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ILLUSORY CORRELATION IN CHILDREN: COGNITIVE AND MOTIVATIONAL BIASES IN CHILDREN'S GROUP IMPRESSION FORMATION

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ABSTRACT

Despite the ubiquity and sometimes devastating consequences of stereotyping, we know little about the origins and development of these processes. The current research examined one way in which false stereotypes about minority groups may be developed, which is called illusory correlation. Research with adults has shown that when people are told about behaviors associated with majority and minority social groups where no relationship between social group and behavior exists, people overestimate the number of infrequent (usually negative) behaviors associated with the minority group. Thus, they form an illusory correlation between group membership and behaviors. This effect appears to be due to the enhanced salience of infrequently-occurring information, which is remembered better and therefore estimated to occur more frequently than less salient information. Furthermore, the minority group is evaluated relatively more negatively or positively than the majority group based on the perceived correlation between group membership and behaviors. When participants are members of one of the groups, people further exaggerate the illusory correlation such that their own group is more strongly associated with positive characteristics.

The current research examined whether illusory correlation occurs in second- and fifth-grade children, and whether there are developmental changes in illusory correlation formation. Study 1 investigated illusory correlation formation in the absence of self-involvement in the target groups using a minimal groups paradigm. Children were presented with pictorially represented behaviors of a majority and minority group. The majority group consisted of 12 target children, and the minority group consisted of 6 target children. Participants completed attributions of each behavior to a group, a frequency estimation task in which they indicated the number of members of each group who performed the infrequent class of behaviors, and evaluations of the two groups. Children were assigned to either a Negative Behavior-Infrequent condition, in which negative behaviors were less frequent than positive behaviors, or a Positive-Infrequent condition, in which positive behaviors were less frequent. If infrequent behaviors associated with the minority group become more salient, children should overestimate the frequency with which the behaviors occur in the minority group. Thus, children should form an illusory correlation between the minority group and infrequent behaviors.

Results showed that children overestimated the proportion of infrequent behaviors in the minority group, regardless of whether the infrequent behaviors were negative or positive. Children in the Positive-Infrequent condition also evaluated the minority group more positively than the majority group, consistent with their estimations of a larger proportion of positive behaviors in the minority group. Children in the Negative-Infrequent condition did not evaluate the groups differently, despite the fact that they estimated more negative behaviors in the minority group than the majority group. However, children's illusory correlations predicted differences in evaluations of the majority and minority groups for the Negative-Infrequent and Positive-Infrequent conditions, indicating that group evaluations were based to some extent on the illusory correlations children formed. There were few age differences. Thus, Study 1 suggests that children do show an information processing bias that leads to illusory correlations between a minority group and infrequent behaviors.

Study 2 investigated the relative influence of self-involvement in the minority or majority group and information processing biases using a minimal groups paradigm. Children were told that they were members of either a majority or minority group, and their group perceptions were measured as in Study 1. Results indicated that children overestimated the proportion of negative behaviors in the minority group, and this trend was the same for children assigned to the majority group and minority group. On the group evaluations, however, children rated their own group more positively than the other group. Illusory correlations also predicted differences in evaluations of the majority and minority groups, indicating that perceiving an association between the minority group and negative behaviors moderated the relative evaluations of the groups.

Study 3 explored these relative influences using real social stimulus groups of girls and boys. Results were the same as in Study 2, with one exception. Fifth-graders in the majority group did not evaluate the groups differently, whereas second-graders in the majority group, and second- and fifth-graders in the minority group evaluated the ingroup more favorably than the outgroup. These results suggest that children are indeed susceptible to illusory correlations, and that there are few consistent age effects. Furthermore, ingroup favoritism motivations are not sufficient to prevent minority group members from perceiving an illusory correlation between their own group and negative

behaviors, although minority group children did evaluate the ingroup more favorably. Again, however, differences in evaluations of the majority and minority groups were predicted by children's illusory correlations. These findings are discussed in terms of their implications for stereotype formation, minority children's group perceptions, and strategies for counteracting illusory correlation effects.

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Chapter 1

ILLUSORY CORRELATION IN CHILDREN: COGNITIVE AND MOTIVATIONAL BIASES IN GROUP IMPRESSION FORMATION

Despite a long history of stereotyping research, very little research has focused on mechanisms by which stereotypes are acquired, particularly in children. It is clear that very young children do form stereotypes. For example, by the third year of life children have acquired some rudimentary gender stereotypes (Kuhn, Nash, & Brucken, 1978; Martin & Little, 1990; Thompson, 1975; Weinraub et al., 1984). However, little is known about how children learn these associations.

One mechanism for stereotype development that has been studied broadly in adults, but until recently has not received attention from a developmental standpoint, is the formation of illusory correlations (see Hamilton & Sherman, 1989 for review). Chapman (1967) defined illusory correlation as a perceived correlation between two classes of events that, in reality, are not correlated, or are correlated to a lesser degree than the perceived correlation. In the classic illusory correlation paradigm, desirable and undesirable behaviors of a large social group and a small social group are described. Although the statistical probability of a desirable or undesirable behavior occurring in either of the two groups is the same, people often perceive an association between group

membership and desirable or undesirable behavior. Thus, they form an illusory correlation between group membership and type of behavior. This effect has been explained by information biases (e.g., Fiedler, 1991; Hamilton & Gifford, 1976; Smith, 1991), as well as motivational factors (e.g., McGarty, Haslam, Turner, & Oakes, 1993). In addition, the formation and nature of illusory correlations have been further studied using modified paradigms that include, for example, the self as a member of one of the social groups (Schaller, 1991; Schaller & Maas, 1989), and self-relevant attitudes as stimuli (Spears, van der Pligt, & Eiser, 1985). When such modifications are made, the illusory correlation effect is often altered, demonstrating the importance of certain motivational forces on group perception.

The formation of illusory correlations has important implications for real-world stereotype development. There are a few cases in which groups are considered "minority" groups because they have a lower status than other groups, but have numbers equal to or greater than the population of the majority group, for example, women in most societies, or Blacks in South Africa. However, most minority group populations are smaller than the majority group population. Given that so many minority groups are numerically smaller than majority groups, illusory correlations may explain why many negative stereotypes about minority groups persist. For example, Blacks comprise only a small proportion of the total U.S. population, whereas Whites make up the majority. Furthermore, Blacks and Whites remain socially segregated to some extent. Thus, when a Black individual is observed in an undesirable act, for instance, behaving aggressively, the relative rarity of witnessing aggressive behavior, combined with the relative infrequency of a White person's encountering Blacks, may lead the White person to overestimate the base rate for the occurrence of aggressive behavior in Blacks compared to Whites, resulting in a negative stereotype of Blacks. Moreover, the observer's membership in either the Black or White social group may add motivation to view one group more positively than the other, which could increase or attenuate the illusory correlation effect. Similar effects could occur in the many situations in which there is a disparity in the representation of various social groups, including other racial groups,

religious and ethnic groups, socioeconomic strata, age groups, and women and men in gender-typed occupations. The simple underrepresentation of social groups in certain situations may make the development of stereotypes, in particular negative stereotypes, more likely and thus put these groups at a disadvantage.

It is important to determine whether children are susceptible to illusory correlations, and to examine the developmental course of these biased perceptions. However, developmental research on illusory correlation has just begun to emerge, and remains scarce. Research on illusory correlation in adults and its explanations will therefore be reviewed, and developmental trends in related processes that might affect the developmental course of the formation of illusory correlations will be discussed.

Illusory Correlation in Adults

Measuring Illusory Correlations

Most studies on illusory correlation have manipulated and measured the phenomenon in similar ways. Participants are presented with two target groups, where one group (the majority group) is numerically larger than the other group (the minority group). The groups are often minimal groups, meaning they are experimentally defined and are not based on real criteria, such as race, religion, or geographical location. In some cases, real-world majority and minority groups may be used (e.g., Whites and Blacks). Characteristics such as attitude positions or positive and negative behaviors are assigned to the two groups, with each group having the same proportion of a certain characteristic as the other. For example, participants may be told that 18 members of Group A (69% of Group A members) performed desirable behaviors, and 9 members of Group A (41% of Group A members) performed undesirable behaviors, and that 9 members of Group B (69% of Group B) performed desirable behaviors, and 4 members of Group B (41%) performed undesirable behaviors. Thus, if perception is unbiased, the

two groups should be judged to have performed the same proportion of positive and negative behaviors.

Three types of tasks are typically used to measure illusory correlation. The first task is an attribution task, in which participants are given the list of characteristics associated with the two groups, and are asked to attribute each characteristic to one of the two groups. For example, participants would be asked to recall whether a member of Group A or B performed the behavior "tried not to take sides when his friends had an argument" (Hamilton & Gifford, 1976). Although some characteristics may be recalled correctly, some attributions are likely to represent a "best guess" as to whether a characteristic (e.g., a negative behavior) was associated with the majority or the minority group. Because the two types of characteristics (e.g., positive versus negative behaviors) should be distributed evenly across the groups, overattribution or underattribution of certain characteristics to the groups indicates biased perception, or an illusory correlation between group membership and particular characteristics.

The second type of task is an estimation of the frequency with which each type of characteristic occurred in each group. For example, participants might be asked to determine the proportion of positive and negative behaviors performed by Groups A and B. Again, because the actual proportions are equal, overestimation or underestimation of certain characteristics represents biased perceptions of the groups. Whereas the attribution task measures recall of the correlation between groups and characteristics, the frequency estimation task represents an overall impression of the group-characteristic correlation.

The final task is an evaluation task, and is usually used when positive and negative behaviors were assigned to the groups. Participants are asked to rate the majority and minority group on several attributes (e.g., sociable, lazy). This task is an affective measure of the perceived positivity and negativity of each of the groups, and is presumed to be influenced by the perceived correlation between group membership and behavior valence. Thus, if an illusory correlation between negative behaviors and

minority group membership is formed, evaluations of the minority group should be more negative than evaluations of the majority group.

The Classic Paradigm

Chapman (1967) first demonstrated the presence of an illusory correlation effect using word pairs. Participants were presented with each word pair several times, and each pair appeared with the same frequency. When the word pairs were strongly associated (e.g., lion-tiger), the rate of co-occurrence for these pairs was overestimated. In addition, participants overestimated the rate of co-occurrence among longer words, which occurred less frequently than the shorter words. Chapman hypothesized that the statistical infrequency of the longer words made them distinctive relative to the shorter words, and therefore led participants to overestimate their co-occurrence.

Hamilton and Gifford (1976) found similar evidence of such distinctiveness-based illusory correlations in social stimuli, in which infrequently occurring behaviors were perceived to be correlated with the smaller social group. In their initial study, participants were told that two groups, Group A and Group B, represent real social groups, and that Group B was numerically smaller than Group A. Participants were not aware of whether they might be members of these "real" social groups. Participants then read statements describing positive or negative behaviors performed by a member of one of the two groups. Group A performed twice as many positive and negative behaviors as Group B (see Figure 1); thus, the ratio of positive to negative behaviors was the same for both groups (2.25 positive behaviors to one negative behavior), and there was no correlation between group membership and behavior. After reading these statements, participants saw the list of behaviors without their corresponding group members, and were asked to attribute each behavior to either Group A or B (attribution task). They also estimated the frequency of occurrence for positive and negative behaviors in each group (frequency estimation task), and completed evaluative ratings of the two groups.

Figure 1

Distribution of Positive and Negative Behaviors in Group A and Group B in Hamilton and Gifford (1976), Experiment 1

Behaviors	***A***	***B***	***Total***
Positive	18	9	27
Negative	8	4	12
Total	26	13	39

To examine whether participants perceived a correlation between group membership and performance of positive or negative behaviors, phi coefficients were calculated. A phi coefficient of zero would indicate that no correlation was perceived, whereas a non-zero phi coefficient would indicate a perceived relationship. The results indicated that phi coefficients for the group attributions and frequency estimations were above zero. Closer examination of the group attributions revealed that participants correctly assigned the positive behaviors to their corresponding groups, but overattributed negative behaviors to Group B, and underattributed negative behaviors to Group A. Although Group A actually performed 67% of the negative behaviors, participants assigned only 48% of the negative behaviors to Group A, and assigned the remaining 52% of the negative behaviors to Group B. Likewise, participants showed a tendency to overestimate the frequency of negative behaviors relative to positive behaviors in Group B on the frequency estimation task, although this effect was not statistically significant. Finally, on the evaluative ratings of the two groups, Group A was rated as more likely to have positive characteristics and less likely to have negative characteristics than Group B (Hamilton & Gifford, 1976).

Hamilton and Gifford's (1976) first experiment demonstrated the formation of an illusory correlation between statistically infrequent, or distinctive, stimulus events. Thus, a correlation was perceived between the smaller social group, and the less frequent, or negative, behaviors. In a second experiment, Hamilton and Gifford reversed the frequency of positive and negative behaviors and again found a perceived association

between the infrequent stimulus sets. That is, in Experiment 2, the positive behaviors were less frequent than the positive behaviors, and participants overestimated the number positive behaviors attributed to Group B—the exact opposite effect found in Experiment 1 in which negative behaviors were less frequent.

This phenomenon has since proved to be a robust and reliable effect. A meta-analysis of 23 studies using attribution tasks, and 28 studies using frequency estimation tasks underscores the consistency and strength of the illusory correlation effect (Mullen & Johnson, 1990). Combined effect sizes for negative distinctive behaviors were large for both attribution and frequency estimation tasks (d=.83-1.0), and effect sizes for non-negative distinctive behaviors were small to moderate for both types of tasks (d=.32-.44).

Explanations for Illusory Correlation Findings

The Distinctiveness Hypothesis. Hamilton and Gifford (1976) argued that their illusory correlation findings were the result of biased encoding of distinctive, or infrequently occurring, information. They reasoned that the infrequency of certain behaviors made them more salient, and that heightened attention to the more salient behaviors led to better encoding of these behaviors. The increased attention to the co-occurrence of the less frequent behavior with the smaller group should result in better encoding of the relationship between the minority group and the infrequent behaviors. As a result, these stimuli should be more readily accessible for later retrieval from memory (Tversky & Kahneman, 1973), and may therefore unduly influence judgments about the frequency of co-occurrence.

The increased salience of the distinctive stimuli was supported by Hamilton and Gifford's (1976) finding that participants were relatively accurate in their group attributions of the more frequent behaviors. In Experiment 1, participants attributed 65% of the more frequent (positive) behaviors to the majority group, and 35% to the minority group, whereas the actual proportions were 67% for the majority group and 33% for the minority group. However, they attributed only 48% of the infrequent (negative)

behaviors to the majority group, and 52% to the minority group, whereas the correct proportions were again 67% for the majority group and 33% for the minority group. When asked to estimate the frequency with which each group performed positive and negative behaviors, participants were accurate in estimating the proportion of frequent and infrequent behaviors in the majority group (66% and 34%, respectively), but they overestimated the proportion of infrequent behaviors (44%) and underestimated the proportion of frequent behaviors (56%) performed by the minority group. Similar results were obtained in Experiment 2 in which negative behaviors were frequent and positive behaviors were infrequent. Thus, the pattern of overestimation of the co-occurrence of the infrequent behaviors being performed by the minority group was consistent across the attribution and frequency estimation measures, and held when the infrequent behaviors are positive as well as negative.

Hamilton, Dugan, and Trolier (1985) further examined the distinctiveness hypothesis in the formation of illusory correlations. In addition to estimating the frequency of occurrence for positive and negative behaviors in the majority and minority groups, participants were also asked to recall any behaviors they had heard and the group who performed each behavior. Hamilton et al. found that participants recalled significantly more minority group-negative (infrequent) behaviors than minority-positive behaviors or majority group behaviors, suggesting that the infrequent behaviors performed by the minority group were indeed more available in memory than other behaviors. Moreover, phi coefficients based on frequency estimations were significantly correlated only with the number of minority-negative behaviors recalled. The more minority-negative behaviors participants recalled, the greater the perceived relationship between group membership and behavior was. These findings further strengthen the argument that the illusory correlation effect results from the increased salience of co-occurring distinctive stimuli.

Evaluations Based on Group Size. Other explanations for the illusory correlation effect were proposed based on the assumption that larger groups may be perceived more favorably than smaller groups. One possibility is that if perceivers have *a priori* notions

that majority groups are more favorable than minority groups, this belief may bias their perceptions against the minority group and lead them to overestimate the minority group's base rate for undesirable behaviors. Hamilton and Gifford (1976) examined this possibility in their second study and found that when desirable behaviors, rather than undesirable behaviors, were infrequent, participants overestimated the co-occurrence of the minority group with desirable behaviors, suggesting that they did not simply show a tendency to overestimate the number of undesirable behaviors performed by the minority group, or overestimate the number of desirable behaviors performed by the majority group.

However, Mullen and Johnson's (1990) meta-analytic review showed that effect sizes for illusory correlation measures were much higher when the distinctive behaviors were negative than when they were non-negative. This finding may indicate some tendency to attribute negative behaviors to minority groups. Another possibility is that participants might identify with the majority group and therefore want to represent it more positively (McGarty et al., 1993). Alternatively, the larger effect sizes for negative distinctive behaviors may be due to the increased salience of negative or undesirable behaviors. Other research has suggested that undesirable behaviors are more salient and attract more attention than desirable behaviors (e.g., Kanouse & Hanson, 1972; Ritchie, McClelland, & Shimkunas, 1967). Consistent with the distinctiveness hypothesis, then, the negative valence of undesirable-distinctive behaviors may further enhance their salience, strengthening the illusory correlation effect when undesirable behaviors are infrequent.

A second explanation that was proposed is derived from the "mere exposure" effect (Zajonc, 1968), in which greater exposure to a stimulus leads to enhancements in evaluations of the stimulus. In illusory correlation studies, because the majority group is numerically larger than the minority group (typically twice as large), the greater exposure to the positive statements associated with the majority group could produce more favorable evaluations of that group. However, examination of the data has shown that participants are fairly accurate in their perceptions of the majority group, but tend to

perceive a relationship between minority group membership and distinctive behaviors. Furthermore, this effect occurs even when desirable behaviors are distinctive, suggesting that illusory correlations are not due to more favorable evaluations of the majority group.

The Regression-Information Loss Hypothesis. Fiedler (1991) proposed that illusory correlation effects can be accounted for in terms of information loss from memory. According to Fiedler's account, illusory correlation is the result of regression to the mean, which is especially strong in the low-frequency category, resulting in an overestimation of the low-frequency behaviors in the minority group. Furthermore, because the position of the minority group, with its very small number of behaviors in the infrequent class, is extreme, any lack of confidence in making judgments or information loss resulting in a central tendency response should affect the minority group more than the majority group because of the minority group's extremely low position on the frequency scale. Importantly, this account does not rely on the assumption that certain behaviors are more distinctive than others. Rather, a simple regression effect due to information loss occurs and influences judgments such that the least frequent behaviors, which occur in the minority group, are overestimated.

Consider, for example, Hamilton and Gifford's (1976) studies in which there were 18 frequent behaviors and 9 infrequent behaviors in the majority group, and 8 frequent behaviors and 4 infrequent behaviors in the minority group. Some uncertainty should occur regarding the group with which some particular behaviors were associated. Because the groups are of unequal sizes, regression to the mean should occur when making judgments about whether the uncertain behaviors were performed by the majority or minority group. However, regression should occur most strongly in the minority group-infrequent behaviors cell because the number of minority-infrequent behaviors is extremely small. Thus, regression to the mean should result in an overestimation of minority-infrequent behaviors, creating an illusory correlation that is not necessarily dependent on the increased distinctiveness of the minority-infrequent behaviors.

The Exemplar-Based Model. A second model that does not rely on the distinctiveness of behaviors to explain illusory correlation is Smith's (1991) exemplar-

based model. According to this model, memory for the behaviors presented in the illusory correlation task depends on the storage and retrieval of specific exemplars. Estimation of the proportions of positive and negative behaviors in which each group engaged is based on the arithmetic difference between the number of positive and negative behaviors. For example, if the majority group engages in 18 positive behaviors and 8 negative behaviors, the absolute difference between positive and negative behaviors is 10, in favor of the positive behaviors. If the minority group engages in 9 positive behaviors and 4 negative behaviors, however, the absolute difference between positive and negative is only 5 in favor of positive behaviors. Thus, the majority group may be judged more positively than the minority group because of the additional positive exemplars that were retrieved.

Encoding Bias versus Retrieval Bias. Hamilton and Gifford (1976) claimed that distinctive stimuli are more salient during the encoding process, and therefore are encoded more effectively than nondistinctive stimuli. However, another possibility, such as that proposed by Smith (1991), is that illusory correlation effects are due to a retrieval bias. According to this view, information may be properly represented at encoding, but biased retrieval processes may result in illusory correlations.

Hamilton et al. (1985) examined the hypothesis that illusory correlations are due to an encoding bias rather than a retrieval bias. They presented one group of participants with a serial presentation of group membership-behavior statements, a second group with the same group-behavior statements followed by a summary table of the number of positive and negative behaviors performed by each group, and a third group with only a summary table. They found that the group that received only the summary table made accurate estimations of positive and negative and behaviors for both of the groups; the two groups that received the serial presentation of the stimuli, however, formed the typical illusory correlation. Hamilton et al. argued that receiving the summary table following the serial presentation was not able to attenuate the illusory correlation effect because the memory bias occurred at encoding. Had the bias occurred at retrieval, they reasoned, viewing the summary table should have led to accurate perceptions.

However, a study by McConnell, Sherman, and Hamilton (1994a) disputed the claim that illusory correlations are necessarily due to a bias during the initial encoding process. They distributed the minority-infrequent behaviors throughout the presentation of behaviors in three conditions: a balanced condition, a primacy-loaded condition, and a recency-loaded condition. In the balanced condition, the minority-infrequent behaviors were distributed evenly throughout the stimulus set. In the primacy-loaded condition, these behaviors were massed early in the behavior presentation, thus making them similar in frequency to the more frequent behaviors and nondistinctive at the time of presentation. Finally, in the recency-loaded condition, the minority-infrequent behaviors were not presented until the end of the list, making them especially distinctive at the time of presentation. The hypothesis that minority-infrequent behaviors are more salient at the time of encoding would predict no illusory correlation in the primacy-loaded condition, and enhanced illusory correlation effects in the recency-loaded condition. However, contrary to the predictions of this hypothesis, the results showed similar effects in all three conditions.

The findings from this study suggest that distinctiveness at the time of encoding is not necessary for the formation of illusory correlations. Fiedler's (1991) and Smith's (1991) models, which do not assume any enhanced encoding of distinctive stimuli, could account for these findings. However, McConnell et al. (1994a) tested an extended distinctiveness-based explanation in which information that is not distinctive at the time of encounter can become distinctive as new information is received and processed. The newly distinctive information is presumed to receive further encoding, and thus result in illusory correlations due to this post-encoding process. They included a latency measure for responses on the group attribution task to test their model. Indeed, they found that response latencies for the minority-infrequent behaviors were lower than for other behaviors, and these results were similar across the balanced, primacy-loaded, and recency-loaded conditions. These results indicate that the minority-infrequent behaviors did become more accessible in memory, regardless of whether they occurred in a position that would make them more or less distinctive relative to other behaviors. Thus, contrary

to Fiedler's and Smith's models, McConnell et al. concluded that illusory correlation effects do appear to result from enhanced encoding of distinctive stimuli, although the enhanced encoding may occur during a post-encoding process rather than at the time of initial encoding. In other words, stimuli need not be distinctive at the time of initial presentation, but can become distinctive later when compared to other behaviors.

McConnell et al.'s (1994a) research suggests that group-behavior associations do not need to be especially distinctive at the time they are first encountered to become salient and lead to illusory correlations. Rather, as it becomes apparent that certain types of group-behavior associations occur less frequently than others, the less frequent associations can become more available in memory and unduly influence later judgments. This finding not only provides further support for the distinctiveness hypothesis, but also lends credence to the notion that illusory correlations may result in real world circumstances. Even when group-behavior associations are not witnessed as part of a large series of behaviors in which certain group-behavior associations are noticeably less frequent, comparisons of the relative frequency of the behaviors may be made later, and the less frequent group-behavior associations could become more salient at that time due to their infrequency. Thus, McConnell et al.'s finding suggests the possibility that illusory correlation effects are not limited to a specific experimental situation in which the order of the behaviors is carefully contrived, but could be generalizable to more realistic situations in which later comparisons must be made to determine the relative frequency of group-behavior associations.

The Search for Features that Distinguish Categories. McGarty and his colleagues (McGarty, et al., 1993; Haslam, McGarty, & Brown, 1996) have proposed that motivational factors, namely, the attempt to imbue categories with meaning by seeking dimensions along which those categories differ, contributes to the formation of illusory correlations. It is argued that categorization is a process by which people attempt to make sense of potentially confusing stimuli (McGarty et al., 1993). When faced with categories of a stimulus, people seek regularities in the stimuli that take the form of similarities and differences, and they then accentuate the similarities and differences to

make distinct and useful categories (Tajfel & Wilkes, 1963). Thus, when told that they will hear behaviors of Groups A and B in illusory correlation studies, people may seek to find differences in the two groups, which may cause or accentuate illusory correlations.

McGarty et al. (1993) examined this possibility by giving participants only minimal information about two groups. Participants were told either that there were twice as many statements about Group A as Group B, that half the positive statements referred to Group A, or were given no information about the groups. No behavior statements about group members were given; thus, there was no possibility that distinctive behaviors or memory biases influenced performance on the illusory correlation tasks. Participants were then presented with behavior statements and were asked to guess the group membership of the person associated with each behavior, provide frequency estimates of the number of positive and negative behaviors associated with each group, and complete trait ratings. With the exception of the no information condition, illusory correlation effects occurred on at least two of the three measures, even in the absence of behavioral information about the groups. In a second study, participants were shown the behavior statements with no reference to group membership, and then were asked to attribute group membership to each behavior. Again, they found that participants formed illusory correlations despite the fact that encoding and retrieval biases were impossible. These results indicate that differential encoding or retrieval of the behavior-group membership information was not necessary for illusory correlations to be perceived. Rather, participants *created* perceived differences in the two groups, not based on any misperception of information, but apparently in an effort to distinguish the categories.

Haslam et al. (1996) investigated whether illusory correlations are formed when participants expect groups *not* to differ on any socially meaningful dimension. They proposed that if people do not expect any group differences before presentation of the behavior statements, they should not form illusory correlations. Illusory correlation effects in a control group, who heard statements about majority and minority groups A and B, were compared to effects in an experimental group, who heard statements about a

majority group of right-handers and a minority group of left-handers (groups that are not expected to differ with respect to social characteristics because these groups have no social meaning). They found that whereas people in the control condition showed biased perceptions against the minority group, people presented with the behaviors of right- and left-handers did not form illusory correlations. In addition, participants in the control condition were more likely than those in the experimental condition to report trying to find differences between the two groups. These findings suggest that illusory correlations may be caused, or at least facilitated, by the search for a means of differentiating two social groups, but that the effects are ameliorated when it is known that the groups have no social meaning and thus do not warrant social differentiation.

Further evidence that illusory correlation effects may have some motivational basis is Acorn, Hamilton, and Sherman's (1988) finding that biased perceptions of one type of characteristic induced by an illusory correlation task generalized to another type of characteristic. In one study, participants were presented with statements describing positive and negative social skills, intellectual skills, or both. If illusory correlations were based solely on the data presented, they should remain domain-specific, and negative evaluations of the minority group should not generalize to a different domain. However, Acorn et al. found that negative perceptions of the minority group were indeed generalized from the social domain to the intellectual domain, or vice versa. In a second study, generalization across the traits of introversion-extroversion and maturity-immaturity was examined, with introversion and immaturity considered undesirable traits. On these dimensions, evaluative generalization did not occur. That is, the introverted group was not rated as less mature, or vice versa. Rather, participants generalized the traits using theory-like reasoning about how the traits are related, judging introverted targets to be more mature, and extraverted targets to be less mature.

