Illusory Correlation and Group Impression Formation in Young and Older Adults

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This study investigated whether a greater illusory correlation bias is present in older adults’ memory and evaluative judgment for majority and minority social groups and, if so, whether this bias might be due to an age-related decline in the ability to engage in on-line processing of group-trait information. Young and older adults read desirable and undesirable trait adjectives about the members of 2 groups under either no-distraction or distraction conditions. Group A had twice as many members as Group B and, for both groups, desirable traits occurred twice as often as undesirable traits. Afterwards, participants completed group–trait memory and evaluative judgment tasks. Greater illusory correlation in memory and evaluative judgment after distraction suggested that diverting resources to competing tasks produced deficits in both memory for specific group–trait information and on-line group impression formation. Older adults’ memory for specific group–trait information was disrupted more by distraction than was young adults’ memory. However, there were no age differences in evaluative judgment after either distraction condition, suggesting that on-line impression formation activities remain intact in old age. These findings are interpreted within the framework of fuzzy trace theory.

CURRENT research in social cognition suggests that the detection and interpretation of relationships between social objects and events plays an important role in impression formation. A focal issue in this area is the question of why these processes sometimes result in biased impressions of individuals and groups. One of the more striking biases in impression formation was illustrated in a now classic study by Hamilton and Gifford (1976). In their study, young adults read statements about individuals in two “social” groups, A and B, who performed either desirable or undesirable behaviors. Group A was larger than Group B, desirable behaviors occurred more frequently than undesirable behaviors for both groups, and there was no relationship between group and behavior valence. Nonetheless, participants overattributed undesirable behaviors to the minority group and evaluated this group less favorably than the majority group. Hamilton and Gifford suggested that this “illusory correlation effect”—the perception of a relationship between group and behavior when there was none—might account for the development of negative stereotypes of minority groups. Subsequent research has shown that illusory correlation in group impression formation occurs reliably in a variety of contexts (for reviews, see McGarty & de la Haye, 1997; Mullen & Johnson, 1990) and may be exacerbated under conditions that tax cognitive resources (Spear & Haslam, 1997; Stroessner, Hamilton, & Mackie, 1992). These findings raise an important question in the study of older adults’ social judgment—namely, do the declines in cognitive resources associated with aging lead to stronger illusory correlation biases and the development of more negative minority group impressions?

There is little agreement on the underlying cognitive processes responsible for illusory correlation in group impression formation. Explanations tend to be divided on the issue of whether impressions of the groups are formed at the time an evaluative judgment is requested using information retrieved from memory or instead are made on-line at the time information about group members is received. The prevailing memory-based explanation for the illusory correlation effect has been proposed by Hamilton and his colleagues (e.g., Hamilton & Gifford, 1976; Stroessner, Hamilton, & Mackie, 1992) who suggest that the effect is due to a memory advantage for minority group undesirable behaviors. Specifically, the minority group undesirable behaviors (i.e., B−) occur less often during presentation and are thus distinctive relative to the three other group-behavior combinations (i.e., A+, A−, B+). These items may be immediately perceived as distinctive or they may be determined to be distinctive through retrospective processing (McConnell, Sherman, & Hamilton, 1994b), but in either case, they are processed more extensively, thereby increasing their availability in memory (cf. Tversky & Kahneman, 1973). This, in turn, produces biases and errors in recall and frequency judgments and, more significantly, overrepresentation of these items in memory-based evaluative judgment.

The contribution of on-line processes to the illusory correlation effect in group impression formation can be seen in the “differentiated meaning” approach of McGarty and Turner (1992). From this viewpoint, individuals seek to emphasize differences between social categories and minimize differences within these categories (cf. Tajfel, 1969). In the illusory correlation task, people make the rational assumption that because the two groups are distinguished by different labels, they must differ in some way and, therefore, their task is to determine how the groups differ on the evaluative dimension implicit in the group-behavior statements. This process of deriving differentiated meaning involves testing hypotheses concerning evaluative differences for the two
groups. For example, individuals may engage in ongoing revision of hypotheses about the odds that desirable behaviors rather than undesirable behaviors prevail for the two groups (e.g., Group A is more desirable than undesirable; Group B is more desirable than undesirable) or of hypotheses that the two groups differ on the evaluative dimension (e.g., Group A members are good and Group B members are bad; Group B members are good and Group A members are bad; McGarty, Haslam, Turner, & Oakes, 1993). Illusory correlation occurs because evidence for the positivity of the majority group is more reliable than evidence for the positivity of the minority group (cf. Fiedler, 1991).

It has recently become apparent that the involvement of memory-based and online impression formation in the illusory correlation task may be determined in part by the encoding environment (e.g., McConnell, Sherman, & Hamilton, 1994a). For example, resource demands during encoding can influence the contribution of these processes to illusory correlation. Although research on this issue is sparse, there is some evidence that the relationship between resource demands and illusory correlation is curvilinear (for a review, see Spears & Haslam, 1997). When resource demands are low, the illusory correlation effect is attenuated because individuals are able to more effectively analyze the evaluative content of the group-behavior statements and integrate this information into an accurate impression of each group. In contrast, when resource demands are moderately high, illusory correlation is enhanced because on-line impression-formation processes produce less accurate representations for the groups (Spears & Haslam, 1997) and evaluative judgments may be influenced to a greater extent by the individual group-behavior statements that can be retrieved from memory (cf. McConnell et al., 1994a). Under very high demands for cognitive resources, online integration of evaluative information may be precluded altogether and memory for both majority and minority group behaviors may also be poor, thereby eliminating the illusory correlation effect (Spears & Haslam, 1997).

Evidence that the availability of cognitive resources during encoding can influence the magnitude of the illusory correlation effect is particularly relevant for the study of how adult aging affects impression formation. Concept identification studies have consistently shown that increasing age is associated with declines in reasoning and hypothesis testing skills (e.g., Arenberg, 1968; Hartley, 1981; Hayslip & Sterns, 1979; Hess & Slaughter, 1986; Sanford, 1973), and it has been suggested that these declines may stem from changes in more basic cognitive resources such as processing speed and working memory capacity (see Salthouse, 1991, for a review of this literature). If changes in these basic resources produce similar declines in on-line processing activities, older adults’ impressions of social groups may be less accurate and more biased. Some evidence in support of this idea comes from research on age differences in person memory and impression formation. For example, consistency effects (i.e., better recall for behaviors that are inconsistent with attributed personality traits than for behaviors that are consistent with these traits; Hastie, 1980) have been observed for older adults when these behaviors are studied after an impression has already been formed, but not when an impression must be formed during study (Hess & Pullen, 1994). According to Hess and Pullen (1994), the burden of simultaneous impression formation and study of the individual behaviors may prevent older adults from engaging in extensive explanation-based processing for the trait-inconsistent information and thus reduce memory for these items. More recent studies have confirmed that memory for the specific behaviors associated with a person (e.g., Joe returned a woman’s purse) as well as impression formation using specific trait information gleaned from these behaviors (e.g., Joe is honest) decline with age. On the other hand, these same studies have shown that evaluative impressions of the person (e.g., likability rating) remain intact (Hess, Follett, & McGee, 1998).

