e.g., continued activation of primed information in the interrupted task condition in Experiment 2). Younger adults were also more likely than older adults to correct for the impact of the primes, whereby they minimized their attributions associated with the primed trait constructs (e.g., biased impression ratings toward the nonprimed end of the trait dimensions) to presumably control for their perceived biasing effect.

Models of social—cognitive functioning assume that correction is associated with heightened awareness of the primed constructs. There is some evidence from our research that younger adults were more likely than older adults to report awareness and that awareness was more likely to be associated with control in the young than in the old. For example, in Experiment 1, younger participants were somewhat more likely than older ones to recall the traits encountered in the priming task, a situation that others (e.g., Lombardi et al., 1987) have argued is associated with heightened prime consciousness. Indeed, we did find that recall of the prime words was positively associated with self-reports of prime awareness in Experiment 1, suggesting that the absence of assimilative effects in the younger adults may have been related to their relatively higher levels of awareness. However, in spite of the fact that the great majority of participants in both age groups were able to recall one or more of the prime words, the older adults continued to demonstrate assimilative effects. This result is consistent with the notion that increasing age is associated with difficulty in controlling unintended sources of influence. In Experiment 2, in which younger adults were observed to be more likely to correct their judgments in the completed task condition, age was also negatively correlated with self-reported awareness. This further suggests a relation between awareness and control of the primed information.

Whereas the results described earlier are consistent with our expectations, there are at least two aspects of the data that appear to be problematic with respect to our conceptual framework. First, the priming effects that we observed were more systematic for the descriptors than for the trait ratings. It may be that priming influences are more powerful under less constrained conditions, which may reduce potential awareness of the primes. For example, Bargh, Chen and Burrows (1996) found that the impact of primed information (e.g., exposure to the word rude) on behavior was stronger outside the test context (e.g., interrupting a conversation between two people in another room) than is typically observed in studies such as ours, in which prime influences are examined in the same context as the priming occurred. In our research, it could be argued that trait productions are more susceptible to prime influences than are trait ratings because of the relatively fewer constraints imposed on the former. In other words, the absence of specific trait prompts may make it more likely that the primes will exert an influence on behavior.

The second concern has to do with the variability in performance across conditions in the younger adults. Whereas the older adults exhibited reasonably consistent prime effects in all task and prime conditions, the younger adults were more variable in their performance across prime types in situations in which correction was expected. One way to interpret these effects has to do with the basis for corrective procedures used in constructing judgments. Specifically, once the individual is cognizant of the potential influence of the previously activated trait constructs on current judgments, the manner in which judgments are adjusted may be relatively idiosyncratic, at least in comparison to the presumed automatic influence of prime information when the individual is unaware. A dominant manner of dealing with prime influences identified in previous research is to compensate for the prime (e.g., contrast) on the basis of the perception that it is having an undue influence on performance. It is likely, however, that one may have alternative theories that
affect this adjustment procedure (e.g., Strack et al., 1993). For example, one might decide the primed constructs will not have an effect on performance and decide not to exert any deliberate effort to control its impact. Thus, the lack of strongly systematic assimilation or correction effects in the younger adults could be seen as evidence of greater control.

A more general interpretive problem relates to the meaning of the prime-consistent biases that we have observed. In some situations, it seems clear that the biases in judgments reflect assimilation. For example, if the descriptor ratings for the older adults in Experiment 1 are examined in relation to both the midpoint of the scale and the ratings of the young adults in the neutral prime condition, it is reasonably clear that the descriptors being produced are consistent with the primed constructs. Interpretation of performance in the interrupted condition of Experiment 2 is less clear. Whereas the prime is having a clear effect on judgments, the fact that ratings in the negative prime condition (M = 3.35) hover just below the scale midpoint makes it difficult to infer that assimilation is occurring. Although these problems do not call into question the validity of the observed priming effects or age differences therein, they do suggest some as yet unidentified situational variability that affects the form of the prime influences on judgments.

In conclusion, the results of these two experiments suggest that increasing age in adulthood is associated with greater susceptibility to unintended influences on social judgments. Whereas this result is consistent with other work on cognition and aging, such as that having to do with implicit memory, it adds to the literature by demonstrating an impact of implicit cognitive processes on judgments. Whereas the prime is having a clear effect on judgments, the fact that ratings in the negative prime condition (M = 3.35) hover just below the scale midpoint makes it difficult to infer that assimilation is occurring. Although these problems do not call into question the validity of the observed priming effects or age differences therein, they do suggest some as yet unidentified situational variability that affects the form of the prime influences on judgments.

References


Appendix

Target Description Used in Both Experiments

Donald spent a great amount of his time in search of what he liked to call excitement. He had already climbed Mt. McKinley, shot the Colorado rapids in a kayak, driven in a demolition derby, and piloted a jet-powered boat—without knowing very much about boats. He had risked injury, and even death, a number of times. Now he was in search of new excitement. He was thinking, perhaps, he would do some skydiving or maybe cross the Atlantic in a sailboat. By the way he acted, one could readily guess that Donald was well aware of his ability to do many things well. Other than business engagements, Donald’s contacts with people were rather limited. He felt he didn’t really need to rely on anyone. Once Donald made up his mind to do something, it was as good as done, no matter how long it might take or how difficult the going might be. Only rarely did he change his mind, even when it might well have been better if he had.\(^A\)


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