Thus, the perceived correlation between group membership and traits was not based only on the information presented. Rather, group evaluations were generalized from one domain to another, suggesting some motivational basis for these perceptions. Although this study does not provide evidence that motivational factors influenced

judgments on the initial task for which participants heard which traits were associated with each group (i.e., social, intellectual, or both), generalization to other trait domains was due to motivational factors and not to a cognitive bias caused by the presentation of information.

Summary. Several explanations for illusory correlation effects have been proposed. Hamilton and Gifford (1976) proposed that these effects result from the increased salience of behaviors that co-occur infrequently, that is, infrequent behaviors in the minority group. Because minority-infrequent behaviors do occur so infrequently, they draw the perceiver's attention to them, making them distinctive in comparison to other group-behavior associations, and the frequency of these distinctive behaviors is overestimated because of their increased cognitive availability (Tversky & Kahneman, 1973).

Fiedler (1991) and Smith (1991) offered explanations for illusory correlation effects that are not dependent on the assumption of increased salience of minority-infrequent behaviors. Rather, illusory correlation is believed to be due to regression to the mean (Fiedler, 1991) or to arithmetic differences between the number of positive and negative exemplars encountered in each group (Smith, 1991). However, McConnell et al. (1994) compared these three theoretical explanations, and found evidence only in support of the distinctiveness hypothesis. Furthermore, McConnell et al. suggested that minority-infrequent behaviors become distinctive at the time of encoding when these behaviors are compared to the more frequent group-behaviors associations that have been stored in memory.

McGarty and his colleagues argued that illusory correlation effects result not simply from a cognitive bias that leads to the overestimation of distinctive behaviors, but to the tendency to imbue categories with meaning. When presented with categories of a stimulus, they argue, people will seek regularities in the stimuli, which will lead to perceived differences between the groups. However, illusory correlation effects may not result from either a cognitive bias or a motivational bias, but from a combination of the two types of biases. While the shared infrequency of minority-infrequent behaviors

makes them cognitively distinctive, motivation to find differences in the two groups may help direct attention towards the distinctive stimuli, or facilitate the overestimation of the frequency of occurrence of these stimuli. In the absence of motivation to find group differences, the belief that the groups are alike may lead perceivers to ignore the distinctiveness of the minority-infrequent behaviors and estimate the groups to be equal.

Variations on the Classic Paradigm

On-line versus Memory-Based Judgments. Hamilton and Gifford (1976) argued that illusory correlations are formed from memory-based judgments. According to their view, distinctive information is represented more strongly in memory and is therefore more accessible for making judgments. Several studies have examined whether illusory correlation can take place under conditions of on-line impression formation. In contrast to memory-based judgments, which rely strictly on information retrieved from memory, on-line impression formation involves attending to the usual behaviors performed by a target. On-line judgments create an overall impression of the target and are continually revised as new information is received.

Sanbonmatsu and his colleagues (Sanbonmatsu, Hamilton, and Sherman, 1987; Sanbonmatsu, Shavitt, Sherman, & Roskos-Ewoldsen, 1987) believed that on-line impression formation would *not* lead to illusory correlation effects involving the overestimation of distinctive behaviors. They examined whether people form illusory correlations of individuals as opposed to groups. Group perception is assumed to be memory-based because perceivers presumably do not expect groups to have a "group personality." On the other hand, individuals are presumed to be judged on-line because the individual is expected to exhibit consistent behaviors that will allow the perceiver to form a clear impression of the individual.

Sanbonmatsu, Hamilton, and Sherman (1987) investigated perceptions of salient and non-salient individual targets in an illusory correlation task. Because judgments of the individual targets are likely to be made on-line, perceivers should attend to the more

typical behaviors of the targets, rather than to the unusual, infrequent behaviors. Participants read about or observed several individual targets. In addition, one of the targets was made distinctive by instructing participants to pay special attention to him. Although each of the targets performed the same number of desirable and undesirable behaviors, participants overestimated the occurrence of the more frequent behaviors when judging the target who was made distinctive, but were accurate in judging the other targets. Thus, on-line impression formation of a distinctive individual target led to illusory correlation that was in the opposite direction as that formed when judging group targets, suggesting that illusory correlation effects are dependent on the target of perception, and the type of information processing that takes place.

Pryor (1986) and Schaller and Maass (1989) demonstrated that on-line impression formation could ameliorate illusory correlation effects when the targets were groups. Participants were instructed to try to form a general impression of the two groups as they read the behavior statements describing each group member. They found that these on-line judgments did not lead to any illusory correlation effects.

Thus, the illusory correlation effect in which the minority group's involvement in infrequent behaviors is overestimated appears to be due to memory-based processing. However, McConnell, Sherman, and Hamilton (1994b) found that group impressions on an illusory correlation task were not strictly memory-based. Correlations between recall for behaviors and judgments, which would indicate memory-based judgments, were only significant when participants received instructions that interfered with on-line processing. McConnell et al. proposed that group judgments may involve a slight degree of on-line processing; this processing does not result in a fully integrated impression of the groups, but may involve some partial perception of group traits which may influence judgments.

The Role of Expectation. Despite the abundance of illusory correlation research on the formation of novel group perceptions, very little work has focused on the role of prior expectations in the perception of illusory correlations. Although Hamilton and Gifford (1976) originally conceived of this phenomenon as a means of developing new stereotypes, prior expectations about specific ways in which groups might differ (e.g.,

stereotypes) may serve to hinder or facilitate the perception of illusory correlations. When group expectations are consistent with the anticipated illusory correlation effects, that is, when expectations about the minority group's characteristics are consistent with the infrequent characteristics exhibited by the minority group, the perception of a correlation between the minority group and these behaviors should be facilitated. However, when minority group expectations are inconsistent with the minority group's infrequent characteristics, perception of an illusory correlation should be impeded. As is predicted in schematic-processing situations, information that confirms expectations should be more readily attended to and encoded, leading to judgments consistent with illusory correlation effects. However, expectations that are inconsistent with actual group characteristics may undermine illusory correlation effects by shifting attention away from the distinctive information that disconfirms prior expectations.

McArthur and Friedman (1980) examined the role of stereotyped expectations on illusory correlation effects using black/white, young/old, and male/female stimulus groups. Groups of blacks, elderly people, and women were expected to be seen by young, white college students as having less desirable characteristics than whites, young people, and men. Indeed, when stereotyped expectations about blacks and elderly people were consistent with shared infrequency, that is, when blacks and elderly people were members of the numerical minority group and infrequent behaviors were undesirable, illusory correlation effects were found such that negative behaviors and negative ratings were more strongly associated with blacks and elderly people. In addition, men, but not women, rated women more negatively and associated more negative behaviors with women when women were the stimulus minority group. In contrast, when expectations about the stimulus groups were inconsistent with the anticipated illusory correlation effects, no illusory correlation was seen. That is, when whites, young people, and men were the stimulus minority groups, undesirable behaviors were not overattributed to these groups, and these groups were rated *more* positively than when they appeared more frequently. Thus, illusory correlation effects based on shared infrequency were not found

when these effects were inconsistent with respondents' prior expectations about the target groups.

Whereas McArthur and Friedman (1980) found that expectations overrode the group information presented to impede the formation of illusory correlation, Berndsen, van der Pligt, and Spears (1996) found that data that disconfirmed expectations could prevent expectancy-based perceptions. Some participants were given the expectation that a minority group behaved more negatively than a majority group. All participants completed a rating task that served to present positive and negative behaviors performed by the two groups. The rating task also disconfirmed the expectation that the minority group would engage in more negative behaviors than the majority group because the base rates for positive and negative behaviors were the same for both groups. Participants who completed the rating task in the absence of prior expectations about the minority groups' behavior perceived an illusory correlation between group and behavior desirability. However, participants who were given the expectation that the minority group would perform more negative behaviors perceived a significantly lower correlation between group and behavior valence after completing the rating task. Although they initially expected the minority group to behave more negatively, the rating task allowed them the opportunity to test and disconfirm their expectation, and the illusory correlation effect was therefore reduced. Thus, in contrast to McArthur and Friedman's findings that group perceptions were primarily expectation-driven rather than data-driven, Berndsen et al. demonstrated that perceptions could be based on an interplay between prior expectations and actual data. The ability of the expectation-disconfirming evidence to reduce expectancy-based illusory correlation effects may be due to the amount of attention to the disconfirming evidence required by the rating task, or to the fact that expectations were manipulated just prior to the rating task and may therefore have been easily revised.

Target Salience. Other means of making information distinctive independent of frequency have been explored. Sanbonmatsu, Sherman, and Hamilton (1987) examined illusory correlation effects when one group was made distinctive by directing

participants' attention towards it. They hypothesized that drawing attention to one group over the others would increase the likelihood that the infrequent behaviors would be associated with this group. Five target groups were used, and each group engaged in the same number of positive and negative behaviors. One of the groups was made distinctive by telling participants that this group was of special interest. As expected, people overestimated the number of infrequent behaviors associated with the distinctive group. Thus, although the groups performed the same number of desirable and undesirable behaviors, the special attention paid to one group led to an association between that group and the infrequent behaviors.

Self-relevant target features have also been shown to make attitudes distinctive and produce illusory correlation effects. Spears et al. (1985) examined illusory correlation as a function of attitude congruence with a majority or minority group position and attitude extremity. Participants who held pro- or anti-nuclear power attitudes read attitude statements about a large town and a small town whose residents held mainly pro- or anti-attitudes towards the building of a nuclear power plant. Spears et al. reasoned that statements congruent with participants' attitudes would be more salient than incongruent attitudes. For participants who held attitudes congruent with the minority position, then, the minority-infrequent statements should be particularly salient because their self-relevance should increase the distinctiveness effects. On the other hand, for participants who held attitudes congruent with the majority position, the salience of the majority position should compete with the distinctiveness effect of the infrequent position and attenuate perceptions of an illusory correlation. Furthermore, these effects were expected to vary in strength as a function of participants' attitude extremity.

Spears et al. (1985) found that, as expected, minority-congruent attitude holders showed stronger illusory correlation effects than majority-congruent attitude holders. Furthermore, the strength of the illusory correlations increased with attitude extremity for the minority-congruent participants, but decreased with attitude extremity for majority-congruent participants. Thus, self-relevance of the attitude statements made statements

congruent with participants' own attitudes more salient and strengthened the illusory correlation for minority-congruent attitude holders. For majority-congruent attitude holders, the competing salience of the majority group's attitude position and the attitude-incongruent minority position reduced the illusory correlation effect, particularly for participants who held strong majority-congruent attitudes.

Summary. Illusory correlation effects change substantially when certain aspects of the paradigm are changed. Specifically, judging individuals rather than groups, judging groups with directions to form coherent group impressions as the information about the groups is presented, and having prior expectations about groups led to a different pattern of perceptions than in the classical paradigm. These differences appear to occur because under these conditions, processing of the group-behavior associations is believed to take place on-line, rather than from a complete set of associations stored in memory. When processing occurs on-line, the perceiver compares each new piece of information to the previously encountered pieces of information to form an impression of the target or targets that is continuously updated. The result is an impression that is more strongly influenced by the more frequently encountered information, rather than by the less frequent information. Thus, when judging individual targets, or when the perceiver is asked to form an impression of the groups at the time of presentation of the group-behavior associations, illusory correlations are not typically formed, and judgments of the targets or groups are fairly accurate. One exception is when individual targets or groups are made explicitly salient. In this case, the more frequent behaviors are overly associated with the salient target, resulting in an illusory correlation effect that is opposite the effect normally found in group perception, that is, that the minority group is overly associated with the less frequent behaviors (Sanbonmatsu, Hamilton, & Sherman, 1987).

However, the presence of prior expectations about groups places an additional constraint on processing. Because perceivers expect certain behaviors to be prevalent in certain groups, their attention should be directed towards confirmatory information. That is, perceivers are likely to search for information that confirms their prior expectations

about the groups, and discount information that contradicts their expectations. The result is group impressions that are likely to be consistent with prior expectations.

Shared infrequency is also not the only way in which group-behavior associations can become distinctive. Even when the groups are the same size and engaged in the same number of positive and negative behaviors, the number of infrequent behaviors performed by a group that has been made salient by directing perceivers' attention towards it will be overestimated (Sanbonmatsu, Sherman, & Hamilton, 1987).

The self-relevance of a group characteristic can also make the characteristic distinctive, and can strengthen or attenuate illusory correlation effects. When the self-relevant characteristic occurs in the minority group, illusory correlations are particularly strong because the relative infrequency of the characteristic and its salience due to self-relevance makes it especially distinctive. However, when the self-relevant characteristic occurs in the majority group, the effects of infrequency and self-relevance compete, and illusory correlation effects are reduced (Spears et al., 1985).

Thus, judging individuals versus groups, prior expectations about groups, target salience, and self-relevance are factors that disrupt the formation of illusory correlations, and may allow for accurate perceptions, or may lead to different types of illusory correlations than those based on shared infrequency. Moreover, findings that on-line processing, which directs attention away from infrequent behaviors, and the effects of increasing target salience, either by increasing attention to particular targets or groups or through self-relevance of target characteristics, add further support to the hypothesis that illusory correlation effects result from the increased salience of certain characteristics. When these characteristics are made more or less salient, illusory correlation effects are likewise enhanced or reduced.

The Self as a Member of a Target Group

Another set of factors influences the formation of illusory correlations when the perceiver is a member of one of the target groups. When the self is implicated in

perceptions, new motivations for the maintenance of self-esteem are introduced. To maintain self-esteem people often engage in self-enhancement strategies such as viewing their own social group more positively than other groups, known as ingroup favoritism. Social categorization research has repeatedly demonstrated that group members show favoritism towards their own group, for example, by allocating more rewards to the ingroup (Tajfel, Flament, Billig, & Bundy, 1971) or by rating the ingroup more favorably than the outgroup (Horowitz & Rabbie, 1982), even when the basis for categorizing people is minimal and apparently unmeaningful (Brewer, 1979; Tajfel, 1982). Schaller and Maass (1989) argued that when the perceiver is a member of a target group used in an illusory correlation task, initial group impressions are formed when the perceiver is categorized into one of the groups rather than following the presentation of behaviors engaged in by the two groups. Thus, participants in illusory correlation studies who are members of one of the target groups are likely to be biased towards their own group before the positive and negative behaviors of the two groups have been presented. This expectation may then bias the group information encountered such that information consistent with the expectation that one's own group is relatively more positive will be remembered and data inconsistent with this notion may be discounted. When ingroup bias and shared infrequency effects are in conflict, perceivers may tend to view their own group more favorably than the outgroup, even if illusory correlation effects would predict the opposite.

Another difference between the processing of information about the self or a group to which one belongs versus groups to which one does not belong is that as in the case of judging other individual targets, making judgments about the self involves on-line processing, which leads to different outcomes than memory-based judgments (Sanbonmatsu, Hamilton, & Sherman, 1987; Sanbonmatsu, Shavitt, et al., 1987). On-line impressions of the self or self-relevant groups should be made beginning with the initial presentation of information and should be continuously revised as new information is encountered. Perceivers should therefore attend to the more frequently encountered information, and should overassociate their own group with the more frequent class of

behaviors. However, self-protective motives should lead perceivers to form the expectation that their own group will be positive. If the more frequent behaviors are undesirable, the normal effects of on-line impression formation and self-enhancement motives will be in opposition.

Sanbonmatsu, Shavitt, et al. (1986) examined the effects of on-line processing of targets and self-enhancement motives on the development of illusory correlations by comparing perceptions of the self to perceptions of individual targets. Participants were told either that they were performing a task along with several other targets (participant condition), or that they would be observing a task performed by several individuals (observer condition). In the observer condition, one target was made salient by asking participants to attend to him, whereas in the participant condition, the self was presumed to function as a salient target. In the success condition, participants were told that they performed the task well, while in the failure condition they were told that they performed poorly. Finally, participants were made to believe that the task was either important (social knowledge) or unimportant (social trivia); thus, the potential effects on self-esteem were varied by whether the person succeeded or failed the task and by the importance of the task.

It was expected that consistent with on-line impression formation, participants would form an illusory correlation between the salient target, whether it was the self or a salient other, and the more frequent class of behaviors, either successes or failures on the task. One exception was predicted. In the condition in which participants performed the task, the task was important, and failures were more frequent than successes, motivation to preserve self-esteem was expected to override the cognitive bias to form an illusory correlation between the self and failures. Thus, although participants in this condition were told that they failed an important task, they were not expected to judge themselves to have any more failures than non-salient targets (Sanbonmatsu, Shavitt, et al., 1986).

Indeed, they found that the self and salient others were judged similarly, and the association between the self or a salient target and successes was overestimated when successes were frequent or when the task was unimportant. However, in the participant

condition, the self was not judged differently than other targets when failures were frequent and the task was important. Furthermore, when asked to rate how well the self or the salient target performed relative to the other targets, the same pattern of results was obtained. Thus, when cognitive biases were expected to work to enhance one's view of the self, illusory correlations were formed, but when cognitive and motivational biases were expected to work in opposition to one another, motivational biases to preserve self-esteem outweighed cognitive effects, and no illusory correlation was formed (Sanbonmatsu, Shavitt, et al., 1986).

Schaller and Maass (1989) investigated the relative effects of ingroup bias and shared infrequency effects on the formation of illusory correlations about self-relevant groups. Because perceivers should expect their own group to be more positive than other groups, this prior expectation should lead perceivers to attend to positive information about their own group, and discount negative, expectancy-incongruent information when forming impressions of their own group.

Self-enhancement motives and ingroup favoritism may therefore exacerbate illusory correlation effects that denigrate the minority group when the perceiver is a member of the majority group. For instance, if the less frequent behaviors in question are negative, an illusory correlation may be expected such that negative behaviors are unduly associated with the minority group. If the perceiver is a member of the majority group, this cognitive bias may combine with a bias towards the majority ingroup and increase the perception of covariation between the minority group and negative behaviors. However, when the perceiver is a member of the minority group and these motivational factors are in conflict with the expected shared infrequency-based illusory correlation effects, the motivational factors could outweigh the cognitive effects of shared infrequency. Thus, minority group members' desire to view their own group favorably might be expected to lead to no illusory correlation effects, or an illusory correlation in favor of the minority group.

Participants were assigned either to a control condition in which they were not members of the target groups, or to experimental conditions in which participants were

told they were members of the majority or minority target groups, which purportedly represented two different personality types. Half the participants read behavior statements in which the more frequent behaviors were positive, and half read statements in which negative behaviors were more frequent. Schaller and Maass predicted illusory correlation effects on the attribution and frequency estimation tasks in the control group and experimental conditions in which shared infrequency and ingroup bias would predict similar outcomes. Thus, minority group members in the desirable-infrequent condition and majority group members in the undesirable-infrequent condition were expected to overattribute infrequent behaviors to the minority group because these perceived correlations would make participants' own group appear more positive. In contrast, illusory correlation effects were expected to be attenuated under conditions of conflict between shared infrequency and ingroup bias. That is, minority group members in the undesirable-infrequent condition and majority group members in the desirable-infrequent condition should show less evidence of illusory correlation because their motivation to view their own group favorably would be at odds with the overestimation of these infrequent behaviors in the minority group (Schaller & Maass, 1989).

Whereas illusory correlation effects were expected on the attribution and frequency estimation tasks under some conditions in the experimental groups, participants who were assigned to the target groups were expected to rate their own group more favorably than the other group, regardless of condition. These more favorable evaluations of the ingroup were expected to be formed at the time of assignment into a group, and were not expected to be dependent on the presentation of behaviors.

As expected, they found that illusory correlation effects on group attributions and frequency estimations were significantly lower in the conditions in which ingroup bias and shared infrequency effects were contradictory. However, they also found a reduction in illusory correlation effects in the other experimental conditions compared to the control condition on the attribution task, although the differences were not significant. Only on the frequency estimation task did minority group members in the desirable-infrequent condition form the anticipated illusory correlation, but majority group

members in the undesirable-infrequent condition did not show the expected illusory correlation effects. Participants also showed a tendency to evaluate their own group more favorably than the outgroup, but these differences were significant only when desirable behaviors were infrequent. Furthermore, differences in ratings of the ingroup and outgroup were mediated by the illusory correlation that was formed (Schaller & Maass, 1989).

Thus, the hypotheses were partially supported. As expected, participants who were members of the target groups developed weaker illusory correlations when ingroup biases and shared infrequency effects were in conflict. However, they also showed weaker illusory correlations when these two factors should have worked in concert. Participants also showed a tendency to rate the ingroup more favorably than the outgroup, but this effect did not appear to be driven by participants' initial categorization into a group, but rather by the illusory correlations they formed from the data presented (Schaller & Maass, 1989).

Schaller and Maass (1989) conducted a second study to investigate the possibility that people were more accurate in remembering information about their own group, and that the reduced illusory correlation effects found in the first study were due to increased accuracy. They reasoned that because people expect their own group to be desirable, encountering undesirable information about one's group would require the reconciliation of this information with the favorable impression of the group. The assimilation of the undesirable information with the prior positive expectation about the group requires more effortful processing, which should make that information more accessible for later recall (e.g., Hastie, 1980; Wyer & Gordon, 1982). Thus, although expectancy-inconsistent information may be given less weight when attending to information about one's group, therefore maintaining a positive image of the ingroup, the expectancy-inconsistent information may be more easily recalled from memory because of the extra processing it requires.

Schaller and Maass (1989) argued that enhanced cognitive availability of expectancy-inconsistent information may have led to the lack of illusory correlation

effects on the attribution tasks in Study 1. Furthermore, they believed that attribution tasks are more sensitive to recall accuracy than frequency estimation tasks because frequency estimation tasks require only probabilistic estimations of the occurrence of certain behaviors by the two groups and thus reflect overall group impressions. Attribution tasks, on the other hand, should be more sensitive to variations in recall accuracy.

The assumptions that group members were more accurate than non-members at remembering group information, and that an attribution task would be more sensitive to this difference were tested in Study 2. Group members' perceptions of illusory correlation were compared to perceptions of a control group that was given instructions to form an overall impression of the groups while the behaviors were being presented. Thus, the control group, as well as the experimental group, were expected to use on-line processing when forming group impressions. They expected that control participants would perceive no correlation between group membership and behaviors, whereas participants assigned to a target group would associate their own group with positive behaviors on the frequency estimation task and show an evaluative preference for their own group. However, on the group attribution task, group members were expected to be more accurate than control group participants, especially for the undesirable behaviors. Another possibility is that if undesirable behaviors were more accessible in memory than desirable behaviors for group members, they might be expected to form an illusory correlation in favor of the outgroup. That is, they might overestimate the association between their own group and negative behaviors (Schaller & Maass, 1989).

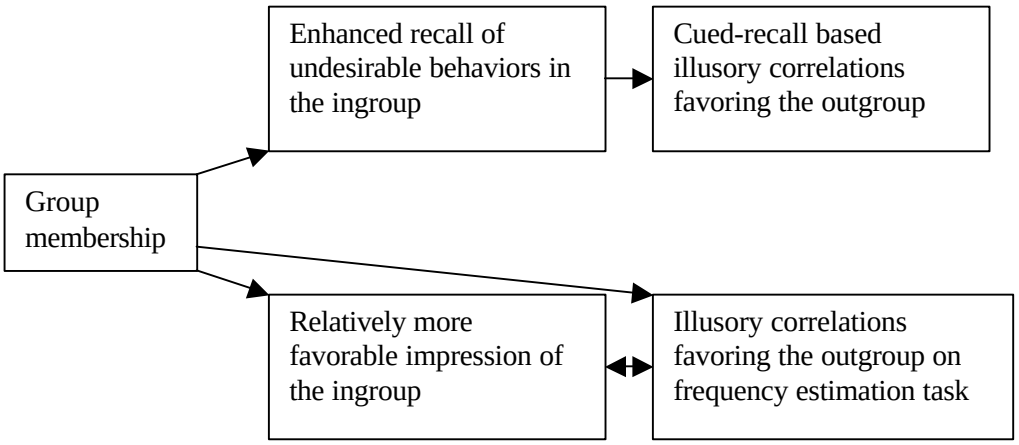
As predicted, control participants did not perceive covariation between the groups and behaviors on the frequency estimation task, but group members perceived a correlation between their own group and positive behaviors. On the attribution task, however, group members perceived less covariation between their own group and positive behaviors than did control participants. Thus, on this task group members perceived their own group less favorably than the control group did. Despite group members' less favorable perception of their group on the attributions, however, their

evaluative ratings of the two groups showed a strong preference for their own group, whereas control participants showed no differences in ratings of the two groups.

In sum, Schaller and Maass (1989) found that first, illusory correlation effects were attenuated when perceivers were members of one of the target groups, particularly when the expected illusory correlation would be in favor of the outgroup. Second, they found that people recalled undesirable information, or information that was inconsistent with their positive expectations for their own group, better than information that was consistent with these expectations, and perceived correlations between their own group and negative behaviors on the attribution task. Third, despite their enhanced recall of undesirable behaviors, participants rated the ingroup more favorably than the outgroup. Motivations leading to ingroup favoritism outweighed the potential effects of the highly accessible negative information about their groups. Fourth, participants perceived a correlation between their own group and positive behaviors on the frequency estimation task, consistent with both on-line processing of the behaviors presented and ingroup favoritism. Finally, the group attribution task and frequency estimation task typically used in illusory correlation studies appear to tap different processes. Whereas attributions reflect memory for the behaviors presented and are therefore more susceptible to differences in recall, frequency estimation is based on an overall impression of the group and therefore may not be as easily influenced by recall when impressions are made on-line (see Figure 2).

Figure 2

Schaller and Maass' (1989) Model for the Effects of Group Membership on Illusory Correlations Involving Self-Relevant Groups



Summary. Sanbonmatsu, Shavitt et al.'s (1986) study and Schaller and Maass' (1989) studies outline two important influences of self-involvement on perceptions of illusory correlations. First, the self functions as a salient target, drawing more attention to behaviors or characteristics relevant to the self than those concerning others. Second, motivational forces related to the protection of self-esteem also affect illusory correlations. When cognitive and motivational biases are in conflict, illusory correlation effects may be attenuated such that one's own group is not seen as less positive than another group, or illusory correlation effects that favor the ingroup may be formed.

Illusory Correlation in Children: Expectations and Related Developments

Despite two decades of research on illusory correlation in adults and the important implications of this phenomenon for understanding the development of stereotypes, research on the development of illusory correlation in children has just begun to emerge. Furthermore, little is known about whether children might be susceptible to the same biases as adults when performing these tasks. Some research on constructs related to

judgments of base-rates for group behaviors, such as encoding of frequency information (Hasher & Zacks, 1984) and schematic information processing (e.g., Bigler & Liben, 1990; Liben & Signorella, 1980; Signorella & Liben, 1984), suggests that few developmental differences might be expected. However, other research (e.g., Jacobs, Greenwald, & Osgood, 1995; Jacobs & Potenza, 1991; Shaklee & Paszek, 1985) suggests that children's ability to make the kinds of relative base-rate judgments required on illusory correlation tasks might improve with age. Additionally, judgments of self-relevant target groups may show developmental changes as children become more and then less biased towards their own social groups (Brown, 1995). Because there has been little research on children's formation of illusory correlations, the development of related skills will be reviewed, and expectations for the development of perception of illusory correlation as it relates to the development of its related skills will be discussed. A model indicating the various skills believed to be involved in the perception of illusory correlation (with no self-relevance) is illustrated in Figure 4.