It is not clear, however, whether these findings for person memory and impression formation generalize to social groups. Integrating behavioral and trait information may be more demanding for a group than for a person, because both individual and group information must be considered (McConnell et al., 1994a). To our knowledge, only one study has investigated how adult aging affects group impression formation (i.e., Hess, Pullen, & McGee, 1996). In this study, participants were instructed to learn the shared characteristics of members of a fictitious group based on descriptions of individual group members that were generated from one of two types of prototypical groups. Descriptions generated from a coherent group prototype had either all desirable or all undesirable features, and descriptions generated from an arbitrary prototype had equal numbers of desirable, undesirable, and neutral features. The findings indicated that older adults had no difficulty acquiring the coherent group prototypes. Hess and his colleagues (Hess, Pullen, & McGee, 1996) suggested that this was because an evaluative impression of the group could be activated in a relatively automatic fashion in this condition. On the other hand, older adults had greater difficulty acquiring the arbitrary group prototype, and this was attributed to their inability to effectively use resource-demanding, hypothesis-testing strategies that involved attention to specific trait information and integration of this information into an organized representation of the group. Additional support for this idea was provided by the finding that independent measures reflecting the efficiency of controlled cognitive processes (digit symbol substitution, free recall) accounted for much of the age-related variance in performance for the arbitrary group prototype.

The goal of the present study was to ascertain whether larger illusory correlation biases are present in older adults’ evaluative judgments for majority and minority social groups and, if so, whether these biases might also be due to an age-related decline in the ability to engage in resource-demanding, on-line processing of group–trait information. Young and older adults studied desirable and undesirable trait adjectives about the members of two social groups (A and B). Group A had twice as many members as Group B and, for both groups, desirable traits occurred twice as often as undesirable traits. Afterwards, participants were asked (a) to indicate which traits in a list composed of original and foil traits were attributed to Group A, Group B, or neither of the groups, (b) to estimate the number of desirable and undesirable traits associated with each group, and (c) to rate how
much they liked each group. According to McConnell and his colleagues (McConnell et al., 1994a), on-line and memory-based impression formation produce different patterns of performance on these memory and judgment measures. On-line processing encourages active evaluation and integration of individual group–trait statements, so memory for these statements is generally accurate. Moreover, on-line processing increases the likelihood that accurate impressions of the majority and minority groups will be formed at encoding, so the illusory correlation bias is reduced or eliminated. And finally, on-line processing eliminates the necessity of basing evaluative judgments on the group–trait statements that can be retrieved from memory, so judgment may not be correlated with memory. In contrast, when memory-based impression formation occurs, memory for individual statements is poorer due to the less extensive processing of these statements at encoding, an illusory correlation bias favoring the majority group over the minority group is present in evaluative judgment, and memory and judgment are correlated. Therefore, if older adults have difficulty performing on-line hypothesis testing and integration of group–trait information, this should be revealed in a pattern of performance on the memory and evaluative judgment measures that is more characteristic of memory-based than on-line impression formation.

To gain a clearer picture of how age-related limitations in cognitive resources might affect group impression formation, the availability of these resources during encoding was manipulated. In a no-distraction condition, participants were allowed to focus solely on the presentation of group–trait statements, whereas in a distraction condition they were also required to perform a concurrent task. With no distraction, young adults should be able to engage in effective online group impression formation, and their memory and judgment performance should reveal a pattern that is characteristic of this type of processing. In contrast, performing the distracting concurrent task should limit their use of resources for effective on-line processing and, as a result, their performance should reflect primarily memory-based processes. If older adults suffer a general decline in the resources they can apply to on-line hypothesis testing and reasoning, their memory and judgment performance may reflect memory-based impression formation even without distraction. Thus, the performance of older participants in the no-distraction condition may resemble that of young participants in the distraction condition. The additional demands of the concurrent task may lead to further disruption in older adults’ on-line processing and may also prevent them from extensively processing both majority and minority group–trait statements. This would produce the paradoxical finding of greater illusory correlation for the young participants than for the older participants in the distraction condition.

**Methods**

**Participants and Design**

Fifty young adults were recruited from psychology classes and given course credit for their participation; 55 older adults were recruited from the community and paid for their participation. Two young adults and 7 older adults were replaced due to a failure either to perform the concurrent task correctly (2 young, 5 older) or to complete the test booklets (2 older). The ages of the remaining 48 young participants (11 men, 37 women) ranged from 19 to 30 years, and the ages of the remaining 48 older participants (18 men, 30 women) ranged from 60 to 83 years. Additional information on participant characteristics (mean age, years of education, Wechsler Adult Intelligence Scale-Revised [WAIS-R; Wechsler, 1981] Information, Vocabulary, Digit Symbol, and Backward Digit Span subtest scores) is presented in Table 1. None of the participants reported histories of neurological or psychiatric illness, and none were taking medications known to affect cognitive functioning. All reported that they were in good health.

Within each age group, 24 participants were randomly assigned to one of two encoding conditions (no distraction vs. distraction). Two different study lists and two test orders (Order 1: trait recognition, frequency estimation, affective rating; Order 2: trait recognition, affective rating, frequency estimation) were counterbalanced across the participants in each encoding condition. Six participants were randomly assigned to each study list by test order combination. Additional within-subject variables were associated with the three tests of illusory correlation. For the trait-recognition test, the variables were social group (A vs. B) and trait valence (desirable vs. undesirable), and for the frequency estimation and affective rating tests, the variable was social group (A vs. B).

**Materials**

Study lists contained 48 group–trait adjective statements that provided information about a desirable or undesirable personality trait of a member of one of two social groups, A and B (e.g., Alex, a member of Group A, is polite; Gary, a member of Group B, is hostile). Forty-eight common male names were randomly assigned to the 36-member Group A and the 12-member Group B. An initial pool of trait adjectives was selected from the 1st (desirable traits) and 4th (undesirable traits) quartiles of Anderson’s (1968) likeableness ratings for personality trait words using the following constraints: A word had to be between 4 and 10 letters in

<table>
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<th>Older Adults</th>
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<td>Backward Digit Span</td>
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Table 1. Participant Characteristics

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length, have a background frequency ranging from 4 to 100 occurrences per million (Francis & Kucera, 1982), and contain no hyphens or prefixes. Sixty-four desirable and 32 undesirable traits were randomly chosen from this pool of words to be used in the study lists.

A pilot study was conducted to determine whether older adults’ desirability ratings for these traits would be similar to the ratings of the young adults used in the original norming study (Anderson, 1968). Ten older pilot participants, chosen from the same population as the experiment participants, were asked to rate the desirability of the traits. The rating scale and instructions for this task were identical to those used in Anderson’s (1968) original study. Specifically, the rating scale ranged from 0 (least favorable or desirable) to 7 (most favorable or desirable), and participants were instructed to think of a person as being described by a trait and then rate the trait according to how much they would like the person. It was emphasized that they should make the ratings according to their own personal opinion.

The older adults’ mean desirability ratings for both the desirable ($M = 5.86$) and the undesirable ($M = 1.41$) trait words were somewhat higher than those of younger adults (desirable $M = 4.84$; undesirable $M = 1.00$), suggesting that their ratings were skewed toward the desirable end of the scale. However, the rank order correlation between the young and older adults’ mean ratings for the trait adjectives was .85 ($p < .0001$), showing that the rated desirability of the traits within this set was highly consistent for the two age groups.