Expectations for Developmental Change in Distinctiveness-Based Illusory Correlations

Perception of Frequency and Attention. Illusory correlation tasks require participants to judge the frequency with which a certain class of behaviors occurred in each of two social groups. Research on the perception of frequency indicates little developmental change in this ability, and changes in illusory correlation effects that are reliant upon the perception of frequency would therefore also not be expected to change developmentally. Hasher and Zacks (1984) reviewed evidence that the encoding of frequency information appears to be an automatic process that is present at all ages and shows no developmental change. Across a variety of tasks, people are remarkably accurate in judging the frequency with which stimuli were presented, even when participants are not expecting a memory test (Zacks, Hasher, & Sanft, 1982) and when using counting strategies would be extremely difficult (Alba, Chromiak, Hasher, & Attig,

1980). Judgments of frequency are insensitive to feedback and practice (Hasher & Chromiak, 1977; Zacks et al., 1982), and show few individual differences, for example, between children who are proficient learners and learning-disabled children (Goldstein, Hasher, & Stein, 1983). Age differences in the ability to detect frequency also have not been found. In one study, 2-, 4-, and 6-year-olds' judgments of frequency were compared to those of college students. All groups were able to detect frequency equally well (Hasher & Chromiak, 1977). In another study, Kindergartners, first-, second-, and third-graders were found to have equally good memory for frequencies (Hasher & Zacks, 1979). Even infants have been shown to be able to discriminate numerosities (Antell & Keating, 1983; Starkey & Cooper, 1980). Thus, the encoding of information about the frequency of occurrence for behaviors on illusory correlation tasks might be expected not to change with age.

Interestingly, despite people's remarkable and apparently automatic capacity to encode frequency information, adults consistently overestimate the co-occurrence of behaviors in a particular group on illusory correlation tasks. Chapman (1967) and Hamilton and Gifford (1976) proposed that these biased judgments result because the relative infrequency of the smaller class of behaviors and the smaller size of the minority group make them more salient than the frequent behaviors and the majority group. This salience increases the cognitive availability of the infrequent events, which, when paired together, are judged to co-occur more often than they actually do. According to Hamilton and Gifford, this increased availability of certain information is the mechanism responsible for illusory correlation. The cognitive bias proposed by Chapman and Hamilton and Gifford might be expected to be present at any age, and therefore to show little if any developmental change. Thus, based on the lack of expected developmental changes in perception of frequency and availability of distinctive information, few developmental changes in illusory correlation might be expected. However, research on other skills necessary for group perception has found improvement with age in these skills, which might predict age-related changes in perceptions of illusory correlation.

Memory Developments. Perception of illusory correlations when the self is not a member of a target group is largely memory-based, and appears to be based on the enhanced encoding of minority-infrequent behaviors (Hamilton & Gifford, 1976; McConnell et al., 1994a). The ability to encode and retrieve information is therefore crucial to the perception of illusory correlations. Brainerd (1981) found developmental changes in the likelihood that children would retrieve stored information to make probabilistic judgments. Most types of memory show improvement with age, including recall (e.g., Perlmutter, 1984), content-specific memory which improves as knowledge increases (e.g., Bjorklund & Muir, 1988; Chi & Ceci, 1987), and working memory capacity and transfer of information to long-term memory (e.g., Ornstein, Naus, & Liberty, 1975). Children also show age-related improvement in the ability to attend to stimuli for longer periods of time (Ruff & Lawson, 1990; Stodolsky, 1974), and to attend only to task-relevant information (e.g., Strutt, Anderson, & Well, 1975).

It is possible that these memory developments could influence biases in judgments of covariation between groups and behaviors. Age differences in what children choose to attend to may result in different patterns of performance on illusory correlation tasks. For instance, if younger children attend to information that is irrelevant to the goal of forming impressions of how group members behave, their judgments of the groups may look quite different from those of older children and adults. The ability to encode and recall behaviors is critical if one is to notice that certain behaviors have occurred less often than others. If younger children have difficulty storing information or recalling the behaviors that they have encountered, the infrequent behaviors may seem less salient than they do to adults and older children. Finally, increased recall of infrequent behaviors is believed to lead to the overestimation of these behaviors in the minority group. However, if younger children cannot easily recall much of the information presented, they may not show the typical perceptions of covariation. If younger children are less able to encode group-behavior associations, or to store or recall this information, then group perceptions may appear random and highly variable,

whereas older children may show more consistent judgments and therefore more evidence of illusory correlation.

On the other hand, Mullen and Johnson's (1990) meta-analytic review showed that illusory correlation effects increased with memory load. Because older children's memory is superior to that of younger children, the same amount of information would represent less of a memory load for the older children. Assuming shared infrequency did cause minority-infrequent behaviors to become more salient for children, older children could actually show *less* susceptibility to illusory correlation than younger children.

Developmental Changes in Estimation and Use of Base-Rates. Research has shown that children's ability to estimate and use base-rates, which are necessary skills in judging covariation between groups and their characteristics, increases with age (Jacobs, Greenwald, & Osgood, 1995; Jacobs & Potenza, 1991). Jacobs et al. (1995) examined first-, third-, and sixth-graders' accuracy in estimating the base-rates for behaviors and attitudes among their classmates. Children reported how often they engaged in certain behaviors (e.g., ride a bike) and how much they liked particular activities (e.g., going to movies), and they also estimated how often other children in their class engaged in the same behaviors and liked the same activities. The self-reports were used to determine mean base-rates for the class and were compared to children's estimations of the base-rates.

They found that children's accuracy in estimating base-rates increased with age for both behavioral and attitudinal items. Correspondence between children's own attitudes and behaviors and their beliefs about others' attitudes and behaviors also increased with age. Younger children's estimates of base-rates for others' attitudes and behaviors were more variable than older children's estimates, as were their actual reports of these items, which could have contributed to their decreased accuracy compared to older children (Jacobs et al., 1995).

Jacobs and Potenza (1991) investigated first-, third-, and sixth-graders' use of base-rates and judgment heuristics in making categorical predictions. Scenarios were used in which only base-rate information or base-rates as well as individuating

information was given. In the base-rate only conditions, information about the base-rate for two types of object or social groups was given (e.g., Two girls took swimming lessons and four girls took piano lessons.). Participants were asked to judge the likelihood that a person or object would be in each category (Do you think Julie took piano lessons or swimming lessons?). Thus, the only logical method of judgment was using the given base-rates to determine that the target object or person would most likely belong to the more frequently occurring object or social group. In another condition, base-rates as well as individuating information was given (e.g., Ten girls are trying out to be cheerleaders and 20 girls are trying out for the band. Juanita is very popular and pretty. She is always telling jokes and loves to be around people.), and participants were asked to judge which group the object or individual most likely belonged to (Is Juanita trying out to be cheerleader or for the band?). Although correct judgments would be based on the base-rate information, individuating information, or stereotype-relevant information about the target that could be used to classify them into a social group, could also be used. Finally, participants' rationales for their choices were collected.

In the object scenarios in which only base-rate information was given, no age differences were found in children's use of base-rates to make judgments. When individuating information and base-rates were given in the object scenarios, however, the use of base-rates increased with age. Younger children were more likely to falsely base their judgments on the individuating information. In the social scenarios, the use of base-rates increased with age when only base-rate information was given. In contrast, when both base-rates and individuating information were given, the use of base-rates to make judgments decreased with age as the use of individuating information increased. Thus, in the social domain, younger children were less able to use either type of information to make judgments than were older children. Indeed, examination of the consistency between children's choices and their rationales for those choices indicated that younger children were less consistent in their choices, using idiosyncratic strategies and personal preferences rather than a comparison of the numbers to make decisions (Jacobs & Potenza, 1991).

Children's increasing adequacy at estimating base-rates and using base-rate information to make predictions about category membership have important implications for their ability to judge social groups on an illusory correlation task. If young children are highly inaccurate at determining base-rates for behaviors and attitudes from their environment, they may be equally inaccurate at attending to the base-rate information about group behaviors when it is given during an illusory correlation study. Their performance on these tasks may appear highly variable and unsystematic, as it did in Jacobs et al.'s (1995) study. In addition, if they are less able to use base-rates to make judgments, their evaluations of groups may appear different from the evaluative patterns found in adults because the young children may be basing their evaluations on something other than the perceived base-rates. For example, they might be expected not to evaluate minority groups more negatively than majority groups based on a perceived correlation between minority groups and negative behaviors, but might show more variability in their evaluations of minority groups. Furthermore, these evaluations might not correspond to their estimations of base-rates for behaviors in the two groups because they may not use this information to determine their evaluations.

Developmental Changes in Judgment of Covariation. Research has also found developmental trends in children's ability to judge covariation from frequency information (e.g., Shaklee & Mims, 1981; Shaklee & Paszek, 1985). Although strategy use in judging covariation on illusory correlation tasks has not been examined per se, several strategies for judging covariation in general, some of which can lead to false estimates of covariation, have been identified (Mullen & Johnson, 1990). Two possible strategies are to simply consider the size of Cell A or Cell D (see Figure 3; Nisbett & Ross, 1980; Rothbart, 1981; Smedslund, 1963). Using the Cell A strategy, covariation judgments should increase as the size of Cell A increases, whereas the Cell D strategy should yield a decrease in covariation estimates as the size of Cell D increases. Another common strategy is the comparison of Cell A and Cell B or (A - B). This strategy leads to increased covariation judgments as the size of Cell A diverges from the size of Cell B (Ward & Jenkins, 1965). The sum-of-diagonals strategy (A + D) – (B + D) is a

comparison of the number of confirming and disconfirming cases (Ward and Jenkins, 1965). Using this strategy, judgments of covariation should increase as the number of confirming cases (A and D) increases relative to the number of disconfirming cases (B and D). Finally, the correct strategy is a comparison of conditional probabilities of an event, or A/(A+C) versus B/(B+D). This strategy takes into account the relative base-rates for groups of different sizes, and should lead to an accurate estimate of covariation.

Figure 3

Contingency Table for Covariation Judgments

	Majority Group	Minority Group
Frequent Behaviors	A	B
Infrequent Behaviors	C	D

Research has shown that while even many adults fail to employ the conditional probabilities strategy in their covariation judgments, children are even less likely to do so. Shaklee and Paszek (1985) asked second-, third-, and fourth-graders to judge whether two events co-occurred. For example, children were given frequencies of healthy plants that received fertilizer (cell A), unhealthy plants that were given fertilizer (cell B), healthy plants that were not given fertilizer (cell C), and unhealthy plants that received no fertilizer (cell D). The children were asked to determine whether sick plants were more likely to get better if they did nor did not receive fertilizer, or whether there would be no difference. To answer the questions, children had to determine whether plants being healthy or unhealthy covaried with whether or not they had been given fertilizer.

Shaklee and Paszek (1985) found that children's strategies for judging covariation became more complex with age. In particular, the use of the Cell A versus Cell B strategy increased, and use of simpler strategies such as Cell A or response biases, in which frequency information was not considered at all, decreased. Use of the sum-of-diagonals strategy also increased slightly with age, although this strategy was used only infrequently. Comparison of conditional probabilities was not used by any of the

children. However, even many of the youngest children used a comparison of frequencies to determine covariation. In a second study, first-, and second-graders were able to use even the most complex strategy of comparing conditional probabilities after receiving training, although children did not use this strategy spontaneously.

The fact that young children were able to make covariation judgments, and their common use of frequency comparisons to make these judgments suggest that children might indeed be susceptible to illusory correlation effects. The most common judgment strategy found by Shaklee and Paszek (1985) was a comparison of Cell A and Cell B. When estimating the frequency of occurrence for behaviors on illusory correlation tasks, comparing the frequency of a certain type of behavior (e.g., desirable behaviors) in majority and minority groups might be expected to result in a positive association between the majority group and the more frequent behaviors, or a negative association between the minority group and frequent behaviors, because these behaviors occurred more frequently in the majority group. Thus, children might be susceptible to a bias when judging the number of positive and negative behaviors performed by majority and minority group members. However, given that children are likely to use more complex strategies as they become older, illusory correlations formed by older children might appear somewhat different than those formed by younger children.

Summary. Hamilton and Gifford (1976) proposed that the basic mechanism responsible for illusory correlation is the increased cognitive availability of certain group-behavior associations that are made distinctive by their shared infrequency. Because this information is more available in memory, it is overestimated when making judgments about groups. This mechanism may be expected to be present at any age. Indeed, perception of frequency, which can be biased if some frequency information is more available than other information, appears to be an automatic process that does not change with age.

However, the formation of illusory correlations in group perception involves processes other than the perception of frequency, and developmental changes in these related skills may lead to developmental increases in susceptibility to illusory

correlations. Such skills include the ability to attend to only task relevant information, and to encode and retrieve relevant information, all of which increase with age. The estimation of base-rates is also necessary in perceiving illusory correlations. Children's ability to estimate and use base-rates increases with age, although their use of base-rates in social perception decreases with age if individuating information is available. Finally, children must be able to judge covariation between two types of stimuli to perceive illusory correlations. Even very young children are capable of judging covariation, suggesting that they may also be susceptible to illusory correlation, but their use of complex strategies in judging covariation increases with age.

Empirical Evidence of Distinctiveness-Based Illusory Correlations in Children

Only one study has addressed the question of whether children form illusory correlations upon learning information about unknown majority and minority groups, and whether there are developmental trends in susceptibility to illusory correlation. Primi and Agnoli (1998) examined children's perceptions of novel social groups of which they were not members in a paradigm similar to that used by Hamilton and Gifford (1976). First- through fifth-graders were shown drawings of 15 positive behaviors and 6 negative behaviors performed by members of a majority group, called the Pines, or a minority group, called the Firs. The majority group was twice as large as the minority group. The children completed a group evaluation task in which they were asked to rate each of the groups on 20 attributes. They then completed a group attribution task in which they were shown the drawing of the behaviors with the group member omitted, and children were asked to determine which group had performed the behavior by sorting the drawings into boxes labeled Firs and Pines. Finally, children were given two stacks of cards, with each card representing a group member in the Firs and Pines groups. The children estimated the frequency of occurrence for negative behaviors in each group by removing the number of cards corresponding to the number of group members who performed positive and negative behaviors.

Primi and Agnoli (1998) reasoned that if illusory correlations are due to an information processing bias in which shared infrequency makes minority-infrequent behaviors more salient, then children should form illusory correlations similar to those found in adults, and these correlations should be similar across ages. To examine whether illusory correlation effects occurred on the group attribution task, phi coefficients were calculated to determine the degree of perceived association between group membership and behavior type. They found that children overattributed negative behaviors to the minority group, and underattributed them to the majority group. However, children also underattributed positive behaviors to the majority group and overattributed them to the minority group. These effects were similar for all age groups, and phi coefficients were not significantly above zero, indicating that there was no correlation perceived between group membership and behavior type.

Children's frequency estimates showed that they accurately estimated the number of majority group members who performed negative behaviors, but overestimated the number of minority group members who engaged in negative behaviors. Phi coefficients for this task were significantly above zero for third and fourth graders only, indicating that children of these ages perceived a correlation between the minority group and negative behaviors. The trend of overestimation of negative behaviors by the minority group was present in all age groups, although it declined with age, with older children's estimations of negative behaviors in the minority group being more accurate. On the evaluation task, children rated the majority group more positively than the minority group on 13 of the 20 adjectives used (Primi & Agnoli, 1998).

In a second study, Primi and Agnoli (1998) replicated Study 1 using first-, third-, and fifth-graders, and found the same results. Again, children overattributed both negative and positive behaviors to the minority group, and underattributed both types of behaviors to the majority group. Children overestimated the frequency of negative behaviors in the minority group, but phi coefficients for this effect were only significantly above zero for third- and fifth-graders. However, variability was higher among first-graders' responses than among the third- and fifth-graders, which may have obscured any

effects in the youngest age group. Finally, the majority group was evaluated more positively than the minority group.

To further investigate Primi and Agnoli's (1998) belief that children's illusory correlations reflected a cognitive bias, they conducted a third study on illusory correlation effects using nonsocial stimuli. Majority and minority groups were composed of squares and triangles, respectively. The shapes appeared in red more frequently than in green. If illusory correlations are caused simply by an information processing bias, children should be expected to overrepresent the number of green triangles in comparison to red triangles or to red or green squares. The results were similar to those of Study 1 and Study 2. First-, third-, and fifth-graders overattributed both the frequent and infrequent colors to the minority (triangles) group, and overattributed both colors to the majority (squares) group. Children overestimated the number of green triangles (minority-infrequent association), but the variability in responses was lower on this task than on the social task, and phi coefficients were above zero for all age groups.

Thus, children's performance on these tasks did not exactly parallel adults' performance, and younger children did respond somewhat differently than older children. On the group attribution task, children did not show evidence of forming illusory correlations similar to those formed by adults. Children were relatively inaccurate in attributing the behaviors to groups. Furthermore, they did not simply overrepresent the number of negative behaviors performed by the minority group on the frequency estimation task, as is typically the case with adults; rather, it appears that they may have tried to equalize the number of positive and negative behaviors across the two groups, especially in the younger age groups, resulting in the appearance of an illusory correlation in favor of the majority group based on mean frequency estimates. Despite younger children's greater overattribution of negative behaviors to the minority group, phi coefficients were significantly above zero only for older ages, reflecting the large variability in younger children's responses. Recall for group membership on this task was also near chance. However, children were not told prior to beginning the tasks that one group was numerically larger than the other, or that they would be asked to

remember which group had performed each behavior. These missing instructions, which are typically given in adult tasks, may have contributed to children's poor recall and their overassignment of both positive and negative behaviors to the minority group.

Children's evaluations of the majority group were more positive than their evaluations of the minority group, as is usually seen in adult ratings on similar tasks. This effect could be attributable to children's inflated estimations of the base-rate for negative behaviors in the minority group, which, as in the case of adults, could have led them to view the minority group more negatively. However, because their recall of behaviors on the attribution task was so poor, and their performance on both the attributions and the frequency estimation tasks could reflect a misunderstanding of the differing group sizes, it is not entirely clear that their more positive evaluation of the majority group is due to an illusory correlation between the minority group and negative behaviors. Another possible explanation that is that children may have an *a priori* expectation that smaller groups are more negative than larger groups. Although this did not appear to be a viable explanation for adult findings (Hamilton & Gifford, 1976), it cannot be discounted for the children in this study. First, college students participating in the adult studies may have developed beliefs that they should not discriminate against minority groups, and that stereotypes about minority groups are often false and should be discounted, but children may not share this value. Second, the children in this study were Italian, whereas most of the adult research has involved American students. Possible cultural and age differences in the valuation of minority groups and motivations to avoid discrimination make it impossible to rule out the possibility that children may simply expect that minority groups will behave more negatively than majority groups.

Expectations for Illusory Correlations when the Self is a Member of a Target Group

The previous sections discussed possible developmental changes in children's perceptions of groups when they are not a member of one of those groups. The following

section will describe developmental changes in factors related to perception of the self in groups.

Prior Expectations and Schematic Information Processing. When the self is a member of one of the target groups used in illusory correlation tasks, new restraints are placed on processing of group information. Because people are likely to expect their own group to be positive due to self-enhancement motives, this expectation should bias processing of information about the groups as the new information is encountered. Thus, perception of self-relevant groups may be similar to perception of nonself-relevant target groups about which the perceiver has prior expectations.

McArthur & Friedman (1980) demonstrated that adults' expectations about groups (e.g., stereotypes) could override the effects of shared distinctiveness in the formation of illusory correlations. Adults ascribed characteristics to the target groups such that their stereotyped beliefs about the groups were upheld, regardless of the actual information given about the groups. Even very young children show this type of schematic processing of stereotyped information, and children might therefore be expected to perceive expectation-based illusory correlations at a young age.

Numerous studies have shown that children are susceptible to information processing biases associated with group expectations. For example, children as young as four and five years of age exhibit better memory for information that is consistent with racial (Bigler & Liben, 1993) and gender stereotypes (Bigler & Liben, 1990; Martin & Halverson, 1983; Liben & Signorella, 1980; Signorella & Liben, 1984) than for counterstereotypical information. Children are also more likely to reconstruct counterstereotypical information such that it becomes consistent with stereotypes than they are to reconstruct stereotype-consistent information (Bigler & Liben, 1990; Bigler & Liben, 1992).

Martin and Halverson (1981) argued that illusory correlations may be formed through children's schematic processing of stereotyped information. Just as shared infrequency may make some novel associations more salient than other associations, stereotypes are believed to direct attention towards stereotype-consistent information,

making this information more salient and thus more cognitively available. For this reason, illusory correlations may be formed to preserve preconceived beliefs about characteristics associated with particular groups.

Schematic processing was found to be similar at all the ages tested in the previously cited studies. However, some age-related changes in the use of expectations in processing stereotyped information on illusory correlation tasks might be expected. Stereotyping has been found to follow a curvilinear pattern of development. The endorsement of gender stereotypes increases sharply between ages four and six, and then begins to decline throughout the elementary school and adolescent years (Trautner, Helbing, Sahm, & Lohaus, 1988; see Huston, 1983 for review). Older children show more flexibility in their beliefs about what is appropriate for women and men, and benefit more from interventions to reduce stereotyping (Bigler & Liben, 1990). Thus, the anticipated effect of prior expectations on illusory correlation might actually be greater for younger children's perceptions than for older children's perceptions.

On the other hand, knowledge about stereotypes and other types of expectations about groups must develop over time. For instance, although children are quite knowledgeable about gender stereotypes by age three (e.g., Blakemore, LaRue, & Olejnik, 1978; Edelbrock & Sugawara, 1979; Kuhn, Nash, & Brucken, 1978), their knowledge continues to accrue throughout adolescence (Huston, 1983). Logically, changes in expectations should lead to differences in perceptions based on these expectations.

Barrett, Abdi, Murphy, and Gallagher (1993) examined the role of children's changing expectations on judgments of category membership. First- and fourth-graders were taught features associated with two novel bird categories. The categories were defined by three consistent features that occurred only in one of the categories, and three random features that occurred in both categories. Two of the consistent features were linked by an intuitive theory (has a big brain and can remember all the places it has found food, or has a small brain and can remember only the last place it found food). However, only three of the consistent features appeared in any given exemplar; thus, the theory-

correlated features did not co-occur more often than the theory-neutral consistent features. Barrett et al. posited that whereas even young children associate the brain with memory (Johnson & Wellman, 1982), older children are more likely to infer a connection between physical properties of the brain (i.e., size) and cognitive ability (i.e., memory for places where the bird has found food) (Crider, 1981). Older children were therefore expected to perceive the theory-correlated features as a basis for category membership, and to use theory-based links when classifying ambiguous stimuli into the two categories.

Following familiarization of the novel bird categories, children were presented with new exemplars that either preserved the theory-based correlation between brain size and memory (i.e., had a large brain and good memory, or had a small brain and bad memory), or violated this correlation (i.e., had a small brain and good memory, or had a large brain and bad memory). Both types of exemplars possessed the same number of nontheory-related characteristics. Thus, the only difference was whether they preserved or violated the expected correlation (Barrett et al., 1993).

Barrett et al. (1993) reasoned that the exemplars that violated the correlation should be more difficult to classify than those that preserved the correlation. They found that fourth-graders' performance on the classification task, but not first-graders' performance, was significantly above chance. As expected, children classified more items that preserved the theory-based correlation than items that violated the correlation. However, this effect did not vary by age, perhaps because the first-graders had a simpler intuitive theory about the relationship between brain size and memory and were able to use this expectation to facilitate their classification of the correlated items. Thus, Barrett et al. demonstrated that children perceived a relationship between category features that were expected to be associated by an intuitive theory, although these features did not actually co-occur more often than other types of features, and they used this expectation to determine the category membership of new exemplars.

One study has directly examined the formation of expectancy-based illusory correlations in children. Susskind (1997) showed Kindergarten, second-, and fourth-grade children drawings of women and men engaged in gender stereotype-consistent or

gender-neutral activities. Although the stereotyped and neutral pictures occurred with the same frequency, Susskind expected that children would overestimate the frequency of occurrence for the stereotyped pictures. He found that second- and fourth-graders did indeed overestimate the frequency of the stereotype-consistent behaviors compared to the neutral pictures, but Kindergartners did not perceive a difference between the frequency of the stereotyped and neutral pictures, perhaps because their gender stereotype knowledge was not as extensive as the older children's knowledge.

In a second study, Susskind (1997) presented second- and fourth-graders with women and men performing stereotype-consistent, neutral, or stereotype-inconsistent behaviors, and varied the frequency with which the sexes occurred. That is, for half the children, women performed the behaviors twice as often as men, and the other half of the children saw men engaged in the behaviors twice as often as women. Susskind predicted that children would again overestimate the relationship between gender and behaviors for the stereotype-consistent pictures, but not for the stereotype-inconsistent and neutral behaviors. As expected, both second- and fourth-graders estimated the frequency of the stereotype-consistent behaviors to be higher than the inconsistent and neutral behaviors, and this effect did not differ for the high- and low-frequency gender conditions. Thus, children's perceptions were influenced by their gender stereotypes such that they perceived an illusory correlation between gender and stereotype-consistent behaviors, although they were relatively accurate at judging the number of women and men presented across the two gender-frequency conditions. These results are consistent with Jacobs and Potenza's (1991) findings that although children's ability to use base-rates in making social judgments increases with age, children prefer to use stereotype-relevant individuating information about targets with increasing age.

Developmental Changes in Intergroup Discrimination. Related to expectation-based illusory correlations is the case in which a participant is asked to make judgments about a group to which the participant belongs. In such situations motivational factors leading to ingroup favoritism can result in more positive perceptions of one's own group than of other groups, even if the perceiver is presented with information that should lead

to the opposite effect. Given that very young children have been shown to be susceptible to information processing biases due to stereotypes and group expectations, young children might also be predicted to show more favorable perceptions of the ingroup on illusory correlation tasks.

However, children's tendencies to favor their own group follow a developmental course that is consistent across various types of social groups. Specifically, children's ingroup favoritism is usually found to peak between the ages of five and eight (Brown, 1995). For example, one study found that British children distributed more sweets to unknown children of their own ethnic group than to children of other ethnic groups, and also attributed more negative traits to the outgroups. The discrepancies between ingroup and outgroup perceptions were more marked in the 7- to 8-year age group than among the 9- to 10-year-olds (Davey, 1983). A study of intergroup discrimination between Dutch-speaking and French-speaking groups in Belgium found that children evaluated their own group more favorably and distributed more rewards to their own group than to the outgroup, and this effect was more pronounced among the 8-year-olds than among the 6- to 7-year-olds or the 9- to 10-year-olds (van Avermaet & McLintock, 1988). Powlishta, Serbin, Doyle, and White (1994) also found that among English-speaking Canadian children, bias against French-Canadians and obese people, and against people of the other sex peaked between ages five and nine.

Gender bias is also quite strong during this time, especially among girls. For example, Yee and Brown (1994) showed children collages of differing attractiveness purportedly constructed by a team of girls or boys. Children allocated prizes to the teams for the quality of the collages. The boys tended to reward the team that had allegedly constructed the more attractive collage, whereas the girls rewarded the team of girls, regardless of whether they had allegedly constructed the good or poor quality collage. Zalk and Katz (1978) also found that girls were more likely than boys to attribute undesirable behaviors to their own gender group and undesirable behaviors to the other gender group, and that ingroup bias was stronger among 7-year-olds than among 10-year-olds.