Two different study lists were constructed using these traits. For each list there were more members of Group A (36) than Group B (12), but for both groups desirable traits occurred twice as often as undesirable traits. Specifically, 24 desirable and 12 undesirable traits were paired with the members of Group A, and 8 desirable and 4 undesirable traits were paired with the members of Group B. These group–trait pairs were randomly arranged in the study lists. Mean word lengths, word frequencies, and desirability ratings were closely matched for the desirable and undesirable traits across the two lists. Half of the participants were given the first study list and the remaining half were given the second study list.

Illusory correlation in memory was measured using a trait-recognition test (e.g., Pryor, 1986), and illusory correlation in evaluative judgment was measured using trait frequency estimation and affective rating tasks. The trait-recognition test booklet was constructed by combining and randomly arranging the desirable and undesirable traits from the two study lists. Thus, for each participant, this booklet contained the 32 desirable and 16 undesirable traits originally presented with members of Group A or Group B as well as 32 new desirable and 16 new undesirable traits that had not been presented for study. The trait-frequency estimation and affective rating tasks were in separate booklets, and separate pages were provided for the estimates and ratings for each group. For the frequency estimation task, the number of statements originally describing a particular group was given at the top of the page along with instructions to indicate how many of the descriptions for that group were desirable and how many were undesirable. For the affective rating task, instructions appeared at the top of the page indicating that participants were to provide a rating for how much the members of a particular group were liked using a rating scale ranging from 1 (not at all) to 7 (very much).

Procedure

Participants were tested individually or in pairs in a session lasting approximately 1.5 hr. The study phase began after the participants completed consent procedures and a questionnaire on biographical information and health status. Young and older participants in the no-distraction encoding condition were given the following instructions:

This experiment is about how people process and retain information about members of different groups. You will see a series of descriptions of different people. For example: Alex is sincere. The people in the statements will be identified by their membership in a particular group. Each person described is a member of one of two groups which, to keep things simple, will be referred to as Group A or Group B. Both groups are real, although the names of the group members have been changed. The descriptions of the group members were generated by people who know them very well. For this experiment, the group members and their descriptions were drawn at random from the actual group population. In the real world, Group B is smaller than Group A. Consequently, statements describing members of Group B occur less often than statements describing members of Group A.

As each statement is presented, read it carefully. This is important because later on we will ask you some questions about these statements.

Young and older participants in the distraction encoding condition were given instructions containing the same first paragraph as the instructions for the no-distraction encoding condition, but the second paragraph was replaced with the following instructions:

In the real world, we often receive information about people while we are doing other things. Therefore, in this experiment, you will be doing two different tasks as the statements about the group members are presented. One of your tasks will be to read each statement carefully. This is important because later on we will ask you some questions about these statements. The other task will be to count forward by 2 from a given number each time you see a new statement. You will be given a number to start from before the statement presentation begins. Each time you see a new statement, add 2 to the current value of the number. For example, if the initial number is 42, adding 2 when you see the first statement would give you the current value of 44. You must keep thinking about this number, then when you see the next statement, you add 2 to 44 to get the current value of 46 and so on. We are interested in how accurately you can do this task, so after all the statements have been presented you will be asked to record the final value.
you have obtained. Please note, however, that both tasks are important. You should therefore read the statements carefully and count accurately.

Participants then received the list of group–trait statements presented individually on slides at an 8-second rate. Young and older participants in the distraction condition were given an odd 4-digit number for the cumulative addition task just before the presentation of the first statement. They were not allowed to write down this number or the intermediate results of their calculations.

After the presentation of the statements, participants in the no-distraction condition were given the trait-recognition test; those in the distraction condition recorded their final cumulative addition value and were then given this test. For the trait-recognition test, participants were informed that they would see a list of several personality traits, some of which had been attributed previously to a member of Group A or Group B and some of which had not been attributed to a member of a group. They were asked to indicate whether each trait was attributed to Group A, Group B, or neither group by placing an A, B, or N, respectively, next to the trait. After completing this test, participants received the trait-frequency estimation task and the affective rating task in counterbalanced order. For the trait-frequency estimation task, participants were told the total number of traits originally attributed to each group and were asked to estimate how many of these traits were desirable and undesirable. For the affective rating task, they were asked to rate how much they liked the members of each group. After completing the last illusory correlation task, participants were given a 5-min break and then received the WAIS-R (Wechsler, 1981) Vocabulary, Digit Symbol, Information, and Backward Digit Span subtests.

**Cumulative Addition Task**

Several dependent measures were obtained from each participants’ data. Trait-recognition responses were coded as either hits (attribution of an original trait to the correct group), mismatch errors (attribution of an original trait to the wrong group), misses (attribution of an original trait to neither group), or false alarms (attribution of a new trait to a group). These responses were further coded into the categories A+ (desirable traits attributed to Group A), A− (undesirable traits attributed to Group A), B+ (desirable traits attributed to Group B), or B− (undesirable traits attributed to Group B). The proportion of responses in each of these categories was obtained by dividing the number of responses by the total number of possible responses in that category (e.g., 10 A+ hits would result in a proportion of 10/24 = .42; 5 B+ mismatch errors would result in a proportion of 5/8 = .62, and so forth). In addition, a signed phi coefficient was computed using the total numbers of original desirable and undesirable traits (i.e., hits + mismatch errors) assigned to Groups A and B, where \( \phi = \frac{(A^+ \times B^-) - (B^+ \times A^-)}{\sqrt{(A^+ + B^-) \times (A^- + B^+) \times (A^+ + A^-) \times (B^+ + B^-)}}. \)

Phi coefficients that are significantly greater than zero indicate the presence of an illusory correlation bias. Frequency estimates for desirable Group A and Group B traits were used to compute the conditional probabilities \( p(+/A) \) and \( p(+/B) \). The actual value for both of these conditional probabilities based on the numbers of desirable and undesirable traits originally paired with Group A and Group B was .67. A signed phi coefficient was also computed using the frequency estimates for \( A^+ \), \( A^- \), \( B^+ \), and \( B^- \) traits. Finally, a liking index was calculated by subtracting the affective rating for Group A from that for Group B. The lower the index, the less favorable the impression of Group B relative to that of Group A.

**Results**

Analyses were conducted for measures of intelligence (WAIS-R Vocabulary, Information, Backward Digit Span, and Digit Symbol subtest scores; Wechsler, 1981) and illusory correlation (trait-recognition, trait-frequency estimation, and affective rating tasks). All effects reported as significant reached a criterion of \( p < .05 \) or better. Strength of association was measured by partial \( \eta^2 \) unless otherwise noted.