Ingroup favoritism is not limited to real social groups. In an adaptation of the minimal groups paradigm in which children were assigned to groups based on their preferences for artists, Vaughan, Tajfel, and Williams (1981) asked children to allocate money to the two minimal groups. They found that children gave more money to their own group than to the outgroup, particularly when this practice would establish a relative discrepancy between the groups.

Yee and Brown (1992) found a similar effect when they examined children's perceptions of their teams' performance in an egg-and-spoon race. Children were given a practice session at running with an egg and spoon and were given bogus feedback regarding their performance. The children were placed on a team of unknown children who were ostensibly expert egg-and-spoon runners or who were less good runners, and they were asked to rate how good each teams' performance was likely to be in a race. As would be expected, children assigned to the high-performance condition believed the high-performance team would perform better than the low-performance team. In contrast, three- and nine-year olds in the low-performance group rated the outgroup as likely to out-perform their own group. Seven-year-olds rated the performance of the two teams similarly, although they judged the high-performance team to be slightly better than their own low-performance team. However, five-year olds in this condition believed their own low-performance team would do better than the high-performance team.

Klaczynski and his colleagues have examined the influence of self-serving biases on reasoning. They have found that adolescents' and adults' personal beliefs bias their scientific reasoning, and that the intrusion of self-serving biases does not change with age. For example, when asked to detect threats to internal validity of evidence relevant to religious beliefs, adolescents were less likely to detect threats to internal validity if detection would discredit their own beliefs (Klaczynski & Gordon, 1996). Thus, they showed evidence of self-serving biases that protected their belief systems. Furthermore, reasoning about evidence that is consistent with one's prior beliefs tends to be more strongly biased by personal beliefs, whereas belief-incongruent evidence tends to be

subject to deeper processing and therefore more sophisticated scientific reasoning (Klaczinsky & Fauth, 1997; Klaczinsky, Gordon, & Fauth, 1997).

In sum, children clearly show a bias towards their own group, even when group assignment is arbitrary and children have had little time to attempt to ascertain how the groups might differ. Children's ingroup bias also tends to increase and then peak around five- to eight-years of age, and then declines. The ingroup favoritism seen in children may also be expected to manifest itself in the formation of illusory correlations. On illusory correlation tasks in which children are assigned to one of the target groups, children, like adults, might be expected to perceive their own group more favorably than the outgroup, even when they are assigned to a minority group in which negative behaviors are distinctive, and the effects of shared infrequency would otherwise result in a more negative perception of the minority group.

Summary. The tendency to view one's own group more positively than other groups may serve as a prior expectation that will bias perception of group-relevant information on illusory correlation tasks such that the perceiver discounts negative information about her own group when forming group impressions. Research on schematic processing and theory-based reasoning has shown that even young children's perceptions are biased by their prior beliefs. The effects of prior expectations do not appear to change with age, although the content of the biases does change as more information is learned. However, research on intergroup discrimination has shown that children's ingroup favoritism does tend to peak around the ages of 5-8 years, and then declines. Thus, the decrease in ingroup favoritism among older children may lead them to show *less* bias based on intergroup discrimination in their group perceptions on illusory correlation tasks.

Expectations for Developmental Changes in the Formation of Illusory Correlations

The proposed mechanism leading to the formation of nonself-relevant illusory correlations is the distinctiveness, or increased cognitive accessibility, of certain group-

behavior associations. These associations may become distinctive because the shared infrequency of the minority group and infrequent behaviors make these minority-infrequent associations particularly salient. The ability to perceive relative frequency, and the enhanced cognitive accessibility of particular types of information leading to the overestimation of this information is not expected to change with age (Hasher & Zacks, 1984).

However, given the developmental changes in other skills that are required for the formation of illusory correlations, some age-related changes in the perception of illusory correlation might be expected. Please refer to the hypothesized processing steps involved in illusory correlation illustrated in Figure 4. First, children must encode the group-behavior associations that have been presented, and to perceive the difference in frequency between the frequent and infrequent behaviors in order to notice the relative infrequency of the minority-infrequent behaviors. The perception of the relative infrequency of the minority-infrequent behaviors should cause these behaviors to become distinctive in memory at the time of encoding. Hasher and Zacks (1984) reviewed evidence showing that children of all ages are quite adept at perceiving frequency, and that this ability appears to be automatic and possibly innate. The perception of distinctive behaviors should therefore not differ with age. However, older children's increased ability to attend to task-relevant stimuli (Strutt, Anderson, & Well, 1975) and to encode and store information in memory (Ornstein, Naus, & Liberty, 1975) should make them better able to encode the group-behavior associations at Level 1. Thus, older children might be more likely to encode the minority-infrequent behaviors for later retrieval.

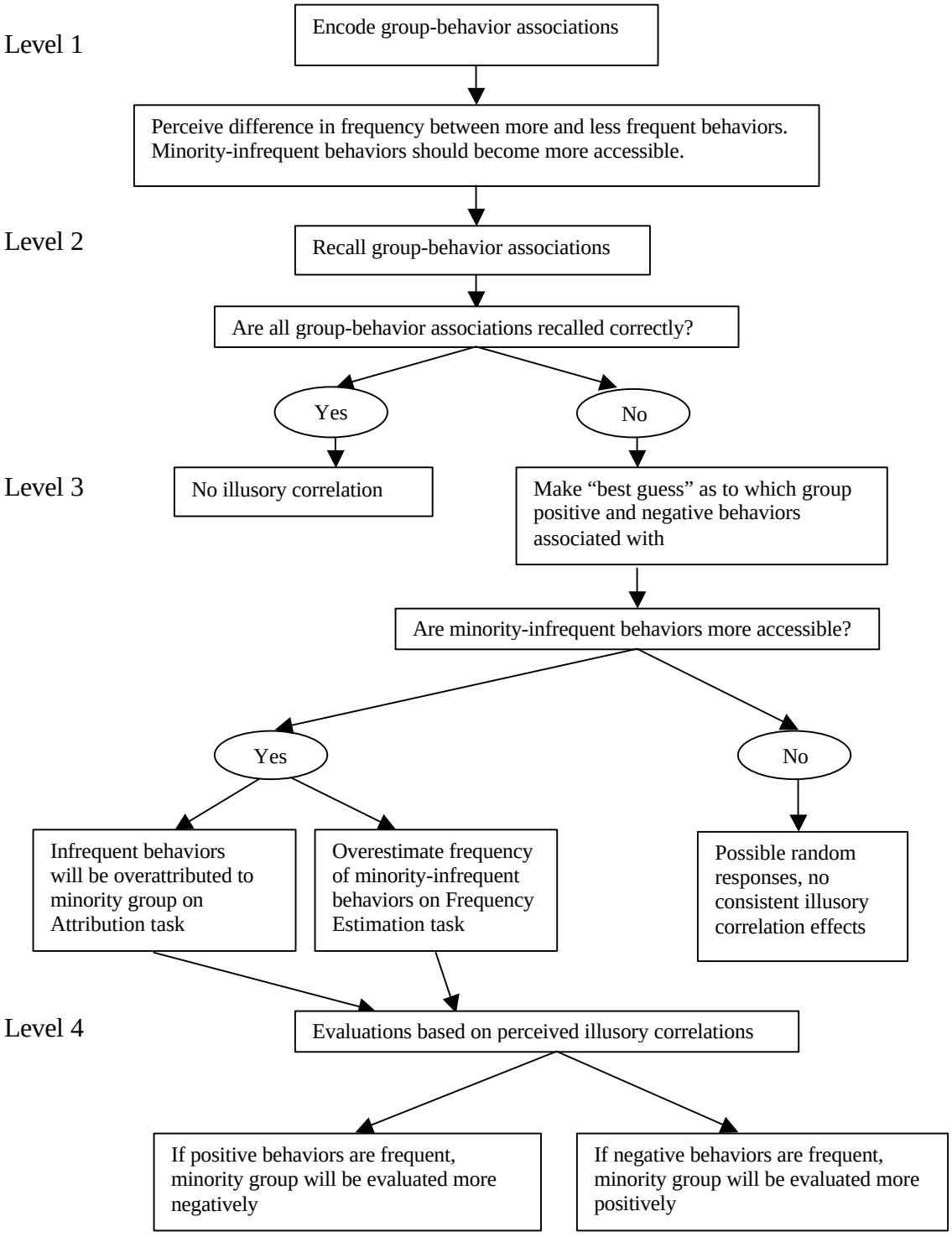
The second processing step is to recall the group-behavior associations. If all associations were recalled correctly, no illusory correlation would be formed because the correct number of positive and negative behaviors would be associated with each group. However, even adults do not correctly recall all this information, and are subject to information processing biases in the attempt to determine which group performed certain positive and negative behaviors. At this level, older children may be able to recall more associations, leading to more consistent judgments of the groups.

In Level 3, children must determine whether positive and negative behaviors were associated with the majority or minority group for group-behavior associations that were not recalled. If minority-infrequent behaviors are more accessible at this point, illusory correlations should be formed on the attribution task and frequency estimation task. If older children remembered more of these distinctive behaviors, then their group perceptions should likewise be more strongly influenced by them.

Estimation of base-rates and perceptions of covariation should also influence perceptions of illusory correlation at this level. Older children's use of more sophisticated strategies for judging covariation (Shaklee & Paszek, 1985) may aid them in making more consistent judgments about correlations between majority and minority group membership and positive and negative behaviors. Perhaps more importantly, children must be able to estimate base-rates for positive and negative behaviors in the two groups to complete the attribution task and, in particular, the frequency estimation task. Older children are more capable of estimating base-rates than younger children (Jacobs et al., 1995), and this skill, in addition to their ability to use more complex strategies for judging covariation and improved memory, may enable older children to make more consistent judgments on the illusory correlation tasks, whereas younger children's judgments are likely to show more inconsistency and variability. If children are susceptible to the same perceptual *biases* that lead to illusory correlations in adults, and older children's judgments on illusory correlation tasks are more consistent than younger children's judgments, then the biases that cause illusory correlations should be more apparent in older children. That is, as children's ability to judge covariation and estimate base-rates, and memory for information improves, their judgments of group-behavior associations should become more accurate. However, if older children do show a bias towards overestimated minority-infrequent information, this bias should become especially apparent in light of their increased accuracy in judging other types of group-behavior associations.

Figure 4

Model of Processing Steps in the Perception of Shared Infrequency-Based Illusory Correlations



Finally, evaluations are made based on the perceived correlation between group membership and behavior type. The use of base-rates becomes especially important at this level because differences in evaluations of the majority and minority groups should be based on a comparison of the base-rates for positive and negative behaviors in the two groups. At Level 4, then, older children's greater ability to use base-rates (Jacobs & Potenza, 1991) should lead to more consistent evaluations of the majority and minority groups that are based on the degree of perceived association between group membership and behavior type.

When the self is a member of one of the target groups, motivational impulses to protect self-esteem are introduced. Specifically, children should be motivated to judge their own group more favorably than the other group. This ingroup favoritism should then lead to biased perceptions of the group such that own-group positive behaviors are attended to more than negative behaviors in forming group impressions, and these reasoning biases may not be different at different ages (Barrett et al., 1993; Bigler & Liben, 1990; Bigler & Liben, 1992; Martin & Halverson, 1981; Klaczinsky & Fauth, 1997; Klaczinsky et al., 1997; Klaczinsky & Gordon, 1996). However, younger children show more ingroup favoritism than older children (Brown, 1995), and their self-serving biases in group perceptions may therefore be stronger than in older children.

Current Research

Three studies were designed to examine first, whether children are susceptible to cognitive biases due to distinctiveness of infrequent information in their judgments of majority and minority groups on illusory correlation tasks. Second, this research investigated the relative effects of intergroup biases and cognitive biases on group perceptions. Finally, developmental trends in cognitive and motivational biases in the formation of illusory correlations were examined.

Study 1 investigated children's susceptibility to illusory correlations in perceptions of novel social groups of which they are not members. Second- and fifth-

graders were presented with positive and negative behaviors (e.g., always gets homework finished on time, throws rocks at windows) assigned to majority and minority group members, with the base-rates for positive and negative behaviors being equivalent in the two groups. Children completed three tasks to assess their perceptions of illusory correlation between group membership and behavior type. The first measure was an attribution task in which children were given the list of behaviors assigned to the two groups, and were asked to determine whether a minority or majority group member performed each behavior. On the second task, children estimated the number of target children in the majority and minority groups who performed the infrequent class of behaviors. Finally, children evaluated the positivity and negativity of each group on several dimensions (e.g., good/bad, nice/mean). These tasks are similar to those used to measure illusory correlation in adults, but were modified for use with children.

Study 2 examined the impact of children's membership in one of the target groups on their group perceptions. Second- and fifth-graders were told that they were members of either a novel majority group or a novel minority group. In both groups, positive behaviors occurred more frequently than negative behaviors, and positive and negative behaviors had the same base-rate of occurrence in both groups. Children again completed an attribution task, a frequency estimation task, and group evaluations to measure their perceptions of illusory correlation.

Study 3 explored the effects of membership in a real social group on illusory correlations. This study paralleled Study 2, but used gender groups as the target social groups. Majority and minority groups were manipulated by varying the number of target girls and boys engaged in a mixed-sex task.

Chapter 2

STUDY 1:
CHILDREN'S PERCEPTIONS OF DISTINCTIVENESS-BASED ILLUSORY CORRELATIONS

Study 1 examined cognitive biases that may lead to illusory correlations in children. Specifically, children's tendency to falsely associate a minority group with an infrequent class of behaviors due to the paired-distinctiveness of the information was examined. In one condition, the infrequent behaviors were negative; in another condition, they were positive. Children were expected to associate the minority group with the infrequent behaviors, regardless of the valence of the behaviors.

It was predicted that fifth-graders would show a greater susceptibility to illusory correlation than second-graders. Younger children's perceptions were expected to show more variability, but be less consistently biased, as Primi and Agnoli (1998) found. Because younger children have inferior memory capacities, are less likely to use complex strategies for judging covariation, and are less adept at judging base-rates in comparison to older children, their responses on illusory correlation tasks were expected to be inconsistent. Older children, in contrast, were expected to show some sensitivity to cognitive biases due to distinctive information, and their patterns of judgment on illusory correlation tasks were therefore predicted to be more similar to those of adults.

Method

Participants

Sixty-five second-graders (35 girls, 30 boys) and 60 fifth-graders (31 girls, 29 boys) participated. The average age of the second-graders was 7 years, 9 months; the average age of the fifth-graders was 10 years, 7 months. Ninety-eight percent of the sample was White, and the remaining 3% was Black. All children attended public elementary schools in a small town or rural area in Central Pennsylvania. The children received a token gift (a pencil) for returning permission slips regardless of whether their parents allowed them to participate. Children were also asked to give their consent before participating. Participants were tested individually in their elementary schools on two different days. Each child participated in all three studies. Studies 1 and 2 were completed on the first day of testing, and Study 3 was completed during a later testing session.

Materials

Target Children. Two novel groups of fictitious children, a "blue" group and a "red" group, were used. The majority group consisted of 12 children, and the minority group consisted of 6 children. The fictitious target children were depicted only by line drawings (see Appendix A), or by a hand shown in a photograph (see Appendix C). Each of the 18 target children engaged in a positive or negative behavior (e.g., making good grades, cheating at games; see Appendix B).

***Target Behaviors*.** Fifty-four positive and negative behaviors related to school or home activities were developed. Four children within the age range of the participants, and five adults rated a list of 70 behaviors on a scale of 1 to 7, ranging from "very bad" to "very good." Behaviors that received ratings that were consistently on the "good" end of

the scale for positive behaviors, or the "bad" end of the scale for negative behaviors, and that received mean ratings of moderate positivity or negativity were chosen. Behaviors rated as extreme or neutral were not included in the final set of target behaviors.

A set of 24 positive and 12 negative behaviors, as well as 6 additional negative behaviors that were used only in the Positive-Infrequent condition, were developed. The specific positive and negative behaviors that children heard in Study 1 were counterbalanced across participants in the Negative-Infrequent condition such that half the participants received Set A and the other half received Set B in Study 1 (see Appendix B for a list of behaviors by set). In the Positive-Infrequent condition, children were presented with the six additional negative behaviors, as well as six negative and six positive behaviors from Set A (see Appendix B, Set C for a list of behaviors used in the Positive-Infrequent condition).

Photographs Depicting Target Behaviors. The target behaviors were depicted using photographs of props associated with the behaviors (e.g., school papers with A's, board games). When necessary, a child's hand was shown in the photograph to demonstrate an action (see Appendix C).

Group-Behavior Associations. The behaviors were associated with the two social groups through verbal statements from the experimenter and the line drawings of a child in a red or blue shirt paired with the photograph. Positive and negative behaviors were associated with the groups across two between-subjects conditions. In the Negative-Infrequent condition, negative behaviors were less frequent than positive behaviors for each target group. The majority group engaged in eight positive behaviors and four negative behaviors, and the minority group engaged in four positive behaviors and two negative behaviors. Thus, the ratio of positive to negative behaviors was 2:1 in both groups. To test for possible *a priori* expectations that minority groups are less positive than majority groups or for mere exposure effects, a Positive-Infrequent condition was also included. In this condition, positive behaviors were less frequent than negative behaviors for each group. If children have prior expectations that the minority group will be less positive than the majority group, or if mere exposure effects cause

them to like the majority group more because they have seen more exemplars from this group, then children should perceive the majority group more positively than the minority group. However, if they are influenced by the infrequency of the minority-infrequent behavior, then they should perceive the minority group more positively than the majority group. The majority group engaged in eight negative behaviors and four positive behaviors, and the minority group engaged in four negative behaviors and two positive behaviors. The colors associated with the majority and minority group were counterbalanced to control for any effects of color preferences.

Illusory Correlation Tasks

Group Attributions. To assess children's attribution of positive and negative behaviors to each of the groups, each photograph depicting a behavior was shown, and line drawings of a child from the red group and blue groups were placed on either side of the photograph. Children were asked to indicate whether a child from the red group or the blue group performed the behavior. Thus, this task assessed recognition of the group associated with each behavior.

Frequency Estimations. Children were shown schematic drawings of 12 majority group members and 6 minority group members wearing shirts of the appropriate color. The drawings were depicted in single rows such that the contrasting size of the two groups was clear (see Appendix D). Children were asked to circle the number of majority and minority group members that engaged in the infrequent class of behaviors. To ensure that children understood that their frequency estimation for the infrequent class of behaviors implied that the remainder of the target children performed the frequent class of behaviors, the experimenter asked the children to verify this by asking, for example, "If these children did bad things, does that mean all the rest of these children did good things?" Any children who answered "no" to this question were asked to revise their frequency estimations to correct the misunderstanding. The frequency estimation

task assessed children's impression of the relative proportion of positive and negative behaviors performed by each of the groups.

Group Evaluations. Children were shown a seven-point Likert scale drawn with numbers ranging from 1 (very negative) to 7 (very positive). A frowning face was drawn above the one to indicate that it anchored the negative end of the scale, and a smiling face was drawn above the seven to indicate that it anchored the positive end of the scale. The children rated how positive and negative the majority and minority groups were on nine descriptors: 1) good/bad; 2) kind/unkind; 3) nice/mean; 4) friendly/unfriendly; 5) likable/unlikable; 6) makes a good friend/makes a bad friend; 7) behaves well/behaves badly; 8) would like to play with/would not like to play with; and 9) would want to have as a friend/would not want to have as a friend. For each descriptor, children rated the majority group, immediately followed by the minority group.

Reliability of ratings across the nine descriptors was calculated to determine whether the descriptors were homogeneous. The alpha coefficient for this analysis was .90 for ratings of both the majority and minority groups; the nine descriptors were thus averaged into one evaluation rating for each target group.

Sentence Memory Measure

The Memory for Sentences subscale from the Stanford-Binet intelligence scales was used as an independent assessment of children's capacity to remember verbal information. This measure was included to act as a covariate in analyses of illusory correlations to control for variance due to individual differences in general verbal memory capacity. The sentences began at the level normed for second- or fifth-graders. The experimenter read a practice sentence aloud and asked the child to repeat it exactly as she had. Recitation of the sentences continued until the child incorrectly repeated three consecutive sentences, or three of the four sentences within two consecutive sentence pairs (sentences were paired by difficulty level). The measure was scored by subtracting the total number of incorrect responses from the total number of sentences

read by the experimenter before the child met the failure criterion. These scores were used in the covariation analyses.

Procedure

Children were tested individually in a quiet area of their school by a female experimenter. Testing took place at the discretion of the teachers. The experimenter briefly explained that she was interested in what children think about other children, and that the participants would hear about some things that other children did, and would be asked to try to remember those behaviors and say what they think about the groups. The experimenter then obtained the child's agreement to participate, and had the child sign an Informed Assent form.

The experimenter introduced two groups of children, a blue group and a red group, who were ostensibly from another town. Target children were of the same sex as the participant to avoid any unwanted gender effects, and the experimenter told the children that she would be using the target children's initials instead of their real names. The experimenter explained that one group had more children than the other group, and showed the picture that would later be used for the frequency estimation task depicting the majority and minority groups in rows and made clear the relative sizes of the groups. Children were told that they would hear about behaviors that the group members had performed, and that they would be asked to remember "whether someone in the red group or someone in the blue group" had performed each behavior. The experimenter placed each photograph depicting a behavior in front of the child, and a drawing of a child wearing a red or blue t-shirt next to the photograph. The child was told, for example, "S.D., who is in the blue group, always makes good grades on tests." Each target child performed a different behavior.

After being shown the 18 group-behavior associations, children completed the attribution task, the frequency estimation task, and the group evaluations. Tasks were administered in this order to each child to avoid contamination of the attribution task,

which assess recognition memory, by overall impressions (frequency estimations) or evaluations of the groups. Following these tasks, children completed the sentence memory measure.

Results

Overview of Analyses

To examine illusory correlation effects on the attribution task, the numbers of positive and negative behaviors attributed to the majority and minority groups were first transformed into phi coefficients. The phi coefficient is a measure of the degree of relatedness between group membership and behavior type. It is calculated by the following formula where A is the number of behaviors attributed to the majority group and B is the number of behaviors attributed to the minority group, and $^{+}$ represents positive behaviors and $^{-}$ represents negative behaviors:

$$(A^{+} * B^{-}) - (B^{+} * A^{-}) / ((A^{+} + B^{+}) (A^{-} + B^{-}) (A^{+} + A^{-}) (B^{+} + B^{-}))$$

A phi score of zero would indicate that the perceived group-behavior associations were equal to the information given; thus, a zero phi coefficient indicates no illusory correlation. A non-zero phi score indicates an illusory correlation between at least one group and a type of behavior. Several analyses were performed on the phi coefficients obtained from the attribution task. First, the mean phi coefficient for each condition and grade was compared to zero to determine whether children formed significant illusory correlations (e.g., Haslam & McGarty, 1994; Schaller & Maass, 1989). The conditional probabilities of each type of group-behavior association were also examined to determine where children's misattributions tended to occur. Second, phi coefficients were subjected to an analysis of variance to determine whether there were condition or age-related differences in the degree to which children formed illusory correlations. In addition, this analysis was repeated as an analysis of covariance with children's scores on the sentence memory task as a covariate to remove variance that may be due to children's general

memory capacity. Third, the proportions of positive and negative behaviors correctly attributed to the majority and minority groups were also compared to determine whether illusory correlations were due to better or worse memory for a particular group-behavior class combination.

To examine illusory correlation effects in frequency estimations, children's estimations of the proportion of the infrequent class of behaviors performed by the majority and minority groups were compared across each condition. Due to the expected age differences in memory mentioned earlier, this analysis was also repeated using sentence memory scores as a covariate.

Finally, evaluations of the majority and minority groups were examined across conditions. In addition, the extent to which illusory correlations predicted evaluations of the majority versus the minority group were examined using regression analyses.

Each analysis outlined above was first analyzed for sex differences. No sex differences were found for any of the measures, so participant sex was excluded from further analyses.

Group Attribution Task

It was predicted that children would form illusory correlations on the attribution task such that they overassociated the infrequent class of behaviors with minority group membership. Due to age-related increases in memory and ability to judge base-rates and covariance, fifth-graders were expected to show stronger, more consistent illusory correlations, whereas second-graders' misattributions were expected to be more inconsistent.

Because illusory correlation effects were expected to be due to increased attention to and memory for infrequent behaviors paired with the minority group, children's *correct* attributions were examined. The proportion of correct attributions made for minority-infrequent behaviors was expected to be larger than for the other group-behavior associations. Thus, more correct attributions of minority-infrequent behaviors

would suggest that children attended more closely to these group-behavior associations than other types of group-behavior associations.

The numbers of positive and negative behaviors attributed to the majority or minority group were computed. Thus, each child's attributions were distributed into four group-behavior type classifications: (1) majority group-positive behaviors; (2) majority group-negative behaviors, (3) minority group-positive behaviors, and (4) minority group-negative behaviors. To examine whether children formed illusory correlations, phi coefficients were calculated using these four scores.

Positive phi coefficients are consistent with an illusory correlation in which the minority group is overassociated with negative behaviors, and negative phi coefficients are consistent with an overassociation of the minority group with positive behaviors. Thus, in the Negative-Infrequent condition, phi coefficients were expected to be positive, and in the Positive-Infrequent condition, phi coefficients were expected to be negative.

Tests for Significance of Phi Coefficients. Phi coefficients obtained for the attribution task in each condition were compared to zero. Scores reliably different from zero indicate that children's attributions showed reliable illusory correlations. Scores were examined separately for each grade, and for the Negative-Infrequent and Positive-Infrequent conditions. Mean phi coefficients were very close to zero; however, some were significantly different from zero. The small number of behaviors used in this study makes it difficult to obtain large phi coefficients. Because children showed basically good memory for the group-behavior associations, the phi coefficients were necessarily small and close to zero. However, the direction of the effects and the statistical reliability of the phi coefficients are particularly important to consider.

In the *Negative-Infrequent* condition, in which phi scores were expected to be positive, phi scores were significantly greater than zero for second-graders, $t(35)=3.2$, $p=.003$, but not for fifth-graders, $t(30)=0.9$, n.s. (see Table 1). Examination of the conditional probabilities for attributions of the infrequent and frequent classes of behaviors to each group indicated that in the Negative-Infrequent condition, both second- and fifth-graders overattributed negative behaviors to the minority group; however,

attributions of positive behaviors to the majority and minority groups were closer to the actual proportions of 66% and 33%, respectively (see Table 2). Thus, although phi coefficients were close to zero for second-and fifth-graders, and did not significantly differ from zero for fifth-graders, mean attribution scores indicate that the expected trend of overattribution of the infrequent class of behaviors to the minority group was present.

The results for the *Positive-Infrequent* condition were less consistent than those for the Negative-Infrequent condition, and only fifth-graders showed a tendency towards the hypothesized illusory correlation effects in this condition. In the Positive-Infrequent condition, phi scores were expected to be negative. Scores for second-graders approached significance, $t(28)=1.8$, $p=.09$ (two-tailed *t*-test), but the mean phi score was *positive*. Phi did not differ from zero for fifth-graders, $t(28)= -0.2$, n.s. (see Table 1). Examination of the conditional probabilities showed that second-graders in the Positive-Infrequent condition overattributed *negative* behaviors to the minority group, contrary to expectations. Fifth-graders, however, overattributed positive behaviors to the minority group, but also equally overattributed negative behaviors to the minority group (see Table 2).