**Intelligence Measures**

Adult aging generally leads to less decline in measures of crystallized intelligence (e.g., Information, Vocabulary) than in measures of fluid intelligence (e.g., Digit Span, Digit Symbol; Horn & Cattell, 1967). To determine whether age differences in intelligence scores were consistent across the two distraction conditions, a 2 (age: young vs. older) \( \times \) 2 (encoding condition: no distraction vs. distraction) multivariate analysis of variance (MANOVA) was conducted for WAIS-R (Wechsler, 1981) Vocabulary, Information, Backward Digit Span, and Digit Symbol scores. These data are presented in Table 1. Age was the only significant effect in this analysis, \( F(4,89) = 63.44, \eta^2 = .74 \). Follow-up univariate tests indicated that older participants had higher Vocabulary, \( F(1,92) = 31.59, MSe = 72.22, \eta^2 = .26 \), and Information scores, \( F(1,92) = 48.57, MSe = 15.87, \eta^2 = .35 \), than young participants, whereas young participants had higher Digit Symbol scores, \( F(1,92) = 164.01, MSe = 76.99, \eta^2 = .64 \), than older participants. These data are therefore consistent with the typical pattern of age differences for measures of crystallized intelligence and fluid intelligence. More importantly, this pattern was consistent across the two distraction conditions.
Illusory Correlation Measures

Trait recognition.— Hits, mismatch errors, misses, and false alarms were entered into separate 2 (age: young vs. older) × 2 (encoding condition: no distraction vs. distraction) × 2 (trait valence: desirable vs. undesirable) analyses of variance (ANOVAs). The presence of a significant Group × Valence interaction provides evidence for the illusory correlation effect and the tests exploring the influence of age and distraction on this effect are of primary concern. Therefore, in the interest of brevity, only the tests of the main and interaction effects of age and encoding condition and the tests involving the Group × Valence interaction are presented here. (The full set of analyses may be obtained from the author upon request.)

Figure 1 shows the proportion of original desirable and undesirable traits correctly attributed to Groups A and B. Hit rates did not vary as a function of age, \( F(1,92) = .21, MSe = .07, \eta^2 = .00 \), or encoding condition, \( F(1,92) = 1.30, \eta^2 = .01 \), and there was no interaction between these two variables, \( F(1,92) = 2.24, \eta^2 = .02 \). As expected, the Group × Valence interaction was significant, \( F(1,92) = 41.42, MSe = .10, \eta^2 = .31 \), indicating that there were differences in the likelihood of correctly attributing desirable and undesirable traits to the majority and minority groups. The Encoding Condition × Group × Valence interaction was not significant, \( F(1,92) = 1.39, MSe = .14, \eta^2 = .01 \). However, there was a significant Age × Group × Valence interaction, \( F(1,92) = 4.50, MSe = .10, \eta^2 = .05 \), and a marginally significant Age × Encoding Condition × Group × Valence interaction, \( F(1,92) = 3.43, MSe = .10, \eta^2 = .04, p < .07 \).

Figure 1 shows the proportions of original desirable and undesirable traits misattributed to Groups A and B. The older participants showed a memory advantage for Group A desirable traits as well as Group B undesirable traits misattributed to Groups A and B. Thus, the hit rates of these participants, like those of young adults, reveal a memory advantage for Group A desirable traits. For older adults in the distraction condition, hit rates were again higher for A+ (\( M = .57 \)) than B+ (\( M = .24 \)) traits, \( F(1,23) = 19.96, MSe = .06, \eta^2 = .46 \), but were similar for A− (\( M = .49 \)) and B− (\( M = .52 \)) traits, \( F(1,23) < 1.00 \), \( MSe = .08, \eta^2 = .01 \). Thus, the hit rates of these participants, like those of young adults, reveal a memory advantage for Group A desirable traits. For older adults in the distraction condition, hit rates were again higher for A+ (\( M = .63 \)) than B+ (\( M = .20 \)) traits, \( F(1,23) = 52.20, MSe = .04, \eta^2 = .69 \), but hit rates were also higher for B− (\( M = .51 \)) than A− (\( M = .20 \)) traits, \( F(1,23) = 11.66, MSe = .10, \eta^2 = .34 \). This finding suggests that distraction during encoding had a significant impact on older adults’ memory for the group–trait statements. Like young adults, they made proportionally more correct attributions for original desirable traits paired with Group A, but unlike young adults, they also made proportionally more correct attributions for undesirable traits originally paired with Group B. Thus, after distraction, the older participants’ showed a memory advantage for Group A desirable traits as well as Group B undesirable traits.

Figure 2 shows the proportions of original desirable and undesirable traits misattributed to Groups A and B. The overall proportion of mismatch errors did not vary as a
function of age, \(F(1,92) < 1.00, MSe = .06, \eta^2 = .01\), but these errors were higher in the distraction condition than in the no-distraction condition, \(F(1,92) = 9.73, \eta^2 = .10\), for both young and older participants, Age \(\times\) Distraction, \(F(1,92) < 1.00, \eta^2 = .01\). Thus, distraction led to poorer memory for the group–trait statements. A significant Group \(\times\) Valence interaction signaled the presence of an illusionary correlation effect in the group–trait data, \(F(1,92) = 34.37, MSe = .10, \eta^2 = .27\), which did not vary with encoding condition, \(F(1,92) = 3.57, MSe = .10, \eta^2 = .04\). However, the Group \(\times\) Valence interaction was qualified by a significant Age \(\times\) Group \(\times\) Valence interaction, \(F(1,92) = 6.83, MSe = .10, \eta^2 = .07\), as well as a significant Age \(\times\) Encoding Condition \(\times\) Group \(\times\) Valence interaction, \(F(1,92) = 4.07, MSe = .10, \eta^2 = .04\). To explore this four-way interaction, separate 2 (encoding condition) \(\times\) 2 (group) \(\times\) 2 (valence) ANOVAs were conducted for each age group.

The analysis for the young participants’ data revealed a significant Group \(\times\) Valence interaction, \(F(1,46) = 5.47, MSe = .10, \eta^2 = .11\), which did not vary with encoding condition, \(F(1,46) < 1.00, MSe = .10, \eta^2 = .00\), showing that the illusionary correlation effect in the young adults’ memory for the group–trait statements was not affected by performance of the concurrent task. Separate analyses of the mismatch errors for desirable and undesirable traits collapsed across the two encoding conditions showed that the young participants misattributed proportionally more of the original desirable traits to Group A (\(M = .43\)) than to Group B (\(M = .22\)), \(F(1,47) = 26.01, MSe = .04, \eta^2 = .36\), but misattributed similar proportions of the original undesirable traits to the two groups (Group A, \(M = .33\); Group B, \(M = .33\)), \(F(1,47) < 1.00, MSe = .08, \eta^2 = .00\). Therefore, regardless of distraction, the illusionary correlation effect in the young adults’ mismatch errors stemmed primarily from a positive bias for the majority group.

For the older participants, both the Group \(\times\) Valence interaction, \(F(1,46) = 37.43, MSe = .10, \eta^2 = .43\), and the Encoding Condition \(\times\) Group \(\times\) Valence interaction were significant, \(F(1,46) = 7.38, MSe = .10, \eta^2 = .14\). Therefore, the data for the no-distraction and distraction conditions were analyzed separately. The Group \(\times\) Valence interaction was significant after both no distraction, \(F(1,23) = 5.97, MSe = .09, \eta^2 = .21\), and distraction, \(F(1,23) = 32.10, MSe = .12, \eta^2 = .58\), revealing illusionary correlation effects in the older participants’ memory for the original group–trait statements for both encoding conditions. Separate analyses of mismatch errors for the desirable and undesirable traits in the no-distraction condition indicated that older participants misattributed proportionally more desirable traits to Group A (\(M = .53\)) than to Group B (\(M = .19\)), \(F(1,23) = 22.68, MSe = .06, \eta^2 = .50\), but misattributed similar proportions of undesirable traits to Group A (\(M = .26\)) and to Group B (\(M = .22\)), \(F(1,23) < 1.00, MSe = .07, \eta^2 = .01\). This finding is similar to that for young participants and shows that in the absence of distraction, the illusionary correlation effect in the older participants’ memory stemmed from a positive bias for Group A. Separate analyses for the desirable and undesirable traits in the distraction condition indicated that older participants again misattributed proportionally more desirable traits to Group A (\(M = .67\)) than to Group B (\(M = .18\)), \(F(1,23) = 54.40, MSe = .05, \eta^2 = .70\), but also misattributed more undesirable traits to Group B (\(M = .54\)) than to Group A (\(M = .22\)), \(F(1,23) = 13.69, MSe = .09, \eta^2 = .37\). Thus, in contrast to the findings for young participants and for older participants in the no-distraction condition, the illusionary correlation effect for older participants in the distraction condition stemmed from both a positive bias for the majority group and a negative bias for the minority group.

Figure 3 shows the proportion of original desirable and undesirable traits that were attributed to neither group. None of the effects of interest were significant in these data: age, \(F(1,92) < 1.00, MSe = .13, \eta^2 = .01\); encoding condition, \(F(1,92) = 1.83, \eta^2 = .02\); Age \(\times\) Encoding Condition, \(F(1,92) < 1.00, \eta^2 = .00\); Group \(\times\) Valence, \(F(1,92) < 1.00, MSe = .02, \eta^2 = .01\); Age \(\times\) Group \(\times\) Valence, \(F(1,92) = 2.33, \eta^2 = .02\); Encoding Condition \(\times\) Group \(\times\) Valence, \(F(1,92) = 1.52, \eta^2 = .02\); Age \(\times\) Encoding Condition \(\times\) Group \(\times\) Valence, \(F(1,92) < 1.00, \eta^2 = .00\). Thus, miss rates for the original traits were similar regardless of age, encoding condition, or the particular combination of social group and trait valence.

Figure 4 shows the proportion of new desirable and undesirable traits incorrectly attributed to Group A and Group B. Older participants had higher false alarm rates than did young participants, \(F(1,92) = 11.81, MSe = .05, \eta^2 = .11,\)
and false alarms were higher after distraction than after no distraction, $F(1,92) = 19.35, MSe = .05, \eta^2 = .17$. However, these effects were qualified by a significant Age $\times$ Encoding Condition interaction, $F(1,92) = 5.64, MSe = .05, \eta^2 = .06$, showing that the higher false alarm rates for older adults occurred only when there was no distraction during encoding.

There was a significant Group $\times$ Valence interaction, $F(1,92) = 29.57, MSe = .08, \eta^2 = .24$, which varied as a function of encoding condition, $F(1,92) = 4.58, MSe = .08, \eta^2 = .06$. However, this illusory correlation effect was not influenced by age, $F(1,92) < 1.00, MSe = .08, \eta^2 = .01$, or by the combined effect of age and encoding condition, $F(1,92) = 2.73, MSe = .08, \eta^2 = .03$. To explore the Encoding Condition $\times$ Group $\times$ Valence interaction, the false alarm data were collapsed over age and separate analyses were conducted for each distraction condition. A Group $\times$ Valence interaction in the data for the no-distraction condition, $F(1,47) = 9.91, MSe = .04, \eta^2 = .17$, revealed the presence of an illusory correlation effect. Participants in this condition attributed a higher proportion of new desirable traits to Group A ($M = .38$) than to Group B ($M = .14$), $F(1,47) = 46.94, MSe = .03, \eta^2 = .50$, but attributed similar proportions of undesirable traits to the two groups (Group A, $M = .19$; Group B, $M = .14$), $F(1,47) = 1.92, MSe = .04, \eta^2 = .04$. Thus, in the absence of distraction, the illusory correlation effect was the result of a positive bias for the majority group. A Group $\times$ Valence interaction was also present in the distraction condition, $F(1,47) = 19.39, MSe = .11, \eta^2 = .29$. However, in this condition, proportionally more new desirable traits were attributed to Group A ($M = .48$) than to Group B ($M = .22$), $F(1,47) = 39.31, MSe = .04, \eta^2 = .45$, and proportionally more new undesirable traits were attributed to Group B ($M = .36$) than to Group A ($M = .19$), $F(1,47) = 7.02, MSe = .09, \eta^2 = .13$. Thus, for participants who were distracted during encoding, the illusory correlation effect was due to both a positive bias for the majority group and a negative bias for the minority group.

Mean phi coefficients computed from the $2 \times 2$ contingency table formed by the attributions of original (i.e., hits + mismatch errors) desirable and undesirable traits to the two groups are shown in Table 2. Separate $t$ tests for the phi coefficients of young and older participants in the no-distraction and distraction conditions indicated that each of these coefficients was significantly different from zero: young, no distraction, $t(23) = 2.88$; young, distraction, $t(23) = 2.09$; older, no distraction, $t(23) = 2.51$; older, distraction, $t(22) = 6.05$. Illusory correlation was therefore present in young and older participants’ memory whether or not distraction occurred during encoding.

A 2 (age: young vs. older) $\times$ 2 (encoding condition: no distraction vs. distraction) ANOVA for the phi coefficients revealed that neither the effect of age, $F(1,91) = 3.50, MSe = .08$.
Table 2. Trait Recognition Phi Coefficients, Trait Frequency Estimates, Frequency Estimate Phi Coefficients, and Affective Ratings as a Function of Age and Encoding Condition

<table>
<thead>
<tr>
<th>Encoding Condition</th>
<th>Young Adults</th>
<th>Older Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>No distraction</td>
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<td></td>
</tr>
<tr>
<td>Trait-recognition phi coefficient</td>
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<td>.36</td>
</tr>
<tr>
<td>Trait frequency estimate</td>
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<td></td>
</tr>
<tr>
<td>Group A</td>
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<td>.19</td>
</tr>
<tr>
<td>Group B</td>
<td>.49</td>
<td>.20</td>
</tr>
<tr>
<td>Frequency-estimate phi coefficient</td>
<td>.02</td>
<td>.28</td>
</tr>
<tr>
<td>Distraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trait-recognition phi coefficient</td>
<td>.17</td>
<td>.40</td>
</tr>
<tr>
<td>Trait frequency estimate</td>
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<td>Group A</td>
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<tr>
<td>Group B</td>
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<td>.22</td>
</tr>
<tr>
<td>Frequency-estimate phi coefficient</td>
<td>.13</td>
<td>.32</td>
</tr>
</tbody>
</table>

.14, \( \eta^2 = .04 \), nor the effect of encoding condition, \( F(1,91) = 3.46, MSe = .14, \eta^2 = .04 \), was significant. However, there was an interaction between these two variables, \( F(1,91) = 5.68, MSe = .14, \eta^2 = .06 \). Separate analysis of the effect of encoding condition for young and older participants’ phi coefficients indicated that for young adults these scores did not vary as a function of the presence or absence of distraction during encoding, \( F(1,46) < 1.00, MSe = .14, \eta^2 = .00 \). However, older participants’ phi coefficients were significantly higher in the distraction condition than in the no-distraction condition, \( F(1,45) = 9.30, MSe = .13, \eta^2 = .17 \). Thus, for young participants the magnitude of the illusory correlation bias in memory was similar after both encoding conditions, but for older adults this bias was greater after distraction. This finding is consistent with the pattern observed in the individual analyses of hit rates and mismatch errors and indicates that distraction had a significant impact on illusory correlation in older participants’ memory for the group–trait statements.