Table 1

Study 1: Mean Phi Coefficients

Condition	n	Mean Phi Coefficient*	SD
Negative-Infrequent			
Second-Graders	36	0.22	.41
Fifth-Graders	31	0.05	.33
Grades Combined	67	0.14	.38
Positive-Infrequent			
Second-Graders	29	0.08	.24
Fifth-Graders	29	-0.01	.28
Grades Combined	58	0.04	.26
Conditions Combined	125	0.09	.34

*Phi coefficients were multiplied by 100 to increase ease of interpretation in the table only.
NOTE: Means and standard deviations do not reflect logarithmic transformations.

Table 2

Study 1: Mean Conditional Probabilities of Positive and Negative Behaviors Attributed to the Majority and Minority Groups

		Group-Behavior Association			
	n	Majority-Positive	Majority-Negative	Minority-Positive	Minority-Negative
Correct Conditional Probabilities		*.67*	*.67*	*.33*	*.33*
Condition					
Negative-Infrequent					
Second-Graders	36	.64 (.13)	.48 (.23)	.36 (.13)	.52 (.23)
Fifth-Graders	31	.59 (.11)	.55 (.18)	.41 (.11)	.45 (.18)
Grades Combined	67	.62 (.12)	.51 (.21)	.38 (.12)	.49 (.21)
Positive-Infrequent					
Second-Graders	29	.60 (.14)	.54 (.11)	.40 (.14)	.46 (.11)
Fifth-Graders	29	.56 (.17)	.57 (.11)	.43 (.16)	.43 (.11)
Grades Combined	58	.58 (.16)	.56 (.11)	.41 (.15)	.45 (.11)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

Condition and Grade Differences in Group Attributions. In order to directly test for the interaction of grade and condition, differences in phi coefficients across conditions and grades were also tested using an analysis of variance. Before performing this analysis, two was added to each phi coefficient to create positive numbers that could undergo logarithmic transformation, and $\log_{10}$ transformations were performed to normalize significantly skewed distributions. The transformed phi scores were entered into a 2(condition: negative-infrequent, positive-infrequent) X 2(grade: 2^{nd}, 5^{th}) analysis of variance. The Condition X Grade interaction was not significant, $F(1, 121)=0.4$, n.s. However, there was a significant main effect of Grade, $F(1, 121)=4.6$, $p=.03$, and a trend for the main effect of Condition, $F(1, 121)=2.9$, $p=.09$. Examination of the means revealed that the main effects were due to positive phi scores among second-graders and

negative phi scores among fifth-graders in the Positive-Infrequent condition, and to phi scores that were closer to zero among fifth-graders in both conditions.

Group differences were also examined controlling for children's memory capacity as measured by the sentence memory task. By controlling for variance due to memory that is not specific to the illusory correlation tasks, additional group differences in attributions could become apparent. Phi coefficients were tested using a 2(condition: negative-infrequent, positive-infrequent) X 2(grade: 2^{nd}, 5^{th}) analysis of covariance (ANCOVA), with the number of sentences correctly recalled entered as the covariate. The main effect of Condition remained marginally significant, $F(1, 120)=2.9$, $p=.09$, and the main effect of Grade was no longer present when memory was controlled, $F(1, 120)=1.7$, n.s.

The loss of the main effect of grade suggests that memory mediated the grade differences in illusory correlations. Indeed, based on a test for mediation described by Baron and Kenny (1986), grade effects should be no longer significant when the variance due to the mediating factor is removed, and the mediating variable should be significantly correlated with the test variable. To test the relationship between memory and phi coefficients, the absolute value of the phi coefficient was computed to eliminate effects of condition (negative-infrequent vs. positive-infrequent). The correlation between memory scores and /phi/ was marginally significant and negative, $r = -.17$, $p=.06$. The negative correlation further suggests that children's memory capacity mediated the formation of illusory correlations such that children with better memory made less distorted attributions, as would be expected. However, the weakness of the correlation also suggests that memory alone cannot account for the illusory correlation effects.

Accuracy of Group Attributions. To test whether illusory correlation effects were due to increased memory for distinctive stimuli paired with the minority group, the proportions of frequent and infrequent behaviors *correctly* attributed to the majority and minority group were examined using a 2(participant condition: negative-infrequent, positive-infrequent) X 2(grade: 2^{nd}, 5^{th}) X 4(target condition: majority-frequent, majority-infrequent, minority-frequent, minority-infrequent) mixed-design ANOVA with Target

Condition as a within-subjects variable, and in which Target Condition represents the group-behavior class combination. There was a main effect of Grade, $F(1, 121)=4.5$, $p=.04$, with fifth-graders making more correct attributions overall than second-graders. There was also a main effect of Target Condition, $F(3, 363)=5.3$, $p=.002$, but this effect was subsumed by a Participant Condition X Target Condition interaction, $F(3, 363)=3.3$, $p=.03$. Differences in correct attributions among the target conditions were examined using post-hoc comparisons. To correct for family-wise error, the alpha level for the post-hoc tests was set at .001 (.05/8).

Children in the *Negative-Infrequent* condition correctly attributed significantly more infrequent (negative) behaviors to the minority group than the majority group, $t(66)=-4.0$, $p<.001$. The latter finding is consistent with the hypothesis that the shared infrequency of infrequent behaviors paired with a minority group makes these stimuli distinctive and therefore more memorable. Children in the Negative-Infrequent condition also made more correct attributions of frequent (positive) behaviors to the majority group than infrequent (negative) behaviors, $t(66)=3.6$, $p=.001$, although this effect may be a consequence of the overattribution of infrequent behaviors to the minority group, resulting in fewer correct attributions of infrequent behaviors to the majority group (see Table 3 for means).

For children in the *Positive-Infrequent* condition, however, the only difference that approached significance was in attributions of frequent (negative) behaviors. Children correctly attributed more frequent behaviors to the minority group than to the majority group, $t(57)=-2.9$, $p=.005$, although this contrast failed to meet the stringent alpha level set for the post-hoc comparisons (see Table 3). This finding may explain why second-graders in the Positive-Infrequent condition overattributed negative behaviors, rather than positive behaviors, to the minority group. The inherent salience of negative behaviors may have led children to attend to these behaviors at least as much as to the less frequent positive behaviors. Thus, the overattribution of negative behaviors to the minority group probably resulted because second-graders paid particular attention to the

minority-negative behaviors, and this effect obscured any effect of increased salience of the minority-infrequent (positive) association.

Table 3

Study 1: Proportion of Positive and Negative Behaviors Correctly Attributed to the Majority and Minority Groups

		Group-Behavior Association			
	n	Majority-Positive	Majority Negative	Minority-Positive	Minority-Negative
Condition					
Negative-Infrequent					
Second-Graders	36	.87 (.13)	.64 (.32)	.79 (.28)	.86 (.23)
Fifth-Graders	31	.83 (.15)	.77 (.23)	.87 (.20)	.90 (.24)
Grades Combined	67	.85 (.14)	.70 (.29)	.83 (.25)	.88 (.23)
Positive-Infrequent					
Second-Graders	29	.78 (.23)	.71 (.17)	.76 (.32)	.81 (.25)
Fifth-Graders	29	.78 (.29)	.78 (.17)	.90 (.45)	.85 (.21)
Grades Combined	58	.78 (.26)	.74 (.17)	.83 (.39)	.83 (.22)
Conditions Combined	125	.82 (.21)	.72 (.24)	.82 (.32)	.86 (.23)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

Summary of Findings for the Attribution Task. In general, the findings from the attribution measure suggest that children are susceptible to the biasing effects of shared infrequency on attributions of behaviors to a majority and minority group. Second- and fifth-graders in the Negative-Infrequent condition showed the predicted overattribution of infrequent behaviors to the minority group. The phi coefficients reflecting this effect were not significantly different from zero for fifth-graders, but this lack of effect may be due to better memory in the fifth-graders. Although fifth-graders' misattributions were not large, they were in the predicted directions.

Attributions in the Positive-Infrequent condition were not as consistent. Second-graders did not show attributional errors in the predicted direction. Rather than overattributing positive behaviors to the minority group, as predicted, they overattributed

negative behaviors to this group. Fifth-graders in the Positive-Infrequent condition overattributed both positive and negative behaviors to the minority group. The inconsistency in the attributional patterns in the Negative-Infrequent and Positive-Infrequent conditions may be due to the relative salience of positive and negative behaviors. Negative behaviors tend to be more salient than positive behaviors, which may have focused the attention of children in the Positive-Infrequent condition on the minority-negative associations (Mullen & Johnson, 1990).

Frequency Estimations

As on the attribution task, children were expected to overestimate the proportion of infrequent behaviors performed by the minority group on the frequency estimation task. This effect was expected to be more pronounced among fifth-graders, whereas second-graders were expected to show less consistency in their frequency estimations. To examine these hypotheses, the number of targets in each group that children estimated as having performed the infrequent class of behaviors was first converted to a proportion score by dividing the estimated number by 12 for the majority group estimation, and by 6 for the minority group estimation. One was then added to each score to create nonzero numbers, and the distribution of scores was normalized using a $\log_{10}$ transformation. The transformed proportions were analyzed using a 2(condition: negative-infrequent, positive-infrequent) X 2(grade: 2^{nd}, 5^{th}) X 2(target group: majority, minority) mixed-design analysis of variance with Condition and Grade as between-subjects variables, and Target Group as a within-subjects variable.

Results indicated a main effect of Target Group, $F(1, 121)=24.2$, $p<.001$, with children estimating a significantly greater proportion of infrequent behaviors in the minority group than the majority group. Contrary to expectations, Target Group did not interact with Grade $F(1, 121)=0.2$, n.s. (see Table 4 for means). Thus, children estimated the minority group to have performed a greater proportion of infrequent behaviors,

regardless of whether the infrequent behaviors were positive or negative, as predicted. However, contrary to predictions, this effect did not differ by grade.

Table 4

Study 1: Estimated Frequency of Occurrence of the Infrequent Behavior Class in the Majority and Minority Groups

		Target Group	
Condition	n	Majority	Minority
Negative-Infrequent			
Second-Graders	36	.34 (.20)	.43 (.22)
Fifth-Graders	31	.34 (.13)	.48 (.19)
Grades Combined	67	.34 (.17)	.45 (.21)
Positive-Infrequent			
Second-Graders	29	.45 (.18)	.53 (.17)
Fifth-Graders	29	.43 (.16)	.49 (.17)
Grades Combined	58	.44 (.17)	.51 (.17)
Conditions Combined	125	.39 (.18)	.48 (.19)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

These hypotheses were tested again controlling for memory capacity. The transformed proportion scores were submitted to a 2(condition: negative-infrequent, positive-infrequent) X 2(grade: 2^{nd}, 5^{th}) X 2(target group: majority, minority) ANCOVA with sentence memory scores as the covariate. Results showed that the main effect of Target Group was no longer significant, $F(1,120)=0.8$, n.s., and no other significant effects emerged. Thus, children's memory appears to have had some mediating effect on frequency estimations.

The relationship between the illusory correlation effect and memory was further tested to determine whether a mediational relationship could be inferred. Higher memory scores on the sentence memory task should be related to *smaller* differences in estimations of infrequent behaviors in the majority versus minority group. To test this relationship, the proportion of infrequent behaviors estimated for the majority group was

subtracted from the proportion of infrequent behaviors estimated for the minority group. Thus, a larger difference score indicates a *greater* illusory correlation. The correlation between the frequency estimation difference scores and memory scores was then computed. This correlation was not significant, and, contrary to expectations, was also positive, r =.14, n.s. The positive, nonsignificant correlation suggests that memory did not have a clear mediational influence on frequency estimations. This finding is perhaps not surprising given that frequency estimations do not measure recall of specific group-behavior associations, but more general impressions of the majority and minority groups.

In sum, children estimated a larger proportion of infrequent behaviors in the minority group than in the majority group, as predicted. There were no differences in this trend in the Negative-Infrequent versus the Positive-Infrequent condition, lending further evidence to the notion that the illusory correlation effects found in this study are due to increased attention to paired-distinctive stimuli. There were also no age effects, indicating that second- and fifth-graders were equally susceptible to illusory correlation effects on the frequency estimation task.

Group Evaluations

Children's evaluations of the majority and minority groups should be influenced by the illusory correlations they formed. Thus, in the Negative-Infrequent condition, in which negative behaviors were overassociated with the minority group, children were expected to evaluate the minority group more negatively than the majority group. In the Positive-Infrequent condition, in which positive behaviors were overassociated with the minority group, the minority group should be evaluated more positively than the majority group.

Condition and Grade Differences in Evaluations. The mean ratings for the majority and minority groups were subjected to a 2(condition: negative-infrequent, positive-infrequent) X 2(grade: 2^{nd}, 5^{th}) X 2(target group: majority vs. minority) mixed-design ANOVA, with Target Group as a within-subjects variable. The expected

Condition X Grade X Target Group interaction was not found, $F(1, 121)=0$, n.s; however, there was a significant Condition X Target Group interaction $F(1, 121)=4.4$, $p=.04$. Post-hoc contrasts ($\alpha=.025$) revealed that children in the Negative-Infrequent condition did not evaluate the majority and minority groups differently, $t(66)=0.5$, n.s. Thus, children in the Negative-Infrequent condition formed illusory correlations such that they overassociated negative behaviors with the minority group on both the attribution and frequency estimation tasks reported earlier, but the illusory correlations were not reflected on the evaluation task.

In contrast, children in the Positive-Infrequent condition rated the minority group more positively than the majority group, as expected, $t(57)=2.3$, $p=.02$ (see Table 5 for means). Thus, only children in the Positive-Infrequent condition evaluated the groups differently based indicators of illusory correlation.

Table 5

Study 1: Mean Evaluation Ratings of the Majority and Minority Groups

		Target Group	
Condition	n	Majority	Minority
Negative-Infrequent			
Second-Graders	36	4.8 (1.3)	4.8 (1.3)
Fifth-Graders	31	4.6 (1.0)	4.4 (1.2)
Grades Combined	67	4.7 (1.2)	4.6 (1.2)
Positive-Infrequent			
Second-Graders	29	4.0 (1.3)	4.8 (1.2)
Fifth-Graders	29	3.5 (1.4)	4.0 (1.2)
Grades Combined	58	3.7 (1.4)	4.4 (1.3)
Conditions Combined	125	4.2 (1.4)	4.5 (1.3)

NOTE: Standard deviations are shown in parentheses.

Regression Analyses. The relative evaluations of the majority and minority groups should be predicted by children's illusory correlations. That is, the degree of association between attributions to a particular group and behavior valence (phi

coefficients), and the degree of perceived difference in the proportion of positive and negative behaviors estimated for each group (frequency estimations) should be the basis for evaluations of the two groups. To examine how illusory correlations contributed to children's evaluations, two regression models were tested. In the first model, grade and condition were regressed onto evaluation scores. In the second model, phi coefficients and frequency estimations were added to this model to test whether illusory correlation measures removed substantially more variance than the grade and condition predictors alone. The dependent variable was the difference in mean evaluations of the majority and minority groups. This variable was computed by subtracting the minority group rating from the majority group rating. This yielded scores ranging from –6 to 6. To simplify the analysis, six was added to each difference score to obtain a positive number from 0 to12, in which scores below six represented a more favorable evaluation of the minority group, and scores above six represented a more favorable rating of the minority group.

The predictor variables in the first model included grade and participant's condition (negative-infrequent vs. positive-infrequent). Condition was dummy coded as 1 and –1 (majority and minority groups), and grade was entered as 2 or 5. This model was not significant, $F(2, 122)=2.5$, $p=.08$, adjusted $R^2= .02$. Model 2 included scores on the illusory correlation measures. Both phi coefficients and frequency estimations were entered into the model together because, although they both measure illusory correlation, the zero-order correlation between the variables was fairly low (see Table 7), and therefore should have relatively little covariance in the model. Thus, variables in the second model included grade, condition, phi coefficients, differences in frequency estimations of the infrequent behaviors for the majority and minority groups, and a frequency estimation X condition interaction term. Because the frequency estimation variable was scored as proportions of infrequent behaviors estimated, and does not take into account whether the infrequent behaviors were positive or negative, the frequency estimation X condition interaction term was included to reflect the expectation that children in the Negative-Infrequent condition should evaluate the majority group more

positively, and children in the Positive-Infrequent condition should evaluate the minority group more favorably. The frequency estimation variable was calculated by subtracting the estimated proportion of infrequent behaviors for the majority group from the estimated proportion of infrequent behaviors for the minority group, and one was added to these values to create positive numbers. Because the frequency estimation variable was also used in calculating the interaction term, the mean of this variable was subtracted from each frequency estimation score to compensate for the distance of two (-1 to 1) between the dummy coded variables in the interaction term. The interaction term was created by multiplying the same frequency estimation variable that was entered into the model alone by condition (1 or –1).

The second model containing grade, condition, phi coefficients, frequency estimation, and frequency estimation X condition was significant, $F(5, 119)=15.4$, $p<.001$, adjusted $R^2=.37$. Three of the five predictor variables emerged as significant independent predictors: Condition, Phi, and Frequency Estimation X Condition (see Table 6 for alpha values and beta weights of all variables, and Table 7 for zero-order correlations among the variables). Thus, Condition functioned as an independent predictor, given that children in the two conditions were expected to show opposite patterns of evaluations of the majority and minority groups. Phi coefficients also predicted evaluations, indicating that illusory correlations measured by the attribution task influenced evaluations. Finally, the interaction variable of Frequency Estimation X Condition was also a significant predictor of evaluations.

The slopes of the regression plane for the Frequency X Condition interaction were calculated using Cohen and Cohen's (1975) method for interpreting interaction terms. The slopes of the interaction plane were dichotomized along the condition variable, creating separate slope values for frequency estimations of children in the Negative-Infrequent and Positive-Infrequent conditions. The slope for the Negative-Infrequent condition was positive, indicating that as the difference in the proportion of infrequent (negative) behaviors estimated for the minority compared to the majority group became larger, evaluations of the minority group became more negative. For children in the

Positive-Infrequent condition, the opposite effect was found. The slope of the regression plane was negative, indicating that as the difference in the proportion of infrequent (positive) behaviors estimated for the minority compared to the majority group became larger, evaluations of the minority group became more favorable. Thus, as expected, children's illusory correlations predicted their relative evaluations of the majority and minority groups. Furthermore, a model containing illusory correlation scores was necessary to significantly predict differences in evaluations of the groups.

Table 6

Study 1: Regression Models Predicting Differences in Evaluations of the Majority and Minority Groups

Predictor	Unstandardized Beta Weight	Standardized Beta Weight	*t*	*p*	Partial *r*
Model 1 (R^2=.02)					
Grade	0.10	.07	0.8	.41	.08
Condition	0.39	.19	2.1	.04	.19
Model 2 (R^2=.37)					
Grade	0.10	.07	1.0	.33	.09
Condition	-5.23	-2.50	- 6.3	<.001	-.50
Phi Coefficient	108.00	.17	2.2	.03	.20
Frequency Estimation	-0.68	- .07	- 1.0	.34	-.09
Freq. Est. X Condition	5.11	2.70	6.8	<.001	.53

Table 7

Study 1: Zero-Order Correlations Between Illusory Correlation Tasks and Evaluations by Condition

	Grade	Sentence Memory	Phi Coefficient	Frequency Estimation	Evaluations
Grade	1.00	.56**	-.22	.11	.06
Sentence Memory	.59	1.00	-.21	.07	.00
Phi Coefficient	-.17	-.11	1.00	.37**	.34**
Frequency Estimation	-.03	.21	.27	1.00	-.63**
Evaluations	.08	-.03	.31	.55	1.00

NOTE: Correlations listed above the diagonal are for the Negative-Infrequent condition; correlations listed below the diagonal are for the Positive-Infrequent condition.
NOTE: Frequency Estimation=estimation for minority - majority group
NOTE: Evaluations=evaluation for majority - minority group
**Correlation is significant at the .01 level (2-tailed).

Summary of Results

Negative-Infrequent Condition. In the Negative-Infrequent condition, negative behaviors were less frequent than positive behaviors. Therefore, children were expected to form an illusory correlation between the minority group and negative behaviors due to the shared infrequency of this combination. They were likewise expected to evaluate the minority group more negatively than the majority group. The results showed that on the attribution task, both second- and fifth-graders in the Negative-Infrequent condition overattributed negative behaviors to the minority group, although only second-graders' phi coefficients significantly differed from zero. The children were also more correct in making attributions for negative behaviors to the minority group than for any other

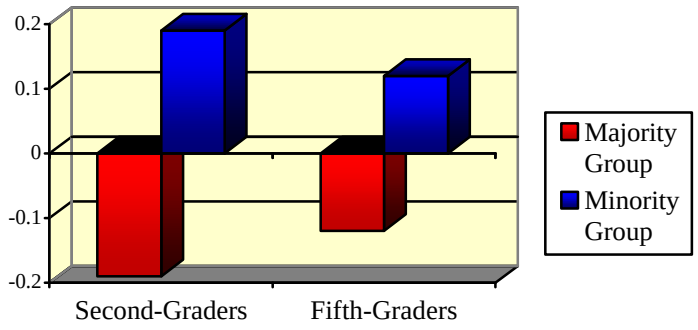
group-behavior combination, suggesting that their overattribution of negative behaviors to the minority group was due to increased salience of the negative behaviors. Similarly, children in this condition estimated a greater proportion of negative behaviors associated with the minority group than the majority group on the frequency estimation task, again indicating an association between the minority group and infrequent behaviors. Despite the illusory correlations these children formed, their evaluations of the majority and minority groups did not differ. However, their illusory correlations did predict their relative evaluations of the groups, suggesting that their perceived illusory correlations had some effect on their evaluations. See Figure 5 for a graphical representation of the Negative-Infrequent condition findings.

Positive-Infrequent Condition. In the Positive-Infrequent condition, positive behaviors were less frequent than negative behaviors; thus, children were expected to form an illusory correlation between the minority group and positive behaviors, and to evaluate the minority group more positively than the majority group. Results showed that on the group attribution task, second-graders overattributed negative behaviors to the minority group, and fifth-graders overattributed both positive and negative behaviors to the minority group. Children in this condition showed better memory for minority-negative behaviors, although the negative behaviors were more frequent, suggesting that negative behaviors are especially salient due to their valence, and children therefore remembered the minority-negative behavior associations better. In contrast, children estimated a larger proportion of positive behaviors in the minority group, suggesting a susceptibility to cognitive biases due to shared infrequency in the Positive-Infrequent condition as well. Finally, the children evaluated the minority group more positively than the majority group, and their illusory correlations predicted this difference in evaluations. See Figure 6 for a graphical representation of the Positive-Infrequent condition findings.

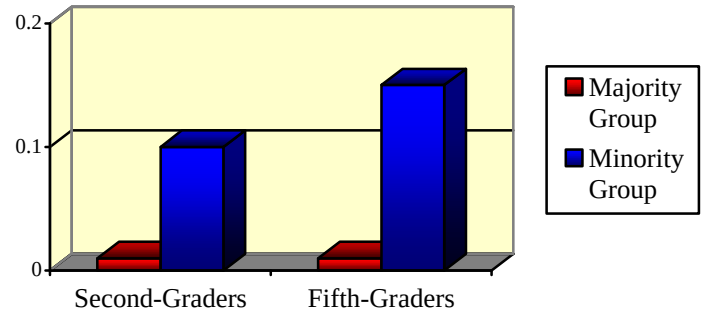
Figure 5

Summary of Findings for the Negative-Infrequent Condition

Attribution Task:
Deviation from Actual Proportion of Negative Behaviors



Frequency Estimation Task:
Deviation from Actual Proportion of Negative Behaviors



Group Evaluations

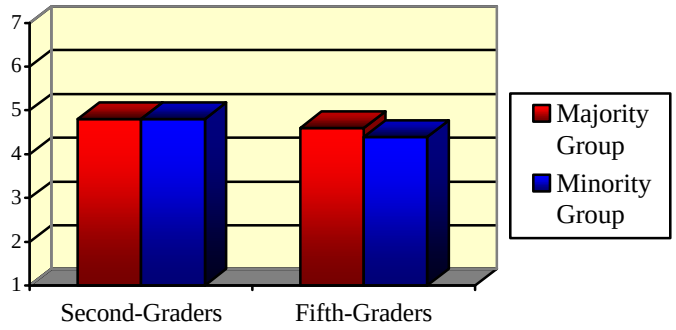
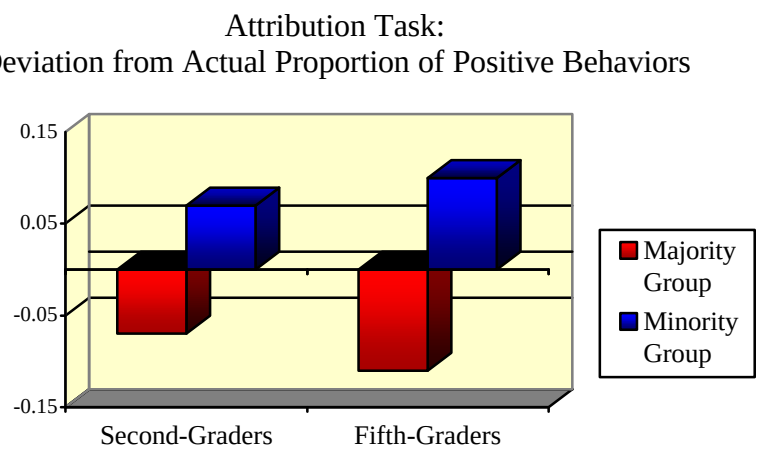
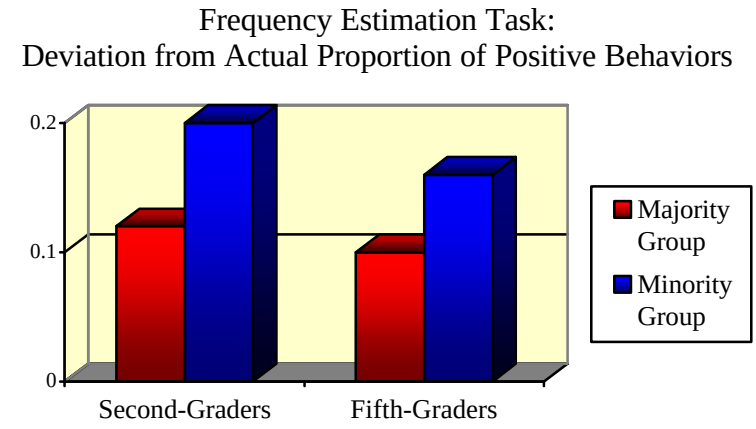
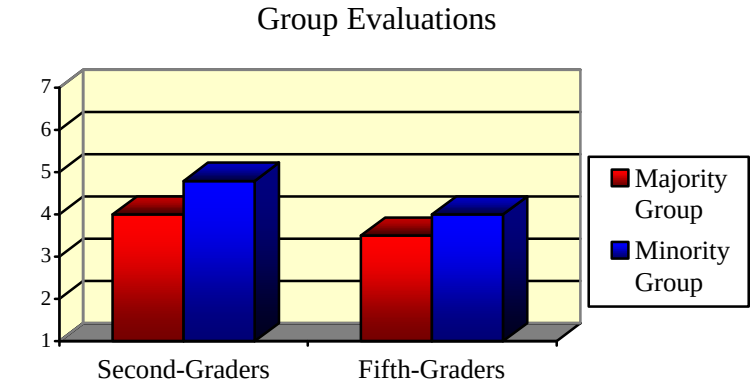


Figure 6

Summary of Findings for the Positive-Infrequent Condition







Discussion

Study 1 examined children's susceptibility to cognitive biases leading to illusory correlations. It was hypothesized that, like adults, children would perceive an erroneous relationship between a minority group and an infrequent class of behaviors. This perceived relationship should be due to the shared infrequency of less frequent behaviors that are performed by a numerically smaller group of target children. The shared infrequency of the minority-infrequent behaviors should make them more noticeable and therefore more memorable, leading to an overrepresentation of this association in memory, and thus a perceived association between the minority group and infrequent behaviors. Furthermore, age-related changes in susceptibility to illusory correlations were predicted. Compared to second-graders, fifth-graders have better memory (e.g., Bjorkland & Muir, 1988; Brainerd, 1981; Chi & Ceci, 1987; Ornstein et al., 1975; Perlmutter, 1984; Ruff & Lawson, 1990; Stodolsky, 1974; Strutt et al., 1975), are better at judging base-rates (Jacobs et al., 1995; Jacobs & Potenza, 1991) and covariation (Shaklee & Mims, 1981; Shaklee & Paczek, 1985), and show less variability in their group perceptions (Primi & Agnoli, 1998). Therefore, it was predicted that fifth-graders would be *more* susceptible to illusory correlations than second-graders because their judgments should be less variable and show more consistent effects of the overassociation between the minority group and the infrequent class of behaviors. Alternatively, however, fifth-graders' increased memory and ability to judge base-rates and covariation might make their group perceptions more accurate, and they might therefore show *less* bias than second-graders.