Frequency judgment.—The mean conditional probabilities computed from participants’ frequency estimates for desirable traits paired with Group A and Group B are shown in Table 2. These data were analyzed by means of a 2 (age: young vs. older) \( \times 3 \) (two social groups: A vs. B) ANOVA. The frequency estimates of older participants were higher overall than those of young participants, \( F(1,92) = 6.83, MSe = .04, \eta^2 = .07 \), however, neither encoding condition, \( F(1,92) < 1.00, MSe = .04, \eta^2 = .00 \), nor the combined effect of age and encoding condition, \( F(1,92) < 1.00, MSe = .04, \eta^2 = .01 \), affected these estimates. The proportion of traits estimated to be desirable was higher overall for Group A than for Group B, \( F(1,92) = 10.97, MSe = .05, \eta^2 = .11 \), and this effect varied as a function of encoding condition, \( F(1,92) = 8.04, MSe = .05, \eta^2 = .08 \). No other interactions were significant: Age \( \times \) Group, \( F(1,92) < 1.00, MSe = .05, \eta^2 = .01 \); Age \( \times \) Encoding Condition \( \times \) Group, \( F(1,92) = 1.29, MSe = .05, \eta^2 = .01 \). Separate analyses for each encoding condition indicated that estimates of the number of desirable traits for the two groups were similar in the no-distraction condition, \( F(1,47) < 1.00, MSe = .04, \eta^2 = .00 \), but were higher for Group A than for Group B in the distraction condition, \( F(1,47) = 15.96, MSe = .06, \eta^2 = .25 \).

Mean phi coefficients computed from the 2 \( \times 2 \) contingency table formed by the frequency estimates for Group A and B desirable and undesirable traits are shown in Table 2. Separate \( t \) tests were conducted to determine whether the mean phi coefficients in the no-distraction and distraction conditions were greater than 0. These tests indicated that the coefficient was not significantly different from 0 in the no-distraction condition, \( t(47) = .41 \), but was significantly greater than 0 in the distraction condition, \( t(45) = 3.99 \). A 2 (age: young vs. older) \( \times 2 \) (encoding condition: no distraction vs. distraction) ANOVA for the phi coefficients supported the outcome of the analysis of frequency estimates. There were no differences in the coefficients of young and older participants, \( F(1,90) = 1.11, MSe = .09, \eta^2 = .01 \). However, the coefficients were higher in the distraction condition than in the no-distraction condition, \( F(1,90) = 8.88, MSe = .09, \eta^2 = .09 \), and this effect did not vary with age, \( F(1,90) = 1.68, MSe = .09, \eta^2 = .02 \). Thus, there was no evidence of an illusory correlation bias in the frequency estimates of young and older participants in the absence of distraction during encoding, whereas this bias was present and was of similar magnitude for participants of both ages after distraction.

Affective ratings.—Affective ratings for the two social groups are shown in Table 2 as a function of age and encoding condition. A 2 (age: young vs. older) \( \times 2 \) (encoding condition: no distraction vs. distraction) \( \times 2 \) (social group: A vs. B) ANOVA revealed no main effects of age, \( F(1,92) = 1.28, MSe = 1.04, \eta^2 = .01 \), or encoding condition, \( F(1,92) < 1.00, MSe = 1.04, \eta^2 = .00 \), nor was there an interaction between these variables, \( F(1,92) < 1.00, MSe = 1.04, \eta^2 = .00 \). Participants generally liked Group A better than Group B, \( F(1,92) = 22.20, MSe = 2.16, \eta^2 = .19 \), but this difference was qualified by a significant interaction between encoding condition and group, \( F(1,92) = 8.11, MSe = 2.16, \eta^2 = .08 \). Neither age, \( F(1,92) < 1.00, MSe = 2.16, \eta^2 = .00 \), nor the combined effect of age and encoding condition, \( F(1,92) = 1.17, MSe = 2.16, \eta^2 = .01 \), influenced the difference in affective ratings for the two groups. Separate analyses of the effect of group for each encoding condition collapsed across the young and older participants’ data indicated that there was no difference in affective ratings for Group A and B in the no-distraction condition, \( F(1,47) = 2.30, MSe = 1.63, \eta^2 = .05 \), but Group A was rated as more likable than Group B in the distraction condition, \( F(1,47) = 23.27, MSe = 2.65, \eta^2 = .33 \). Thus, young and older participants’ preference for Group A over Group B appeared only when they were distracted during encoding of the group–trait statements.
Correlational Analyses

Zero order correlations between measures of memory (i.e., phi-recognition) and evaluative judgment (i.e., phi-frequency, liking index) can be found in Table 3. For young and older participants in both encoding conditions, greater illusory correlation in the frequency estimates for the two social groups was associated with a less favorable impression of Group B relative to Group A. In contrast, the relationship between illusory correlation in memory and evaluative judgment varied by age and encoding condition. For young adults in the no-distraction condition, there was no relationship between illusory correlation in memory and evaluative judgment. However, for young adults in the distraction condition and for older adults in both encoding conditions, greater illusory correlation in memory was associated with a less favorable impression of Group B.

Zero order correlations between individual trait-recognition scores and evaluative judgment (i.e., liking index) can be found in Table 4. There were no significant correlations in the no-distraction condition for young adults, however, for older adults, higher hit rates for B+ statements were associated with a more favorable impression of Group B relative to Group A. In the distraction condition, there were several significant correlations for each age group. For young adults, higher hits for A+ statements, lower hits for A− and B+ statements, lower misattributions of original A+ traits to B and original B− traits to A, higher misattributions of new desirable traits to Group A and new undesirable traits to B, and lower misattributions of new undesirable traits to Group A and new desirable traits to Group B were all associated with a less favorable impression of Group B relative to Group A. A similar pattern of correlations was observed for older adults in the distraction condition: Higher hits for A+ and B− statements, lower hits for B+ and A− statements, lower misattributions of original A+ traits to B and higher misattributions of original A− traits to B, lower misattribution of new undesirable traits to A and new desirable traits to B, and higher misattribution of new undesirable traits to B were all associated with a less favorable impression of Group B relative to Group A.