The hypothesis that children would form illusory correlations between a minority group and an infrequent class of behaviors was generally supported. In the Negative-Infrequent condition, negative behaviors were expected to be overassociated with the minority group. On the attribution task, children in this condition were quite accurate in attributing positive behaviors to the majority and minority groups, making mean attributions near the correct proportions for the majority and minority groups. However,

children overattributed negative behaviors to the minority group, and underattributed negative behaviors to the majority group. These trends were supported by positive phi coefficients, although only second-graders' phi scores were significantly above zero. Children's frequency estimations also demonstrated an overestimation of negative behaviors in the minority group. That is, children estimated the minority group to have performed a greater proportion of negative behaviors than the majority group, although the actual proportions of negative behaviors were equal for the two groups.

Contrary to expectations, the illusory correlations formed by children in the Negative-Infrequent condition did not lead to differences in the evaluation of the majority and minority groups. Although these children overassociated negative behaviors with the minority group, they did not evaluate the minority group more negatively than the majority group. However, regression analyses indicated that children's illusory correlations did influence their relative ratings of the two groups such that children who formed stronger illusory correlations also evaluated the majority and minority groups more differently. Thus, the potential for illusory correlations between a minority group and negative behaviors to lead to more negative evaluations of the minority group seems apparent.

Children in the Positive-Infrequent condition also showed some of the expected illusory correlation effects. In this condition, positive behaviors were less frequent than negative behaviors, and a perceived association between the minority group and positive behaviors was predicted. On the attribution task, results were not as similar to the predicted trends as in the Negative-Infrequent condition. Second- and fifth-graders in the Positive-Infrequent condition overattributed both positive and negative behaviors to the minority group, and underattributed these behaviors to the majority group. Contrary to expectations, second-graders showed a greater overattribution of negative behaviors to the minority group than positive behaviors. However, findings for the frequency estimation task in the Positive-Infrequent condition did support the hypothesis that children would perceive a false relationship between the minority group and infrequent (positive) behaviors. Indeed, children estimated a greater proportion of positive

behaviors to have been performed by the minority group than the majority group. Finally, children in the Positive-Infrequent condition evaluated the minority group more favorably than the majority group, as would be expected based on the perceived association between the minority group and positive behaviors. The illusory correlations children formed also predicted the difference in their evaluations of the majority and minority groups.

The predicted age-related trends in illusory correlation were not found. It was hypothesized that second-graders' judgments would show more variability than fifth-graders' judgments, and that fifth-graders should therefore evidence stronger illusory correlation effects. Contrary to these expectations, both age groups were equally susceptible to illusory correlations on the frequency estimation task, which measures overall group impressions. Both age groups also showed similar differences in group evaluations. On the attribution task, second-graders formed significant illusory correlations, but fifth-graders formed weaker illusory correlations than second-graders. Thus, even children as young as second grade were clearly susceptible to biases that cause illusory correlations. Fifth-graders' attributions were more accurate than second-graders' attributions, which probably caused the weaker illusory correlation effects. However, fifth-graders' misattributions were in the predicted directions, and they formed illusory correlations that were similar in strength to those of second-graders on the frequency estimations.

In sum, the hypothesis that children would overassociate the minority group with infrequent behaviors was generally supported. In both the Negative-Infrequent and Positive-Infrequent conditions, children overestimated infrequent behaviors in the minority group, and these perceptions predicted differences in their evaluations of the groups. Results from the attributions task were not as consistent across conditions, perhaps because this task is more sensitive to specific variations in memory than the frequency estimation task, which measures overall impressions of the groups. Thus, the frequency estimation task may be a better indicator of how children view the groups'

positive and negative behavior in general, whereas the attribution task assesses memory for specific group-behavior associations.

Distinctiveness of Group-Behavior Associations

The illusory correlation effects and patterns of correct attributions found in Study 1 suggest that certain stimuli are more salient than others, and that illusory correlations are due to the increased distinctiveness of certain group-behavior associations over others. Results from the frequency estimation task in both the Negative-Infrequent and Positive-Infrequent conditions showed that illusory correlation effects are characterized by an overestimation of infrequent behaviors in the minority group. Children in the Negative-Infrequent condition made an erroneous association between the minority group and infrequent behaviors on the attribution and frequency estimation tasks. Children in this condition also made more correct attributions for minority-negative behaviors, underscoring the particular salience of the association. Children in the Positive-Infrequent condition overassociated both negative and positive behaviors with the minority group on the attribution task, but on the frequency estimation task they overestimated the positive (infrequent) behaviors in the minority group.

Given this fairly consistent finding of illusory correlations between the minority group and negative behaviors, it might appear that the illusory correlations are due to a bias towards viewing minority groups more negatively than majority groups. However, the lack of difference in evaluations of the majority and minority groups in the Negative-Infrequent condition, and the finding of more positive evaluations of the minority group in the Positive-Infrequent condition suggest otherwise. The proportion of correct attributions in the Positive-Infrequent condition was greater for minority-negative behaviors, suggesting that this association may have been more salient than other group-behavior associations. The reason may be that negative behaviors are inherently more salient than positive behaviors, and therefore attract more attention than positive behaviors. Thus, when paired with a minority group, the minority-negative association

stands out, even when negative behaviors are more frequent than positive behaviors. The salience of the minority-negative behaviors may have obscured any effects of the distinctiveness of the minority-positive behaviors in the Positive-Infrequent condition on the attribution task. Nevertheless, the distinctiveness of the minority-positive association became apparent on the frequency estimations task, in which children in the Positive-Infrequent condition overestimated the proportion of positive behaviors in the minority group.

The slightly different patterns of results found in the Negative-Infrequent and Positive-Infrequent conditions on the attribution task are not entirely inconsistent with findings from research with adults. Meta-analysis showed that whereas illusory correlations were very robust when negative behaviors were infrequent, effect sizes were much smaller when the infrequent behaviors were non-negative (Mullen & Johnson, 1990). The reason for these results may be that the added salience of negative behaviors makes minority-negative behaviors particularly distinctive when negative behaviors are infrequent, but competes with the salience of the minority-positive relationship when positive behaviors are infrequent.

The Role of Memory in the Formation of Illusory Correlations

Children's memory capacity, as measured by the independent sentence memory task, mediated age differences in illusory correlation effects on the attribution task. There was also partial evidence for a mediating role of memory on children's frequency estimations. On both tasks, when sentence recall scores were covaried out of the analyses, there were no longer significant illusory correlation effects. Further evidence for the mediating role of memory in attributions came from a significant negative correlation between sentence recall scores and phi coefficients, with children who scored higher on the sentence recall task forming weaker illusory correlations. There was no significant correlation between sentence recall and frequency estimations, perhaps because frequency estimations represent an overall impression of the majority and

minority groups, and may thus be less dependent on memory for specific group-behavior correlations.

Memory should indeed mediate illusory correlation effects to some extent because these effects should be memory-based. That is, they appear to be dependent on better memory for certain group-behavior associations than others, which leads the more salient group-behavior associations to be overrepresented in memory, and overestimated in judgments of the groups. However, illusory correlation effects are not entirely accounted for by memory capacity, perhaps because illusory correlations are caused by systematic memory *distortions* that are due to differences in the salience of certain types of stimuli, rather than by a simple inability to remember the stimuli. Thus, having a better memory does not necessarily make one immune to the bias towards attention to certain stimuli.

Chapter 3

STUDY 2: DUAL INFLUENCES OF DISTINCTIVENESS AND INGROUP FAVORITISM ON PERCEPTIONS OF ILLUSORY CORRELATION IN SELF-RELEVANT MINIMAL GROUPS

The methodology of Study 1, in which children formed impressions of groups to which they do not belong, represents a social perceptual situation that undoubtedly occurs in real life. Perhaps more often than not, however, children are members of one of the social groups about which they are forming impressions. For example, any perceptions of gender groups probably involve a comparison to oneself, as most people have a clear gender identity. Numerous other social groupings, such as race, religion, and social class, are also likely to make reference to the self. Thus, in addition to understanding the cognitive biases that lead to illusory correlations, it is also important to understand how motivation to view one's social group, and thus oneself, favorably can impact the formation of illusory correlations.

The purpose of Study 2 was to examine the dual influences of cognitive biases that lead to illusory correlations between a minority group and infrequent behaviors, and motivational biases to view one's own social group more favorably than other social

groups. Using a methodology similar to that of Study 1, several group-behavior associations were presented, children were told that they themselves were members of either the target majority or minority group, and the formation of illusory correlations and group evaluations were measured. Because a case in which positive behaviors outnumber negative behaviors is more ecologically valid than the reverse situation, negative behaviors were always the infrequent class of behaviors. Thus, based on cognitive biases in attention to the minority-infrequent behaviors alone, illusory correlations between the minority group and negative behaviors would be predicted.

Based on Schaller and Maass' (1989) findings, children were expected to attend closely to behaviors in their own group. The self-relevance of this task may motivate children to use on-line processing when listening to the group-behavior associations to form impressions of the groups as each behavior is presented. On-line processing should lead to an association between one's own group and *frequent*, in this case positive, behaviors. Children may also presuppose that their own group will behave desirably; thus, children may attend more to positive behaviors in forming their impressions of their own group, and may also attend to negative behaviors when forming impressions of the other group.

For children assigned to the Majority[1] group, the predicted direction of illusory correlations based on motivational biases to view the ingroup more favorably than the outgroup and the fore-mentioned cognitive biases should be the same. Majority group children should form illusory correlations such that the minority group is associated with negative behaviors and the majority group is associated with positive behaviors, and majority group children should evaluate the majority group more positively than the minority group. For children assigned to the Minority group, however, motivational biases and cognitive biases may be in conflict. That is, unless children use purely on-line processing, and do not rely on any memory-based processing to form impressions, the cognitive bias that makes minority-negative behaviors more salient than other group-

[1] The capitalized words "Majority" and "Minority" will from this point on signify reference to the *participants* who are assigned membership to one of the target groups.

behavior associations should lead Minority group children to form an association between their own group and negative behaviors. However, the motivational bias to view one's own group more favorably than the other group may attenuate this bias, leading to weaker illusory correlations, or it may overwhelm the cognitive bias and allow Minority group children to form an illusory correlation between the minority group and *positive* behaviors.

Schaller and Maass (1989) also found different results for adults' attributions and frequency estimations when participants were told that they were members of one of the target group. On the frequency estimation measure, adults formed illusory correlations between their own group and positive behaviors. On the group attribution measure, in contrast, illusory correlations were attenuated. Schaller and Maass argued that the attenuation was due to the effortful processing required to reconcile negative behaviors in one's own group with the *a priori* notion that one's own group will behave positively. An increased amount of attention is given to negative behaviors in one's own group in order to reconcile the discrepancy between expectations and actual information, and consequently ingroup-negative behaviors are well represented in memory, and illusory correlations between the outgroup and negative behaviors are decreased. The reason for the difference in illusory correlations on the two measures, according to Schaller and Maass, is that the frequency estimation task measures overall group impressions and calls for less accurate memory, whereas the attribution task is subject to more accurate memory for the group-behavior associations. Thus, illusory correlation effects in children might also be attenuated on the attribution task.

The most important age effect predicted for Study 2 was a decrease in the influence of ingroup favoritism on fifth-graders' perceptions. Specifically, fifth-graders were expected to show less difference in their estimations of negative behaviors in the ingroup versus the outgroup, and less of a difference in evaluations of the majority and minority groups due to the expected decrease in ingroup favoritism. It was also predicted that fifth-graders assigned to the Minority group would show more negative minority group perceptions if they were influenced by the shared infrequency of the minority-

negative behaviors, but would be less influenced by a motivation to attribute positive behaviors to the ingroup due to ingroup favoritism than second-graders assigned to the Minority group.

Method

Participants

Participants were the same children who participated in Study 1.

Materials and Procedure

Materials. The materials were similar to those used in Study 1. The same line drawings of girls and boys were used to depict the majority and minority groups. The target groups were labeled the "yellow" group and the "green" group, and the drawings depicted children wearing a yellow or green t-shirt. As in Study 1, the majority group consisted of 12 children, and the minority group consisted of 6 children. Each target child was associated with a positive or negative behavior, which was communicated by placing a drawing of a child in a yellow or green shirt next to a photograph depicting the behavior. The behaviors used in Study 2 consisted of the set of behaviors not used in Study 1 (e.g., Set B if Set A was used in Study 1). The list of positive and negative behaviors was counterbalanced across Studies 1 and 2, but each individual child received a different set of behaviors for Study 1 and Study 2 (see Appendix B). Positive behaviors were always more frequent than negative behaviors in Study 2; thus, the majority group engaged in eight positive behaviors and four negative behaviors, and the minority group engaged in four positive behaviors and two negative behaviors.

Group Assignment. Half the participants were assigned to membership in the Majority group, and the other half were assigned to Minority group membership. At the beginning of Study 2, the experimenter told the children that she would tell them about

two other groups of children, and that this time they would be members of one of the groups. She asked them to choose whether they wanted to be in the "green" or "yellow" group, and told them that once they had chosen a group they could not change their group membership. Thus, children chose the *color* group they preferred to belong to. However, children's membership in the Majority or Minority group was assigned prior to the study, and the color associated with the majority and minority group for that particular participant was determined by the color the child chose to be associated with. Allowing children to choose their preferred color group membership should have helped children identify with either the majority or minority group and minimized any extraneous effects due to color preferences.

Measures. The measures included the same group attribution, frequency estimation, evaluation, and sentence memory tasks that were used in Study 1. For the evaluation task, analysis of the descriptors showed ratings to be reliable across the nine descriptors for Study 2, with alpha coefficients of .91 for majority group ratings, and .92 for minority group ratings. The descriptors were therefore averaged to form a composite evaluation score for each group.

Procedure. Following the color group assignments, children were shown the drawings of 12 majority group and 6 minority group children used for the frequency estimation task, and they were told that the "green" (or yellow) group had twice as many children as the "yellow" (or green) group. The experimenter told the children that she would "tell them about some things that children in the green and yellow groups have done," and instructed them to attend to and try to remember the group associated with each behavior. For each group-behavior association, a drawing of a child of the participants' sex wearing either a yellow or green t-shirt was placed next to the photograph depicting the behaviors, and the experimenter said, for example, "J.M., who is in the green group, always shares her toys with other children." Children then completed the attribution task, frequency estimation task, and group evaluations. Testing for Study 2 took place immediately following Study 1 and the sentence memory task.

Results

Overview of Analyses

The analyses of Study 2 were the same as in Study 1. For the group attribution task, children's attributions of each behavior to a group were used to compute phi coefficients. The phi coefficients were first tested to determine whether they were significantly different from zero. Condition and grade differences in phi coefficients were then examined, and finally, the accuracy of children's attributions was examined. For the frequency estimation task, condition and grade differences in the proportion of negative behaviors attributed to each group were assessed. Finally, children's evaluations of the majority and minority groups were examined, and regression analyses were performed to determine whether illusory correlations predicted differences in group evaluations. For each analysis, sex differences were tested in preliminary analyses. No sex differences were found on any of the measures; therefore, participant sex was not included as a factor in the following analyses.

Attribution Task

In Study 2, children were told that they were members of the Majority or Minority group. Their perceptions were therefore expected to be influenced by both cognitive-based illusory correlation effects due to the shared infrequency of minority-negative behaviors, as well as motivational biases to view their own group more positively than the other group. For children assigned to the Majority group, ingroup favoritism effects and shared infrequency effects should lead to similar illusory correlation effects; therefore, children assigned to this group were expected to have positive phi coefficients, consistent with a relationship between the majority group and positive behaviors. However, for children assigned to the Minority group, ingroup favoritism motives and cognitive effects of shared-infrequency should be in conflict. Therefore, children

assigned to the Minority group were expected to have phi coefficients that are close to zero, indicating an attenuation of illusory correlation, or negative phi coefficients, consistent with a perceived association between the minority group and positive behaviors.

Tests of Significance of Phi Coefficients. These hypotheses were first tested by comparing phi coefficients for each condition against zero. Results of one-sample *t*-tests showed that none of the phi coefficients differed from zero (see Table 8 for means). Thus, neither second- and fifth-graders in the Majority group, nor second- and fifth-graders in the Minority group showed significant illusory correlations on the attribution task.

Examination of the proportion of positive and negative behaviors attributed to each group revealed that children's attributions of positive behaviors were very accurate. Their attributions of negative behaviors were slightly lower than the actual proportions for the majority group, and slightly higher than the actual proportions for the minority group, but this tendency was not sufficient to produce significant phi coefficients (see Table 9 for means). The lack of illusory correlation effects on this task may have occurred for several reasons. First, because children were motivated to attend to behaviors relevant to their own group, they may have remembered the group-behavior associations more accurately, thus forming no illusory correlations. Second, the attenuation of illusory correlation effects could have been due to practice effects carried over from Study 1. Finally, the lack of illusory correlation effects on the attribution task could be interpreted as an indication that children were using on-line rather than memory-based processing when forming perceptions of the groups.

Table 8

Study 2: Mean Phi Coefficients

Condition	n	Mean Phi Coefficient*	SD
Majority Group Members			
Second-Graders	32	0.07	0.33
Fifth-Graders	29	0.01	0.27
Grades Combined	61	0.04	0.34
Minority Group Members			
Second-Graders	33	0.09	0.33
Fifth-Graders	31	0.07	0.35
Grades Combined	64	0.08	0.34
Conditions Combined	125	0.06	0.34

*Phi coefficients were multiplied by 100 to increase ease of interpretation in the table only.
NOTE: Means and standard deviations do not reflect logarithmic transformations.

Table 9

Study 2: Mean Conditional Probabilities of Positive and Negative Behaviors Attributed to the Majority and Minority Groups

		Group-Behavior Association			
	n	Majority-Positive	Majority-Negative	Minority-Positive	Minority-Negative
Correct Conditional Probabilities		*.67*	*.67*	*.33*	*.33*
Condition					
Majority Group Members					
Second-Graders	32	.63 (.14)	.57 (.23)	.37 (.14)	.43 (.23)
Fifth-Graders	29	.64 (.07)	.63 (.16)	.36 (.07)	.36 (.16)
Grades Combined	61	.64 (.11)	.60 (.20)	.36 (.11)	.40 (.20)
Minority Group Members					
Second-Graders	33	.65 (.11)	.58 (.20)	.35 (.11)	.42 (.20)
Fifth-Graders	31	.65 (.08)	.59 (.23)	.35 (.09)	.41 (.23)
Grades Combined	64	.65 (.10)	.59 (.21)	.35 (.10)	.41 (.21)
Conditions Combined	125	.64 (.10)	.59 (.21)	.36 (.10)	.41 (21)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

Condition and Group Differences in Phi Coefficients. Although children did not form significant illusory correlation effects on the attribution task, a test of condition and grade differences was nevertheless performed to test the original hypothesized condition X grade interaction. Phi coefficients were first transformed to normalize significantly skewed distributions by adding two to each phi coefficient and performing a $\log_{10}$ transformation. The transformed phi scores were subjected to a 2(group membership: majority, minority) X 2(grade: 2^{nd}, 5^{th} grade) analysis of variance. The results showed no significant differences in grade or condition. This analysis was repeated including children's sentence memory scores as a covariate to remove variance due to differences in memory capacity. Results again indicated no significant effects.

Accuracy of Attributions. To determine whether children showed increased memory for certain group-behavior associations, the proportion of positive and negative behaviors correctly attributed to each group was examined. Proportions of positive and negative behaviors that were correctly attributed to the majority and minority groups were calculated, and were submitted to a 2(participant condition: majority group, minority group) X 2(grade: 2^{nd}, 5^{th}) X 4(target condition: majority-positive, majority-negative, minority-positive, minority-negative) mixed-design ANOVA with Target Condition as a within-subjects variable. There was a significant main effect of Target Condition, $F(3, 363)=3.5$, $p=.02$. Post-hoc analyses on the contrasts of theoretical interest ($\alpha=.01$) indicated that a significantly greater proportion of positive behaviors than negative behaviors was correctly attributed to the majority group, $t(124)=3.6$, $p<.001$, but there was no difference in the proportion of positive and negative behaviors attributed to the minority group. There was also a trend towards more correct attributions of positive behaviors to the majority group than to the minority group, $t(124)=1.7$, $p=.09$, but the proportion of negative behaviors correctly attributed to the majority group versus the minority group did not differ (see Table 10 for means). Thus, children's memory biases tended to be towards making more correct attributions for positive behaviors to the majority group. This finding is in contrast to that of Study 1, in which children tended to make more correct attributions for negative behaviors to the minority group.

Table 10

Study 2: Proportion of Positive and Negative Behaviors Correctly Attributed to the Majority and Minority Groups

		Group-Behavior Association			
	n	Majority-Positive	Majority Negative	Minority-Positive	Minority-Negative
Condition					
Majority Group Members					
Second-Graders	32	.82 (.18)	.77 (.27)	.75 (.21)	.84 (.39)
Fifth-Graders	29	.93 (.10)	.88 (.17)	.93 (.11)	.88 (.32)
Grades Combined	61	.87 (.15)	.82 (.23)	.84 (.19)	.86 (.36)
Minority Group Members					
Second-Graders	33	.89 (.12)	.75 (.29)	.84 (.26)	.76 (.31)
Fifth-Graders	31	.92 (.10)	.80 (.27)	.90 (.20)	.82 (.30)
Grades Combined	64	.91 (.11)	.77 (.28)	.87 (.24)	.79 (.31)
Conditions Combined	125	.89 (.14)	.80 (.26)	.85 (.22)	.82 (.33)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

Frequency Estimations

On the frequency estimation task, it was predicted that children in both the Majority and Minority groups would estimate a greater proportion of negative behaviors to have been performed by the outgroup compared to the ingroup, based on the expected ingroup favoritism effects. Fifth-graders were expected to show less ingroup favoritism than second-graders; therefore, it was predicted that, compared to second-graders assigned to the Minority group, fifth-graders assigned to the Minority group would show attenuated illusory correlations, or even illusory correlations between the minority group and negative behaviors, because their frequency estimations should be more strongly influenced by shared-infrequency effects, which would lead to an overestimation of minority-negative behaviors. Likewise, fifth-graders assigned to the Minority group were

expected to be less influenced by ingroup favoritism effects, which would lead to an overestimation of minority-positive behaviors.

The numbers of majority and minority group members that children estimated to have performed negative behaviors were converted to proportions by dividing the estimated number of behaviors by 12 for the majority group, and 6 for the minority group. One was added to the proportions to remove all zero values, and $\log_{10}$ transformations were performed to normalize the distributions. These scores were entered into a 2(condition: majority group, minority group) X 2(grade: 2^{nd}, 5^{th}) X 2(target group: majority group, minority group) mixed-design analysis of variance, with Target Group as a within-subjects variable.

Results showed a significant main effect of Target Group, $F(1, 121)=40.0$, $p<.001$, with children estimating a greater proportion of negative behaviors to have been performed by the minority group than the majority group. The expected Condition X Grade X Target Group interaction approached significance, $F(1, 121)=3.4$, $p=.07$. Because differences in second- and fifth-graders' memory capacities were expected, the analysis was repeated including sentence memory as a covariate. When memory was controlled, the main effect of Target Group remained significant, $F(1, 120)=5.7$, $p=.02$, and the Condition X Grade X Target Group interaction was also significant, $F(1, 120)=4.2$, $p=.04$. Post-hoc analyses ($\alpha=.01$) were performed on the contrasts of interest to ascertain the trends within each condition. Frequency estimations for children assigned to the Majority and Minority groups were compared within each condition at each grade level separately.

Estimations of negative behaviors were significantly greater for the minority group than the majority group for second-graders assigned to the Majority group, $t(31)=3.6$, $p=.001$, fifth-graders in the Majority group, $t(28)=4.2$, $p<.001$, and second-graders assigned to the Minority group, $t(32)=3.6$, $p=.001$. However, estimations of negative behaviors in the majority and minority groups did not differ among fifth-graders assigned to the Minority group, $t(30)=1.5$, n.s. (see Table 11 for means).

The results for children assigned to the Minority group are quite interesting in that second-graders showed no sign of their frequency estimations being influenced by ingroup favoritism. Fifth-graders, on the other hand, did not estimate significantly more negative behaviors in their own group than the outgroup, although the trend was towards a larger proportion of negative behaviors attributed to the minority group. This effect could reflect more accurate memory for the group-behavior associations due to age-related increases in memory for the self-relevant groupings, or it could reflect *increased* ingroup favoritism among fifth-graders assigned to the Minority group.

Table 11

Study 2: Estimated Frequency of Occurrence of Negative Behaviors in the Majority and Minority Groups

		Target Group	
Condition	n	Majority	Minority
Majority Group Members			
Second-Graders	32	.35 (.15)	.47 (.21)
Fifth-Graders	29	.35 (.13)	.51 (.19)
Grades Combined	61	.35 (.14)	.49 (.20)
Minority Group Members			
Second-Graders	33	.33 (.14)	.49 (.22)
Fifth-Graders	31	.40 (.17)	.46 (.21)
Grades Combined	64	.36 (.16)	.47 (.21)
Conditions Combined	125	.36 (.15)	.48 (.21)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

Group Evaluations

Children were expected to show ingroup favoritism in their group evaluations. That is, they were expected to evaluate their own group more favorably than the outgroup. It was predicted that second-graders would show greater ingroup favoritism

effects than fifth-graders; second-graders were therefore expected to show greater differences in their evaluations of the majority and minority groups. In addition, evaluations of the majority and minority groups were expected to be based on the illusory correlations children formed. Thus, phi coefficients and frequency estimations should predict evaluations of the groups.

Condition and Grade Differences in Evaluations. Evaluations were subjected to a 2(group membership: majority vs. minority) X 2(grade: 2^{nd}, 5^{th}) X 2(target group: majority vs. minority) mixed-design ANOVA, with Target Group as a within-subjects variable. The expected Group Membership X Grade X Target Group interaction was not significant, $F(1, 121)=2.6$, n.s. However, there was a significant Group Membership X Target Group interaction, $F(1, 121)=17.8$, $p<.001$.

Post-hoc analyses ($\alpha=.025$) on the hypotheses of interest indicated that, as expected, children in the Majority group evaluated the majority more positively than the minority group, $t(60)=3.6$, $p=.001$, whereas children in the Minority group evaluated the minority group more positively than the majority group, $t(63)=-2.3$, $p=.02$ (see Table 12 for means). Thus, children evaluated the ingroup more favorably than the outgroup, but there was no attenuation of the ingroup favoritism effect among fifth-graders, as had been predicted.

Table 12

Study 2: Mean Evaluation Ratings of the Majority and Minority Groups

Condition	n	Target Group: Majority	Target Group: Minority
Majority Group Members			
Second-Graders	32	5.2 (1.5)	4.2 (1.6)
Fifth-Graders	29	5.1 (1.0)	4.2 (1.1)
Grades Combined	61	5.1 (1.3)	4.2 (1.3)
Minority Group Members			
Second-Graders	33	4.1 (1.3)	5.1 (1.2)
Fifth-Graders	31	4.6 (1.2)	4.7 (1.1)
Grades Combined	64	4.4 (1.3)	4.9 (1.2)
Conditions Combined	125	4.7 (1.3)	4.6 (1.3)

NOTE: Standard deviations are shown in parentheses.

Regression Analyses. To examine whether children's illusory correlations predicted their evaluations, three regression models were tested. The first two contained only simple predictors, and the third block included interaction variables. Model 1 tested the predictive power of grade and condition. Condition was dummy coded as 1 and –1, representing Majority and Minority group membership, respectively, and grade was entered as 2 or 5. The dependent variable was created by subtracting the evaluation rating for the minority group from the rating for the majority group, yielding scores ranging from –6 to 6. Six was added to each score to create positive numbers ranging from 0 to 12, with scores below six representing evaluations in favor of the minority group, and scores above six representing evaluations in favor of the majority group. For Model 1, the overall regression model was significant, $F(2, 122)=9.5$, $p<.001$, adjusted $R^2=.12$. Only Condition was a significant predictor in this model.

In Model 2, grade and condition, as well as phi coefficients, and frequency estimation were regressed onto evaluation scores. Phi and frequency estimation were again entered into a single regression model because the correlation between the two variables was relatively low. The frequency estimation predictor variable was created by

subtracting the proportion of negative behaviors estimated for the majority group from the proportion of negative behaviors estimated for the minority group, and one was added to the scores to create nonzero numbers, with scores below one representing illusory correlations in favor of the minority group, and scores above one representing illusory correlations in favor of the majority group. For Model 2, the overall model was significant, $F(4, 120)=11.2$, $p<.001$, adjusted $R^2=.25$, and the R^2 change was significant (R^2 change=.14, $F(2, 120)=11.3$, $p<.001$). Condition and Frequency Estimation emerged as significant predictors of differences in evaluations of the majority and minority groups. Phi also approached significance as a predictor (see Table 13 for alpha values and beta weights, and Table 14 for zero-order correlations among the variables). Thus, children's group membership predicted differences in evaluations independently in both models. As expected, children's illusory correlations also predicted differences in evaluations of the two groups, and adding the illusory correlation variables significantly reduced error in the regression model, underscoring their importance in children's group evaluations.

Because condition was an independent predictor of evaluations, a third regression model with the added interaction variables of phi X condition and frequency estimation X condition was tested to examine whether illusory correlation effects affected evaluations differently for children assigned to the Majority and Minority groups. These interaction variables were created by multiplying the variable that was entered into the regression alone by condition (1 or –1), and subtracting the mean score of the original variable. Model 3 was significant, $F(6, 118)=7.5$, $p<.001$, adjusted $R^2=.24$. Frequency estimation again predicted differences in evaluations, and phi approached significance as a predictor. However, neither interaction variable was significant, and there was no change in R^2. These findings suggest that the condition to which children were assigned (i.e., the Majority or Minority group) influenced their evaluations, but not through an interaction with illusory correlation effects. Rather, group membership alone was sufficient to motivate certain patterns of evaluations. Furthermore, illusory correlation effects influenced children's evaluations in the same way regardless of whether children were in the Majority or Minority group.

Table 13

Study 2: Regression Models Predicting Differences in Evaluations of the Majority and Minority Groups

Predictor	Unstandardized Beta Weight	Standardized Beta Weight	*t*	*p*	Partial *r*
Model 1 (R^2=.12)					
Grade	0.12	.09	1.0	.32	.09
Condition	0.74	.36	4.3	<.001	.36
Model 2 (R^2=.25)					
Grade	0.16	.11	1.4	.15	.13
Condition	0.72	.35	4.4	<.001	.38
Phi Coefficient	86.70	.14	1.7	.09	.15
Frequency Estimation	2.90	.30	3.6	<.001	.32
Model 3 (R^2=.24)					
Grade	0.17	.12	1.5	.13	.12
Condition	1.05	.51	1.1	.26	.09
Phi Coefficient	84.58	.14	1.7	.10	.13
Frequency Estimation	2.93	.30	3.6	<.001	.28
Phi X Condition	41.57	.07	0.8	.42	.07
Frequency Est. X Condition	-0.32	-.18	-0.4	.70	-.04

Table 14

Study 2: Zero-Order Correlations Between Illusory Correlation Tasks and Evaluations by Condition

	Grade	Sentence Memory	Phi Coefficient	Frequency Estimations	Evaluations
Grade	1.00	.67**	-.10	.11	-.06
Sentence Memory	.48**	1.00	-.11	.03	-.02
Phi Coefficient	-.03	-.16	1.00	.24	.27*
Frequency Estimations	-.21	-.24	.41**	1.00	.33**
Evaluations	.23	.18	.23	.40**	1.00

NOTE: Correlations for Majority group members are listed above the diagonal.
Correlations for Minority group members are listed below the diagonal.
NOTE: Frequency Estimation=estimation for minority - majority group
NOTE: Evaluations=evaluation for majority - minority group
*Correlation is significant at the .05 level (2-tailed).
**Correlation is significant at the .01 level (2-tailed).

Summary of Results

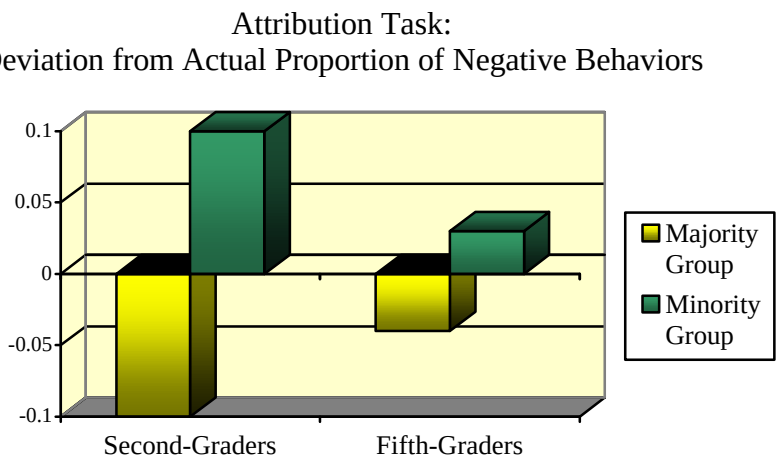
Results for Children Assigned to the Majority Group. Neither second- nor fifth-graders formed significant illusory correlations on the attribution task. On the frequency estimation task, however, both second- and fifth-graders assigned to the Majority group overestimated the proportion of negative behaviors in the minority group compared to the majority group. Second- and fifth-graders in this condition also evaluated the majority group more favorably than the minority group. In addition, the illusory correlations children formed predicted the difference in evaluation of the majority and minority groups, but membership in the majority group also predicted this difference, indicating the importance of both illusory correlations and ingroup favoritism on relative

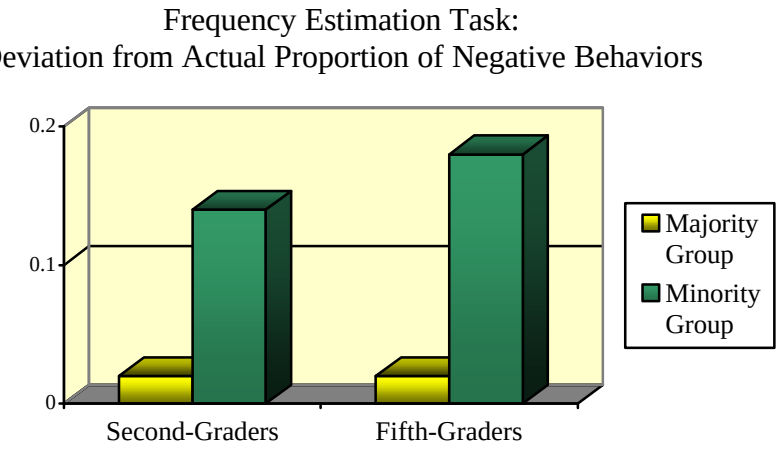
evaluations of the groups. See Figure 7 for a graphic representation of Majority group findings.

Results for Children Assigned to the Minority Group. Results for Minority group members were similar to those for Majority group members. Neither second- nor fifth-graders formed significant illusory correlations on the attribution task. Minority group children did form an illusory correlation between the minority group and negative behaviors on the frequency estimation task. Despite the direction of this illusory correlation, Minority group children evaluated the minority group more positively than the majority group. However, both membership in the Minority group and the illusory correlations these children formed predicted differences in evaluations of the majority and minority groups. Thus, when Minority group children formed stronger illusory correlations between the minority group and negative behaviors, they were less likely to evaluate the minority group more positively than the majority group. See Figure 8 for a graphic representation of Minority group findings.

Figure 7

Summary of Findings for Majority Group Members





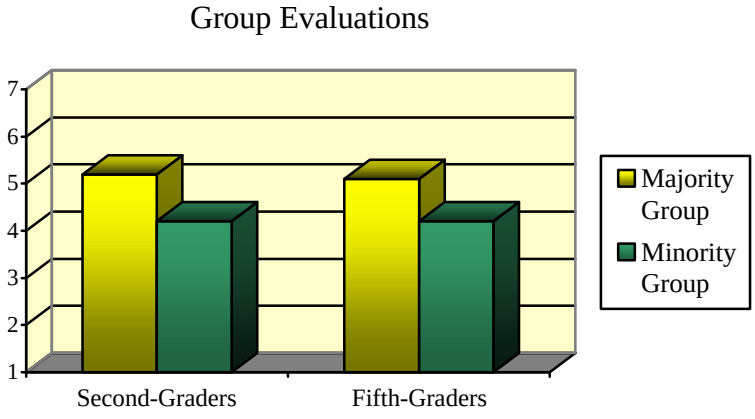
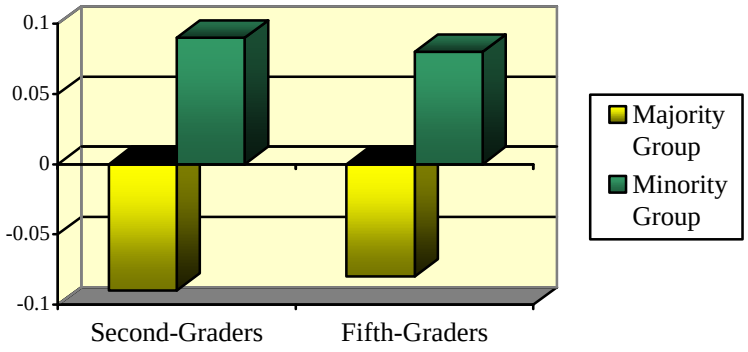


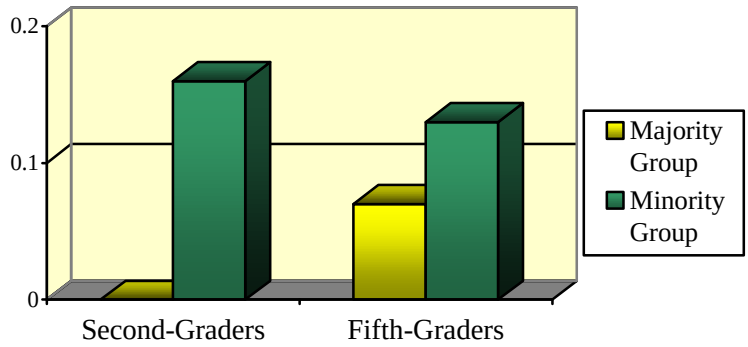
Figure 8

Summary of Findings for Minority Group Members

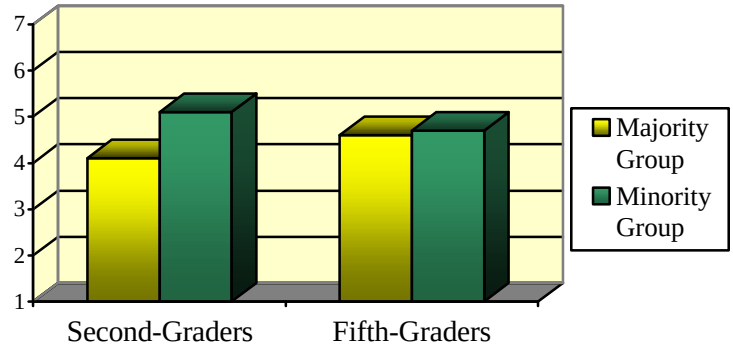
Attribution Task:
Deviation from Actual Proportion of Negative Behaviors



Frequency Estimation Task:
Deviation from Actual Proportion of Negative Behaviors



Group Evaluations



Discussion

Study 2 examined the influences of cognitive biases towards attending to and overestimating minority-negative behaviors, and motivational biases of ingroup favoritism when children are members of one of the target groups on children's illusory correlations. For children assigned to the Minority group, motivational biases were expected to be in conflict with the cognitive biases. Thus, illusory correlations in this unique situation were of interest.

It was hypothesized that children's illusory correlations would favor the ingroup, particularly for Majority group children because both cognitive and motivational biases should lead to an illusory correlation between the minority group and negative behaviors. One possible qualification, however, was that illusory correlations might have been attenuated on the attribution measure because children may have paid closer attention to the group-behavior associations because they were self-relevant in this study. This increased attention could have led to increased accuracy and decreased illusory correlation effects.

Age differences were also predicted, particularly with respect to ingroup favoritism effects. Second-graders were expected to show more ingroup favoritism than fifth-graders. Thus, illusory correlation effects and group evaluations that favor the ingroup were expected to be stronger for second-graders. This prediction is particularly important in the hypotheses for Minority group members. Because second-graders should show stronger ingroup favoritism, any effects of the distinctive minority-negative behaviors were expected to be compensated by ingroup favoritism, leading to more favorable perceptions of the minority group. For fifth-graders in the Minority group, on the other hand, ingroup favoritism effects should have declined by this age, and illusory correlations may therefore not favor the ingroup as much, but rather be attenuated, or even favor the outgroup.

On the attribution task, perceptions were quite accurate, and there were no significant illusory correlation effects. Children in both the Majority and Minority

groups slightly overattributed negative behaviors to the minority group, but phi coefficients were not significantly different from zero for any group of children. There were also no differences across grades or conditions in the extent to which children formed illusory correlations. The only pattern of incorrect attributions suggests that children were influenced by the distinctiveness of the minority-negative behaviors; however, children showed no significant distortion in their attributions, perhaps because the self-relevance of the information made their memory for the group-behavior associations more accurate, or because their attributions became more accurate with practice following Study 1.

Examination of correct attributions showed that children made more correct attributions for majority-positive behaviors. This finding could indicate that they were using on-line processing to form an impression of each group that was revised as each group-behavior association was presented. On-line processing would mean that children should have attended to the more frequent behaviors in forming impressions; thus, they would have paid special attention to the majority-positive behaviors. There are discrepancies in children's attributional distortions and their correct attributions that make it unclear whether children were processing information on-line, or using memory-based processing when completing the attribution measure. The lack of significant phi coefficients, and the higher proportion of majority-positive behaviors that was correctly attributed are consistent with on-line processing strategy, but the actual pattern of attributions, in which negative behaviors were overattributed to the minority group, is consistent with memory-based processing. Given these results, it is possible that children used both types of processing on the attribution task. Interestingly, the direction of children's illusory correlations, on the attribution task and especially on the frequency estimations task, underscores the importance of a cognitive bias to associate negative behaviors with the minority group.

On the frequency estimation task, second- and fifth-graders overestimated the proportion of negative behaviors performed by the minority group. For Majority group children, this illusory correlation effect could occur either through the distinctiveness of

the minority-negative behaviors or ingroup favoritism for the majority group. With these two biases acting in conjunction, children in the Majority group could certainly be expected to form this type of illusory correlation.

Among children assigned to the Minority group, second-graders perceived an illusory correlation between the minority group and negative behaviors on the frequency estimation task. Fifth-graders perceived a larger proportion of negative behaviors in the minority group, but did not form significant illusory correlations. Thus, the perceptions of second-graders in the Minority group appear to have been influenced mainly by the distinctiveness of the minority-negative behaviors, and not strongly influenced by ingroup favoritism. There are two possible explanations for why the fifth-graders in the Minority group did not form significant illusory correlations. One possibility is that these children's perceptions were simply more accurate than those of second-graders or fifth-graders in the Majority group. Examination of correct attributions shows that fifth-graders in the Minority group were quite accurate in their attributions, but no more accurate than fifth-graders in the Majority group, who did form significant illusory correlations on the frequency estimation task. If accuracy on the attributions task can be presumed to predict accuracy on frequency estimations, then the explanation that fifth-graders in the Minority group formed no illusory correlations on the frequency estimations due to increased accuracy is perhaps unlikely. Another possibility is that fifth-graders' perceptions may have been affected by ingroup favoritism such that the motivation to view the minority group positively negated any cognitive bias to overestimate minority-negative behaviors. Interestingly, this explanation would imply that fifth-graders showed *more* ingroup favoritism than second-graders, although the reverse finding was predicted.

Although Minority group children did not show illusory correlations in favor of their own group, but rather showed no illusory correlations or illusory correlations that favored the outgroup, their group evaluations nevertheless were more positive for their own group than for the majority group. Thus, the effects of ingroup favoritism were very clear on the evaluation measure. Children in the Majority group also rated the ingroup

more positively, but this effect would be expected whether children were basing their evaluations on ingroup favoritism or the illusory correlations they formed.

The regression analyses provided further support that children's group membership influenced their evaluations, but that evaluations were not solely influenced by ingroup favoritism. Group membership was a significant independent predictor of the difference between evaluations of the majority and minority groups. The extent to which children formed illusory correlations also predicted the difference in evaluations of the majority and minority groups. However, the predictive power of group membership did not interact with illusory correlation effects. That is, for Majority group members, stronger illusory correlations between the minority group and negative behaviors predicted a greater difference in evaluations of the majority and minority group, with evaluations favoring the majority group. For Minority group members, stronger illusory correlations also predicted evaluations of the majority group that were more favorable compared to evaluations of the minority group. Thus, although Minority group members evaluated the minority group more favorably than the majority group on average, those children who formed stronger illusory correlations between the minority group and negative behaviors also evaluated the minority and majority groups less differently than children who formed weaker illusory correlations. Furthermore, examination of individual scores showed that some of these Minority group children evaluated the majority group more positively than the minority group.

Distinctiveness versus Ingroup Favoritism

Children's group perceptions were clearly affected by both cognitive biases that make infrequent information distinctive and more memorable, as well as ingroup favoritism. The clearest effect of ingroup favoritism was found on the evaluations. Minority group children evaluated the ingroup more favorably than the outgroup, despite the fact that they estimated more negative behaviors to have been performed by minority group members than majority group members. Other possible ingroup favoritism effects

are less clear. The lack of significant phi coefficients could have been influenced by ingroup favoritism insofar as children's desire to view their own group positively may have led them to notice the ingroup-positive behaviors, and may also have made ingroup-negative behaviors more salient because they had to reconcile the negative behaviors with their positive ingroup preconceptions. However, the insignificant phi coefficients also could have been caused by increased attention to the group-behavior associations due to the self-relevance of the groups, or to practice effects. The lack of significant differences in Minority group fifth-graders' frequency estimations could also have been affected by ingroup favoritism. Increased ingroup favoritism among these fifth-graders could have caused them to estimate fewer minority group-negative behaviors than they otherwise would have, which decreased the illusory correlation effect. The direction of their frequency estimations was towards greater estimation of minority-negative behaviors, suggesting that the distinctiveness of the minority-negative behaviors was quite influential in their perceptions.

There is also support for effects of distinctiveness of shared-infrequent information on illusory correlations. Both Majority and Minority group members estimated more minority-negative behaviors than majority-negative behaviors, indicating that the paired-infrequent information was particularly salient and tended to be overestimated. Although children's phi coefficients were not significantly different than zero, examination of their attributions indicated a tendency to overattribute negative behaviors to the minority group. Thus, distinctive information clearly played a role in children's illusory correlations, even when children were members of the Minority group and the distinctive information led to more negative perceptions of their own group.

The Role of Memory

Children's memory capacity appears to have played a different role in Study 2 than in Study 1. When children were not told that they were members of one of the target groups, their scores on the sentence memory task mediated their illusory correlations, at

least to some extent. However, when children were told that they were members of a target group, memory did not mediate their perceptions. Sentence memory had no effect on attributions. It did act as a covariate in the frequency estimations, but not as a mediator. Rather, it removed enough variance to make other effects *more* apparent, rather than removing condition or age effects. Thus, memory was important in children's frequency estimations, but illusory correlations were based on memory *distortions* due to the distinctiveness of the minority-infrequent behaviors, rather than on memory *capacity*.

Chapter 4

STUDY 3:
FORMATION OF ILLUSORY CORRELATIONS ABOUT GENDER GROUPS

The purpose of Study 3 was to further explore the development of illusory correlations in self-relevant groups by using real social groups as target stimuli. The processes involved in the formation of illusory correlations may be similar when children perceive completely unfamiliar groups and familiar groups in a specific setting. However, the latter case may be more strongly influenced by prior expectations about the groups. Whereas the belief that one's own social group will behave favorably is the only prior expectation that is likely to affect illusory correlation formation when groups are completely novel, other expectations, such as specific stereotypes or more general attitudes about what a group is like, may affect illusory correlations about familiar groups. Given that second- and fifth-graders already have extensive knowledge, and therefore prior expectations, about many different social groups, it is important to explore the formation of illusory correlations in familiar social groups as well as novel groups. In addition, ingroup favoritism may have more or less impact when social groups are real than when they are fictitious minimal groups. Gender groups served as the social groups

in Study 3, and Majority and Minority status was assigned to the participants by manipulating the number of target girls and boys in a stimulus task group.

It is important to note that although gender groups do not differ in the overall population, the balance of females and males is unequal in many situations. For example, girls are often in the minority on mixed-sex little league sports teams, boys are often in the minority in home economics classes, and women are a small minority in certain professions such as engineering. Thus, the situation in Study 3 does not represent many social situations in which gender groups are relatively balanced, but is representative of some situations. To more closely parallel such situation-specific perceptions of gender groups, the target behaviors used in Study 3 occurred within a single scenario of children working together on a school project.

Method

Participants

Participants were the same children who participated in Studies 1 and 2.

Materials and Procedure

The majority and minority groups consisted of either 12 target girls and 6 target boys, or 12 target boys and 6 target girls. Children were told that the target girls and boys were an elementary school class working on a big school project together. As in Studies 1 and 2, each target child was associated with either a positive or negative behavior, none of which were used in Studies 1 and 2, and each group performed twice as many positive behaviors as negative behaviors (see Appendix B, Set D for a list of Study 3 behaviors). The target behaviors were all related to work on a group project for school. The drawings of girls and boys used in the preceding studies, but with uncolored t-shirts, were used for the group-behavior assignments. Either a boy or a girl was paired with each

photograph, and children were shown drawings of both boys and girls on the attribution and frequency estimation tasks.

On the frequency estimation task, more realistic drawings of girls and boys than the minimalist line drawings used in Studies 1 and 2 were used to more closely represent real groups. In addition, each of the targets in the frequency estimation graphic were different, more clearly representing distinct children. However, the same minimalist line drawings used in Studies 1 and 2 were used to present the group-behavior associations and on the attribution task to avoid children becoming too concerned with remembering which *specific target*, rather than which *group*, performed each behavior on the attribution task if 18 different targets were used.

The procedure was identical to that of Study 2 with the exception that, rather than choosing a color group, the participants' sex determined whether they were Majority or Minority group members. Because gender groups are very salient to children (McGraw, Durn, & Durnam, 1989; McGraw, Durm, & Patterson, 1983; Serbin & Sprafkin, 1986), participants' gender or their membership in one of the target groups was not explicitly mentioned. Following the presentation of the group-behavior associations, children completed an attribution task, a frequency estimation task, and group evaluations similar to those used in Studies 1 and 2. On the evaluation task, reliabilities among the descriptors was high for Study 3 (alpha reliability coefficient=.89 for majority group ratings, and .90 for minority group ratings). Testing took place during a second testing session, usually several weeks after testing for Study 1 and Study 2 was completed.

Results

The analyses for Study 3 were identical to those in Study 2. Each analysis was first performed including participant sex as a factor to test for sex differences. No main

effects or interactions with sex[2] were found for any of the measures, and main effects and interactions that did not involve sex remained significant whether or not sex was included as a variable in the analysis of variance. Sex was therefore excluded from any of the reported analyses.

Attribution Task

The predictions for Study 3 were the same as those for Study 2. Children were expected to attribute a larger proportion of positive behaviors to the ingroup than the outgroup. Thus, positive phi coefficients were predicted for children assigned to the Majority group, and negative phi coefficients were predicted for children assigned to the Minority group. If children's attributions showed any such influence of ingroup favoritism, older children were expected to show less of this effect. Alternatively, it was expected that children might show no illusory correlations due to the increased memory for the group-behavior associations that is motivated by the self-relevance of the information.

Tests for Significance of Phi Coefficients. Attributions were converted to phi coefficients, and these scores were first tested for significance against zero. Analyses were performed separately for each condition and grade level.

Fifth-graders assigned to the *Majority* group had phi scores significantly below zero, $t(31)=-2.7$, $p=.01$, but phis did not differ from zero for second-graders in the Majority group, $t(31)=-0.4$, n.s. (see Table 15). Mean numbers of positive and negative behaviors attributed to each group were examined to ascertain how the positive and negative attributions were distributed between the groups. Both second-and fifth-graders assigned to the Majority group had negative phi scores, and the attributional trends were

[2] For the *attribution task*, sex main effect $F(1, 117)=0.6$, n.s.; Sex X Condition $F(1, 117)=0.8$, n.s.; Sex X Condition X Grade $F(1, 117)=0.9$, n.s. For the *frequency estimation task*, Sex X Target Condition $F(1, 117)=0.0$, n.s.; Sex X Condition X Target Condition $F(1, 117)=0.0$, n.s.; Sex X Condition X Grade X Target Condition $F(1, 117)=0.1$, n.s. For the *group evaluations*, Sex X Target Group $F(1, 117)=0.5$, n.s.; Sex X Condition X Target Group $F(1, 117)=0.0$, n.s.; Sex X Condition X Grade X Target Group $F(1, 117)=0.1$, n.s.

similar for these groups of children. Children tended to underattribute positive behaviors to the majority group, and overattribute positive behaviors to the minority group. However, their attributions for negative behaviors were quite accurate (see Table 16). Better memory for the negative behaviors would be expected given children's supposed self-involvement in the target groups, but even children in the Majority group showed a bias towards attributing more positive behaviors to the minority group, possibly suggesting a preexisting bias towards viewing both girls and boys positively.