**DISCUSSION**

The main prediction in this experiment was that due to a general decline in the ability to engage in on-line hypothesis testing and integrative processes to form accurate group impressions, older adults’ evaluative judgments for majority and minority social groups would reflect primarily memory-based impression formation. McConnell and colleagues (1994a) have shown that memory-based impression formation is characterized by the presence of illusory correlation in evaluative judgment, poor memory for group-behavior statements, and a positive correlation between memory and judgment, whereas on-line impression formation is characterized by little or no illusory correlation in evaluative judgment, accurate memory for group-behavior statements, and no correlation between memory and judgment. In the absence of distraction, a pattern characteristic of on-line impression formation was clearly present in the memory and judgment data of both young adults. The pattern observed in older adults’ memory and judgment data in this condition suggested a mix of both on-line and memory-based processes. Thus, age-related declines in cognitive resources apparently did not prevent on-line impression formation for the older adults in this condition. A pattern characteristic of memory-based impression formation was present in the memory and judgment data of both young and older adults in the distraction condition, showing that competing demands for resources during encoding reduced on-line impression formation processes for members of both age groups. Distraction did not produce a differentially greater disruption in the evaluative judgments of older adults, but it did produce greater biases in their memory for individual group–trait statements. Thus, competing demands at encoding had a more detrimental effect on older adults’ memory for the specific content of group–trait statements than on their impressions of the majority and minority groups.

The absence of an illusory correlation effect in the young adults’ trait-frequency estimations and affective ratings in the no-distraction condition suggests that during the presentation of the group–trait statements they engaged in on-line processing to produce an accurate, integrated impression of the majority and minority groups. The finding that there was no relationship between the young adults’ memory for the group–trait statements and their evaluative judgment is also consistent with this idea. However, the positive bias in their memory for the majority group (i.e., high rates of misattributions of original and new desirable traits to the majority group) conflicts with the notion that memory for individual group–trait statements will generally be accurate after online impression formation (cf. McConnell et al., 1994a). It is possible that the young adults engaged in extensive processing of the statements with desirable traits; however, the knowledge that the majority group was frequently associated with desirable traits clearly had a stronger influence on their memory for these statements than did the actual statement content (cf. Fiedler, 1991; Fiedler, Russer, & Gramm, 1993; McGarty & Turner, 1992). On the other hand, this knowledge had little influence on their impressions of the two social groups. This pattern of findings suggests that the young adults used different types of information for the memory and judgment tasks. For trait recognition, they relied on retrieval of individual majority and minority group–trait statements that was influenced not only by the accessibility of encoded representations of these statements, but also by the

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**Table 3. Correlations Between Memory (Phi-Recognition) and Evaluative Judgment (Phi-Frequency, Liking Index)**

<table>
<thead>
<tr>
<th></th>
<th>No Distraction</th>
<th>Distraction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liking Index</td>
<td>Liking Index</td>
</tr>
<tr>
<td></td>
<td>Phi-Frequency</td>
<td>Phi-Frequency</td>
</tr>
<tr>
<td>Young adults</td>
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<tr>
<td>Phi-Recognition</td>
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<td>.75**</td>
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<tr>
<td>Phi-Frequency</td>
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<td>—</td>
</tr>
<tr>
<td>Older adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phi-Recognition</td>
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<td>.72**</td>
</tr>
<tr>
<td>Phi-Frequency</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Notes: Phi-Frequency = frequency-estimate phi coefficient; Phi-Recognition = trait-recognition phi coefficient.

*p < .05; **p < .01.
general knowledge that majority group desirable traits occurred frequently. For the trait-frequency estimation and affective rating tasks, they relied on the integrated impressions of the two social groups formed during the presentation of the group–trait statements.

The fact that no illusory correlation effects were observed in the older adults’ trait-frequency estimations and affective ratings suggests that they too formed accurate on-line impressions of the majority and minority groups in the absence of distraction. Moreover, the positive bias in their memory for the majority group indicates that they detected the frequent occurrence of the majority group–desirable-trait statements and used this knowledge in the retrieval of desirable traits. On the other hand, whereas the young adults’ memory and judgment data provided evidence of primarily online processes, the older adults’ data provided some evidence of memory-based processes. Specifically, the finding that higher illusory correlation in memory was associated with higher illusory correlation in affective rating is consistent with memory-based impression formation and suggests that some of the older participants may have relied on the same information for trait recognition and evaluative judgment. Moreover, when older adults had low hit rates for the original minority group desirable traits they also had a less favorable impression of this group. Thus, although the present data provide little evidence for the prediction that age-related limitations in cognitive resources would prevent older adults from engaging in on-line impression formation, they do suggest that reductions in these resources might make this process somewhat less efficient.

Illusory correlation effects were observed in the trait-frequency estimation and affective ratings of both young and older adults who were distracted during encoding, and there were no age differences in the magnitude of these effects. Moreover, memory for the group–trait statements was less accurate after distraction than after no distraction. Finally, for members of both age groups in the distraction condition, greater illusory correlation in memory was associated with greater illusory correlation in both frequency estimation and affective rating, and memory for the individual majority and minority group–trait statements was related to the magnitude of the preference for Group A relative to Group B. These findings are consistent with memory-based impression formation and suggest that competing demands for cognitive resources during the presentation of the group–trait statements interfered with accurate on-line impression formation. The fact that this effect was not compounded by age indicates that distraction led to no greater disruption in on-line processing for older adults than for young adults. It is also clear from these findings that the performance of older adults who encoded the group–trait statements without distraction did not resemble that of young adults who encoded them with distraction, once again ruling out the possibility that an age-related decline in cognitive resources eliminates on-line impression formation activities.

Both young and older adults again displayed a positive bias in their memory for the majority group, showing that distraction did not prevent detection of the frequent occurrence of the majority group desirable traits. Moreover, members of both age groups displayed a negative bias in their memory for the minority group that was not present in the absence of distraction. This suggests that, in addition to disrupting on-line impression formation, distraction resulted in inaccurate representations of the frequencies of majority and minority group undesirable traits. However, this negative bias was substantially stronger in older adults’ memory than in young adults’ memory. Specifically, older adults’ memory was more accurate for undesirable traits originally paired with the minority group than for those paired with the majority group, whereas this was not the case for young adults. Older adults showed high rates of misattribution of both original and new undesirable traits to the minority group, whereas young adults showed high rates of misattribution of only new undesirable traits to this group. Finally, phi coefficients derived from the memory data revealed a greater illusory correlation effect for older adults than for young adults. These findings suggest that distraction during encoding led older adults to process the undesirable traits less extensively. Assuming that memory-based impression formation dominated in the distraction condition, it is surprising that the stronger negative bias in older adults’ memory for the minority group was not accompanied by a correspondingly greater illusory correlation in their evaluative judgments.

Although the pattern of performance in the young and older adults’ memory and judgment data in the two encoding conditions points to variations in on-line and memory-based impression formation, the findings are not entirely consistent with the on-line and memory-based explanations of illusory correlation. For example, the on-line processing view exemplified by the differentiated meaning approach (Fiedler, 1991; McGarty & Turner, 1992; McGarty et al., 1993) suggests that the positive bias seen in young and older adults’ memory for the majority group in the absence
of distraction occurs because the frequent occurrence of desirable majority group traits provides reliable evidence for the positivity of this group; however, this approach does not provide an adequate account of why this bias was not translated into a preference for the majority group in trait-frequency estimation and affective rating tasks. The memory-based view exemplified by the paired distinctiveness approach (Hamilton & Gifford, 1976; McConnell et al., 1994b) suggests that the illusory correlation effect seen in both young and older adults’ evaluative judgments after distraction should be accompanied by a memory advantage for the original minority group undesirable traits. However, such a memory advantage was observed only for the older adults in this condition. Moreover, as pointed out previously, the larger negative bias in older adults’ memory for the minority group was not accompanied by a larger illusory correlation effect in their evaluative judgment. What is needed is a theoretical framework that can integrate the present findings under one conceptual umbrella. Fuzzy trace theory (Brainerd & Reyna, 1990; Reyna & Brainerd, 1995) may provide this framework.

Four principles of fuzzy trace theory seem most pertinent to the findings in this experiment: gist extraction, fuzzy-to-verbatim representational continua, the fuzzy-processing preference, and output interference (see Reyna & Brainerd, 1995, for a review of the extensive evidence for these principles). According to the theory, as people encode events, they extract the overall meanings, global patterns, and relationships among these events and encode these “fuzzy” gist representations in addition to the more precise “verbatim” representations of the individual events. This results in a continua of independent representations ranging from fuzzy to verbatim. All of these representations are available for various cognitive tasks, but because different tasks ask different questions of the system, the actual representations used will vary. More specifically, verbatim questions ask for exact information, whereas gist questions ask for global judgments. Memory tasks generally fall into the first category and require verbatim representations; judgment and reasoning tasks fall into the latter category and prefer fuzzy representations. However, each of the question types can potentially be answered by either gist or verbatim representations, giving rise to the possibility of interference errors in both memory and judgment. Inappropriate verbatim representations or incorrect gist representations may be used in a judgment task; likewise, inappropriate gist representations or inaccurate verbatim representations may be used in a memory task. These interference errors vary with the accessibility of the gist and verbatim representations.

In the present context, it seems reasonable to assume that regardless of the encoding condition, adults of both ages encoded verbatim representations of individual group–trait statements and extracted gist representing general evaluative impressions of the majority and minority groups. It is likely that at least some of the gist extraction processes involved ongoing generation, testing, and revision of hypotheses concerning frequency variations in the set of group–trait statements, the desirability of each social group, and how the groups might differ on the evaluative dimension (e.g., McGarty & Turner, 1992; McGarty et al., 1993). In the absence of distraction, these gist extraction processes were efficient and relatively accurate. As a result, the gist representations mapped the global features of the statement set, including general knowledge of the frequencies of the desirable and undesirable group–trait statements (e.g., Fiedler, 1991; Fiedler et al., 1993) and the proportions of the majority and minority group desirable and undesirable traits. No illusory correlation biases were observed in the frequency estimations and affective ratings of young and older adults in this condition because these judgments were based, for the most part, on accurate gist representations. Distraction at encoding did not prevent adults of either age from encoding gist representations, but it apparently led to significant changes in the quality of these representations. In particular, when distracted, adults in both age groups may have focused their gist extraction processes on especially salient patterns and highly selective, confirmatory hypotheses (e.g., Sanbonmatsu, Posavac, Kardes, & Mantel, 1998). Thus, illusory correlation biases were observed after distraction because the gist representations were distorted. Extraction of evaluative gist information may be an automatic or obligatory process (e.g., Hess et al., 1998); however, diverting resources to competing tasks is clearly detrimental to this process. It is clear, however, that old age does not invariably lead to further distortion of these representations. This finding, together with earlier research showing that there are no age differences in evaluative judgments for individuals (e.g., Hess & Bolstad, 1998; Hess et al., 1998), suggests that encoding and use of gist in the evaluative judgment of both persons and groups remains intact in old age.

Verbatim representations, which were encoded in parallel with gist representations, presumably contained episodic information on the specific content of the individual group–trait statements. Although these representations may be independent of the gist representations (e.g., Reyna & Brainerd, 1995), it is likely that gist extraction processes influenced the degree of attention paid to statements that confirmed (A+ and B– group–trait statements) and/or disconfirmed (A− and B+ group–trait statements) relevant hypotheses (e.g., Fiske & Neuberg, 1990). Memory performance for adults in both age groups reflected retrieval of verbatim representations as well as interference from gist representations, as indicated by the systematic misattribution errors for original and new group–trait statements (cf. Reyna & Brainerd, 1995). In the absence of distraction, gist representing the high frequency of desirable traits for the majority group interfered with both young and older adults’ memory for the desirable group–trait statements, but there was little evidence of gist interference for the undesirable group–trait statements for either age group. Although verbatim representations for the group–trait statements would be preferred over gist representations in trait recognition, the high frequency of the majority group desirable traits was a very salient feature of the group–trait statements (cf. Fiedler, 1991). Consequently, it is likely that this gist information was weighted heavily in memory.

In the distraction condition, encoding of verbatim representations for the group–trait statements would necessarily have been less extensive and may have focused only on distinctive and/or confirming information. As a result, verbatim representations of the group–trait statements were less

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accessible and gist representations had an even stronger influence on memory for the group–trait statements. In particular, this gist interference was responsible for the positive bias in memory for the majority group, the negative bias in memory for the minority group, and the congruence between memory and evaluative judgment. Note that this view differs from the memory-based explanation of illusory correlation, which suggests that congruence in memory and judgment stems from differential distinctiveness in memory for the individual group–trait statements (e.g., Hamilton & Gifford, 1976; McConnell et al., 1994b) rather than from the influence of gist representations in both memory and judgment.

The stronger negative bias seen in older adults’ memory for the minority group after distraction suggests either that their verbatim representations for the undesirable statements were even less accessible than those of younger adults or that they had greater difficulty inhibiting gist interference. It is possible that older adults in this condition sought to further reduce the resource demands of encoding the verbatim information by devoting much less attention to group–trait statements that disconfirmed their hypotheses (A–) than to statements that confirmed these hypotheses (B+; cf. Fiske & Neuberg, 1990; McGarty & Turner, 1992; Mutter & Pliske, 1994). Alternatively, it is possible that while the accessibility of the verbatim representations did not vary for young and older adults, older adults had greater difficulty inhibiting the intrusion of the distorted but more accessible gist representations into their memory responses. The present data do not clearly distinguish between these two alternatives; however, the findings are consistent with studies suggesting that older adults process individual behavioral characteristics less extensively than do young adults (Hess et al., 1998) and with studies suggesting that older adults’ memory may be more susceptible to interference from easily accessed conceptual knowledge (Hess, 1982; Hess & Follett, 1994).

In conclusion, although adult aging may be associated with declines in cognitive resources (e.g., Salthouse, 1991), this does not invariably lead to stronger illusory correlation biases and the development of more negative minority group impressions. However, diverting resources during encoding does produce stronger illusory correlation biases in both young and older adults’ group impressions. Older adults show greater memory biases for specific group–trait information when they are distracted during encoding, but this is not associated with differentially greater illusory correlation in their group impressions. Fuzzy trace theory (e.g., Reyna & Brainerd, 1995) provides a better explanatory framework for these findings than do current accounts of the illusory correlation effect (e.g., Fiedler, 1991; McConnell et al., 1994b; McGarty & Turner, 1992). This theory may also prove to be a useful framework for integrating developmental research in social judgment and reasoning.

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