For children assigned to the *Minority* group, second-graders had phi scores significantly below zero, $t(32)=-3.8$, $p=.001$, but phis were not significantly different from zero for fifth-graders assigned to the Minority group, $t(27)=0.8$, n.s. (see Table 15). Examination of the conditional probabilities showed that, like Majority group members, these children tended to underattribute positive behaviors to the majority group and overattribute positive behaviors to the minority group. Interestingly, fifth-graders in the Minority group had *positive* phi coefficients, contrary to predictions, although their phi scores were not significantly different than zero. These children tended to overattribute negative behaviors to the minority group, but also overattributed positive behaviors to the minority group (see Table 16). However, because their phi coefficients indicated no significant illusory correlation effect, it is not clear that these attributional trends are meaningful.

Table 15

Study 3: Mean Phi Coefficients

Condition	n	Mean Phi Coefficient*	SD
Majority Group Members			
Second-Graders	32	-0.02	0.33
Fifth-Graders	32	-0.09	0.19
Grades Combined	64	-0.06	0.27
Minority Group Members			
Second-Graders	33	-0.11	0.17
Fifth-Graders	28	0.04	0.25
Grades Combined	61	-0.04	0.22
Conditions Combined	125	-0.05	0.25

*Phi coefficients were multiplied by 100 to increase ease of interpretation in the table only.
NOTE: Means and standard deviations do not reflect logarithmic transformations.

Table 16

Study 3: Mean Conditional Probabilities of Positive and Negative Behaviors Attributed to the Majority and Minority Groups

		Group-Behavior Association			
	n	Majority-Positive	Majority-Negative	Minority-Positive	Minority-Negative
Correct Conditional Probabilities		*.67*	*.67*	*.33*	*.33*
Condition					
Majority Group Members					
Second-Graders	32	.62 (.15)	.65 (.13)	.38 (.15)	.35 (.13)
Fifth-Graders	32	.59 (.08)	.66 (.12)	.41 (.08)	.34 (.12)
Grades Combined	64	.61 (.12)	.65 (.12)	.39 (.12)	.35 (.12)
Minority Group Members					
Second-Graders	33	.56 (.08)	.65 (.11)	.44 (.09)	.35 (.11)
Fifth-Graders	28	.62 (.09)	.59 (.12)	.38 (.09)	.41 (.12)
Grades Combined	61	.59 (.09)	.62 (.12)	.41 (.09)	.38 (.11)
Conditions Combined	125	.60 (.11)	.64 (.12)	.40 (.11)	.36 (.12)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

Condition and Grade Differences in Phi Coefficients. Group differences in phi scores were expected. Specifically, children assigned to the Majority group were expected to have higher phi scores than children assigned to the Minority group. Among Minority group members, second-graders were expected to show stronger ingroup favoritism effects in their illusory correlations than fifth-graders. The distribution of phi coefficients was normalized by adding two to each score and performing $\log_{10}$ transformations. These scores were examined using a 2(condition: majority group, minority group) X 2(grade: 2^{nd}, 5^{th}) X 2(target group: majority, minority) mixed-design ANOVA with Target Group as the within-subjects variable. The predicted Condition X Grade interaction was significant, $F(1, 121)=6.2$, $p=.01$.

Post-hoc analyses ($\alpha=.01$) revealed that second-graders assigned to the Majority vs. Minority groups did not differ in the degree to which they formed illusory correlations on the attribution task, $t(64)=0.9$, n.s. Fifth-graders assigned to the Minority group had significantly higher phi scores than fifth-graders assigned to the Minority group, $t(59)=2.6$, $p=.03$, and this effect was due to the former group's mean phi coefficient being positive and the latter group's mean phi coefficient being negative.

For children assigned to the Majority group, fifth-graders and second-graders did not differ, $t(63)=0.5$, n.s. For children assigned to the Minority group, fifth-graders had significantly higher phi scores than second-graders, $t(60)=3.8$, $p=.008$. This effect is again due to fifth-graders' having a positive mean phi score, whereas second-graders had a negative mean phi score. Thus, the observed group differences were due to negative mean phi scores among all groups except fifth-graders assigned to the Minority group, who had a positive mean phi score.

The analysis for group differences in phi scores was repeated using sentence memory as a covariate. The transformed phi scores were analyzed using a 2(condition) X 2(grade) ANCOVA with memory as a covariate. Results revealed that the Condition X Grade interaction remained significant, $F(1, 120)=5.6$, $p=.02$, and no other effects emerged. Thus, the observed group differences in phi scores were not accounted for by differences in memory.

Accuracy of Attributions. The proportion of correct attributions made to the majority and minority groups was also examined. Fifth-graders were expected to show better memory for the group-behavior associations than second-graders. It was also predicted that children would show better memory for negative behaviors in the minority group, and Minority group members were expected to show particularly good memory for this group-behavior association. Alternatively, because children tend to show better memory for schema-consistent behaviors, which should be positive behaviors in one's own group, Minority group members could be expected to remember minority-positive behaviors better than minority-negative behaviors.

The proportions of positive and negative behaviors correctly attributed to the majority and minority groups were subjected to a 2(participant condition: majority group, Minority group) X 2(grade: 2^{nd}, 5^{th}) X 4(target condition: majority-positive, majority-negative, minority-positive, minority-negative) mixed-design analysis of variance, with Target Condition as a within-subjects variable. There was a main effect of Target Condition, $F(3, 363)=5.5$, $p=.001$. This effect was subsumed by a Participant Condition X Grade X Target Condition interaction, $F(3, 363)=3.1$, $p=.03$. Post-hoc analyses were performed to compare correct attributions across the four group-behavior combinations within each grade and participant condition. The alpha level was set at $\alpha=.003$ (.05/16) to compensate for family-wise error.

The analyses indicated that second-graders assigned to the *Majority* group did not differentially remember any group-behavior associations. Fifth-graders assigned to the Majority group correctly attributed more positive behaviors to the minority group than the majority group, $t(31)=3.2$, $p=.003$. They also correctly attributed more negative than positive behaviors to the majority group, although this contrast did not reach the alpha level set for the post-hoc analyses, $t(31)=2.4$, $p=.02$ (see Table 17 for means). Thus, children in the Majority group did not show the expected memory effects, but rather appear to have had better memory for group-behavior associations that were expected to be *inconsistent* with the expectation that the ingroup would behave more positively than the outgroup.

Unlike children assigned to the Majority group, second-graders assigned to the *Minority* group made more correct attributions for negative than positive behaviors to the majority group, $t(32)=3.8$, $p=.001$, and for positive behaviors to the minority group than the majority group, $t(32)=5.5$, $p<.001$. Fifth-graders assigned to the Minority group correctly attributed more negative behaviors to the minority group than the majority group, $t(27)=2.6$, $p=.02$, but this contrast did not meet the alpha level set for the post-hoc analyses (see Table 17 for means). Thus, second-graders in the Minority group showed memory effects suggestive of ingroup favoritism in attention to the positive and negative behaviors. These children made more correct attributions for negative behaviors than positive behaviors to the outgroup, but correctly attributed more positive behaviors than negative behaviors to the ingroup. In contrast, fifth-graders in the Minority group made more correct attributions of negative behaviors than positive behaviors to the ingroup, suggesting that they were especially attentive to their own group's negative behaviors.

Table 17

Study 3: Proportion of Positive and Negative Behaviors Correctly Attributed to the Majority and Minority Groups

		Group-Behavior Association			
	n	Majority-Positive	Majority Negative	Minority-Positive	Minority-Negative
Condition					
Majority Group Members					
Second-Graders	32	.84 (.18)	.91 (.20)	.82 (.26)	.88 (.25)
Fifth-Graders	32	.85 (.13)	.93 (.15)	.95 (.12)	.91 (.20)
Grades Combined	64	.84 (.14)	.92 (.17)	.88 (.21)	.89 (.23)
Minority Group Members					
Second-Graders	33	.81 (.14)	.93 (.13)	.95 (.12)	.92 (.18)
Fifth-Graders	28	.88 (.09)	.86 (.17)	.92 (.15)	.96 (.13)
Grades Combined	61	.84 (.12)	.90 (.15)	.94 (.13)	.94 (.16)
Conditions Combined	125	.84 (.14)	.91 (.16)	.91 (.18)	.92 (.20)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

Frequency Estimations

In their frequency estimations, children in the Majority group were expected to estimate the minority group to have performed a greater proportion of negative behaviors than the majority group. In contrast, children in the Minority group were expected to estimate a greater proportion of negative behaviors in the majority group, which would be consistent with ingroup favoritism effects, and second-graders were expected to show this effect more strongly than fifth-graders. However, if Minority group members were to estimate a larger proportion of negative behaviors in the minority group, this effect would be consistent with cognitive biases that should lead to an overestimation of negative behaviors in the minority group.

The numbers of negative behaviors children estimated for the majority and minority groups were converted to proportions, one was added to each score to create non-zero numbers, and the distribution of scores was normalized using a $\log_{10}$ transformation. The transformed proportion scores were entered into a 2(condition: majority group, Minority group) X 2(grade: 2^{nd}, 5^{th}) X 2(target group: majority, minority) mixed-design ANOVA with Target Group as a within-subjects variable. The predicted three-way interaction was not significant, $F(1, 121)=0.4$, n.s. However, there was a significant main effect of Target Group, $F(1, 121)=21.1$, $p<.001$, with children estimating a larger proportion of negative behaviors in the minority group than the majority group (see Table 18 for means). Thus, children associated the minority group with negative behaviors, regardless of their own group membership.

Table 18

Study 3: Estimated Frequency of Occurrence of Negative Behaviors in the Majority and Minority Groups

		Target Group	
Condition	n	Majority	Minority
Majority Group Members			
Second-Graders	32	.30 (.16)	.42 (.21)
Fifth-Graders	32	.40 (.09)	.46 (.14)
Grades Combined	64	.35 (.13)	.44 (.18)
Minority Group Members			
Second-Graders	33	.37 (.18)	.42 (.19)
Fifth-Graders	28	.40 (.11)	.43 (.12)
Grades Combined	61	.38 (.15)	.43 (.16)
Conditions Combined	125	.37 (.14)	.43 (.17)

NOTE: Standard deviations are shown in parentheses. Means and standard deviations do not reflect logarithmic transformations.

This analysis was repeated as an analysis of covariance with sentence memory scores as a covariate. The main effect of Target Group was no longer significant, $F(1, 120)=2.9$, $p=.09$, and no other effects emerged. The decrease in the effect of Target Group due to the memory covariate suggests that memory may have mediated children's illusory correlations on this task. To complete a mediation analysis, the correlation between sentence memory scores, and the difference between the proportion of negative behaviors estimated for the minority versus majority group was calculated. The correlation was negative, $r = -.13$, indicating that as memory scores improved, illusory correlation effects decreased. However, the correlation was not significant, suggesting that children's memory ability did not entirely account for the illusory correlations they formed.

Group Evaluations

It was predicted that children would have more positive evaluations of their own group than the outgroup, and that second-graders would show more of an ingroup

favoritism effect than fifth-graders. Furthermore, it was hypothesized that illusory correlation effects would predict differences in evaluations for the majority and minority groups.

Condition and Grade Differences in Evaluations. To test differences in evaluations of the majority and minority groups, children's nine evaluation ratings for each group were averaged into single evaluation scores for the majority and minority groups. The composite ratings of the two groups were subjected to a 2(condition: majority group, minority group) X 2(grade: 2^{nd}, 5^{th}) X 2(target group: majority, minority) mixed-design analysis of variance. There was a main effect of Target Group, $F(1, 121)=4.4$, $p=.04$, and a significant Condition X Target Group interaction, $F(1, 121)=46.9$, $p<.001$. These effects were subsumed by the predicted Condition X Grade X Target Group interaction, $F(1, 121)=17.4$, $p<.001$.

To further examine this three-way interaction, post-hoc analyses were conducted on the contrasts of theoretical interest ($\alpha=.01$). These analyses showed that second-graders assigned to the Majority group evaluated the majority group more positively than the minority group, $t(31)=4.0$, $p<.001$. Fifth-graders in the Majority group, however, did not evaluate the groups differently, $t(31)=0.2$, n.s. Second-graders assigned to the Minority group evaluated the minority group more positively than the majority group, $t(32)=-5.5$, $p<.001$, as did fifth-graders assigned to the Minority group, $t(27)=-3.1$, $p=.004$ (see Table 19 for means). These findings suggest that second-graders in both groups, as well as fifth-graders in the Minority group, showed favoritism towards the ingroup on the evaluations. However, fifth-graders in the Majority group showed the expected age-related decrease in ingroup favoritism on this measure.

Table 19

Study 3: Mean Evaluation Ratings of the Majority and Minority Groups

		Target Group	
Condition	n	Majority	Minority
Majority Group Members			
Second-Graders	32	5.4 (0.9)	4.2 (1.4)
Fifth-Graders	32	4.4 (0.8)	4.4 (0.8)
Grades Combined	64	4.9 (1.0)	4.3 (1.1)
Minority Group Members			
Second-Graders	33	3.7 (1.3)	5.5 (1.0)
Fifth-Graders	28	4.2 (1.0)	4.9 (0.7)
Grades Combined	61	3.9 (1.2)	5.2 (0.9)
Conditions Combined	125	4.4 (1.2)	4.7 (1.2)

NOTE: Standard deviations are shown in parentheses.

Regression Analyses. The variables that contributed to children's evaluations were examined using regression analyses. The dependent variable was calculated by subtracting evaluation ratings for the minority group from ratings for the majority group. Six was then added to these scores to create positive numbers. Three models were again tested. Model 1 contained grade and condition regressed onto evaluation ratings. Grade was entered as 2 or 5, and condition was dummy coded as 1 and –1 (Majority and Minority group member, respectively). This model was significant, $F(2, 122)=21.8$, $p<.001$, adjusted $R^2=.25$. Only Condition was a significant predictor in this model. Model 2 included grade and condition, and added phi coefficients and frequency estimation as predictors. The frequency estimation variable was created by subtracting the estimated proportion of negative behaviors in the majority group from that estimated for the minority group, and adding one to make all scores positive. Model 2 was significant, $F(4, 120)=22.0$, $p<.001$, adjusted $R^2=.40$, and accounted for significantly more variance than Model 1 (R^2 change=.16, $F(2, 120)=16.6$, $p<.001$). Condition, Phi, and Frequency Estimation contributed significantly to the model (see Table 20 for alpha values and beta weights, and Table 21 for zero-order correlations among the variables).

Thus, as children estimated more negative behaviors in the minority group compared to the majority group, evaluations also became more positive for the majority versus the minority group.

Condition acted as an independent predictor in both Model 1 and Model 2. To examine whether the effects of condition were due to differences in the predictive power of phi and frequency estimation among children in the Majority and Minority groups, a third regression analysis was performed including interaction variables of phi X condition and frequency estimation X condition. Model 3 was also significant, $F(6, 118)=15.0$, $p<.001$, but there was no change in R^2, adjusted $R^2=.40$. Phi and Frequency Estimation again emerged as significant predictors. However, neither interaction variable was significant. Thus, condition predicted differences in evaluations of the majority and minority groups independent of its influence on illusory correlation effects. That is, children tended to evaluate the ingroup more favorably than the outgroup, but the influence of illusory correlation effects was the same for children in both groups.

Table 20

Study 3: Regression Models Predicting Differences in Evaluations of the Majority and Minority Groups

Predictor	Unstandardized Beta Weight		Standardized Beta Weight	*t*	*p*	Partial *r*
Model 1 (R^2=.25)						
Grade	-0.04	-.03	-0.4	.71	-.03	
Condition	1.00	.51	6.6	<.001	.51	
Model 2 (R^2=.40)						
Grade	-0.02	-.01	- 0.2	.85	-.02	
Condition	0.92	.48	6.8	<.001	.53	
Phi Coefficient	176.03	.22	3.1	.002	.27	
Frequency Estimation	3.40	.29	3.9	<.001	.34	
Model 3 (R^2=.40)						
Grade	0.01	.01	0.1	.93	.01	
Condition	0.26	.14	0.3	.80	.02	
Phi Coefficient	153.12	.19	2.6	.01	.18	
Frequency Estimation	2.91	.25	3.1	.002	.21	
Phi X Condition	67.79	.09	1.1	.26	.08	
Frequency Est. X Condition	0.66	.37	0.7	.49	.05	

Table 21

Study 3: Zero-Order Correlations Between Illusory Correlation Tasks and Evaluations by Condition

	Grade	Sentence Memory	Phi Coefficient	Frequency Estimations	Evaluations
Grade	1.00	.67**	-.13	-.14	-.39**
Sentence Memory	.46**	1.00	-.20	-.14	-.31**
Phi Coefficient	.34**	.28	1.00	.43**	.54**
Frequency Estimations	-.08	-.13	-.13	1.00	.57**
Evaluations	.33**	.28*	.09	.16	1.00

NOTE: Correlations for Majority group members are listed above the diagonal.
Correlations for Minority group members are listed below the diagonal.
NOTE: Frequency Estimation=estimation for minority - majority group
NOTE: Evaluations=evaluation for majority - minority group
*Correlation is significant at the .05 level (2-tailed).
**Correlation is significant at the .01 level (2-tailed).

Summary of Results

Results for Children Assigned to the Majority Group. Second-graders assigned to the Majority group did not show significant illusory correlations on the attribution task. Fifth-graders showed significant illusory correlations between the minority group and positive behaviors, contrary to expectations. Fifth-graders also made more correct attributions of positive behaviors to the minority group than any other group-behavior combination, consistent with the illusory correlation they formed. On the frequency estimation task, both second- and fifth-graders in the Majority group overassociated negative behaviors with the minority group. Finally, second-graders evaluated the majority group more positively than the minority group, but fifth-graders in the Majority group did not evaluate the groups differently. Both the illusory correlations children

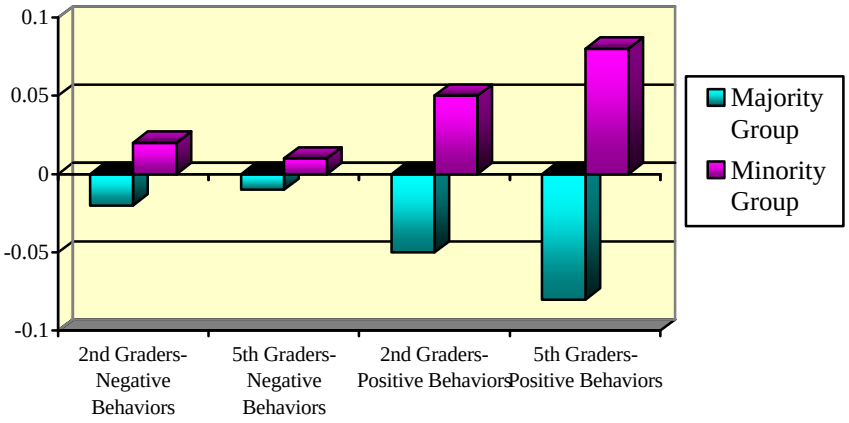
formed and their group membership predicted differences in evaluations of the two groups, and this effect did not differ by grade. A graphic representation of these findings is presented in Figure 9.

Results for Children Assigned to the Minority Group. Second-graders assigned to the Minority group formed significant illusory correlations between the minority group and positive behaviors on the attribution task, but fifth-graders did not. The trend among fifth-graders' attributions was an overattribution of both negative and positive behaviors to the minority group. Consistent with these findings, second-graders made more correct attributions of negative behaviors to the majority group and positive behaviors to the minority group, whereas fifth-graders made more correct attributions of negative behaviors to the minority group. However, on the frequency estimation task, second- and fifth-graders formed an illusory correlation between the minority group and negative behaviors. On their evaluations, both second- and fifth-graders evaluated the minority group more positively than the majority group, despite showing the opposite impression on the frequency estimation task. However, children's illusory correlations as well as their group membership predicted the difference in evaluation of the majority and minority groups. Thus, children's illusory correlations as well as their membership in the Minority group predicted their relative evaluations of the groups. A graphic representation of these findings is presented in Figure 10.

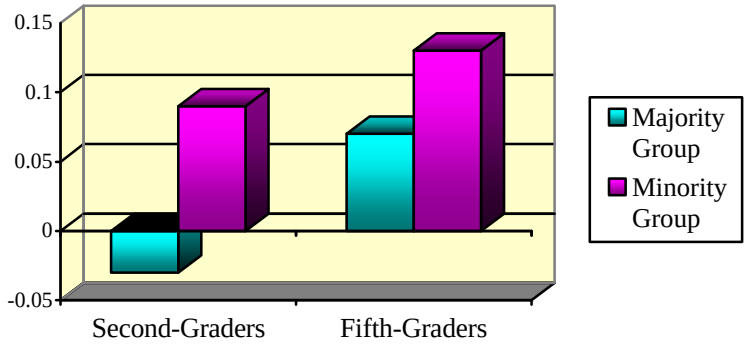
Figure 9

Summary of Findings for Majority Group Members

Attribution Task:
Deviation from Actual Proportions of Negative and Positive Behaviors



Frequency Estimation Task:
Deviation from Actual Proportion of Negative Behaviors



Group Evaluations

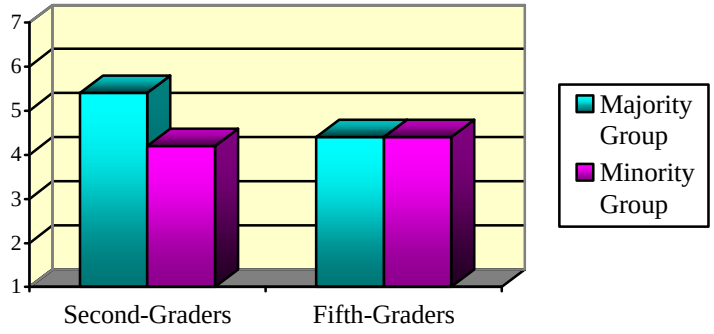
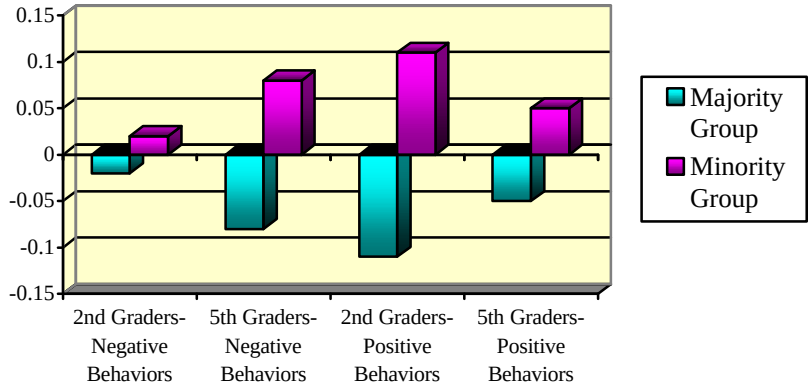


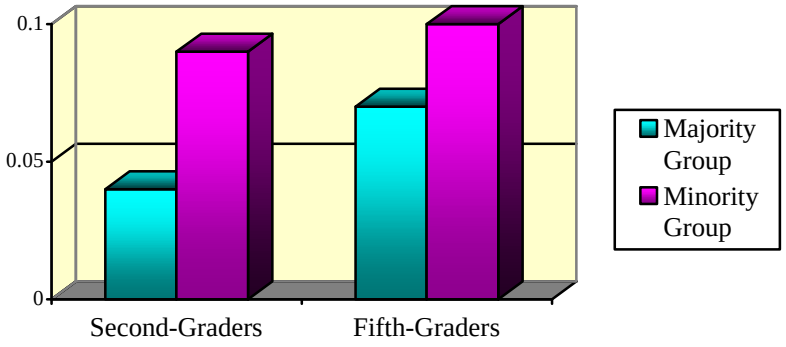
Figure 10

Summary of Findings for Minority Group Members

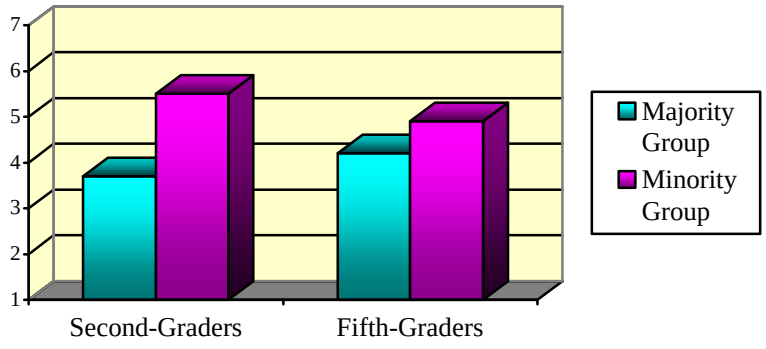
Attribution Task:
Deviation from Actual Proportion of Negative and Positive Behaviors



Frequency Estimation Task:
Deviation from Actual Proportion of Negative Behaviors



Group Evaluations



Discussion

Study 3 examined illusory correlation formation using gender groups. Thus, as in Study 2, children were members of one of the target groups, but unlike Study 2, the target groups were actual social categories rather than minimal groups. This situation was of both theoretical and practical importance not only because it employed real social groupings, but also because it represents a case in which children may have prior expectations about the positivity and negativity of the groups. Although this study measured impressions of the gender groups in a given situation, children's extensive knowledge of gender groups may introduce biases in perceptions of the experimental situation that are due to expectations about the groups' behavior. In addition, unlike Study 2 in which children's membership in a target group was made explicit, the experimenter did not mention the participants' gender, and children's own group membership therefore could have been less salient than in Study 2. However, the results suggest that children's own membership in a gender group was sufficiently salient to produce ingroup favoritism effects on the evaluations that were similar to those found in Study 2. Importantly, not making the perceivers' group membership salient may be more representative of most real social situations in which perceivers' group membership is made salient by the situation, rather than by a bystander mentioning the perceiver's social group.

The predictions for Study 3 were the same as those for Study 2, and in general, the results were similar. As in Study 2, children overestimated the frequency of negative behaviors in the minority group on the frequency estimation task, and tended to evaluate their own group more favorably than the outgroup. However, there were a few key differences, particularly on the attribution task. Second-graders assigned to the Majority group and fifth-graders assigned to the Minority group showed no significant illusory correlations on the attribution task, but fifth-graders assigned to the Majority group and second-graders assigned to the Minority group overattributed positive behaviors to the minority group, although negative behaviors were less frequent and should therefore have

been more salient. The overassociation of positive behaviors with the minority group in these cases appears to be due to increased salience of the positive behaviors in the minority group, which children's greater accuracy in making attributions for minority-positive behaviors suggests. The possibility that children had *a priori* expectations for the minority group to behave more positively is unlikely given that children overestimated negative behaviors in the minority group on the frequency estimation task. In addition, girls and boys each served as the majority and minority group for half the participants; thus, if children had expectations about one gender behaving better than the other, the counterbalancing of gender in the majority and minority groups should have diluted the effects of such an expectation.

There are three remaining explanations for why minority-positive behaviors were more salient. First, children could have had a prior expectation that the minority group would engage in more negative behaviors than the majority group, and may have been surprised by the minority-positive behaviors, thus making them more salient. However, findings from Study 1 call into question the validity of this explanation. Results from Study 1 suggested that negative behaviors were far more salient than positive behaviors, and that children did not have *a priori* notions that the minority group would behave more negatively. A second possible explanation is that children had expected that the gender groups would *not* differ significantly in the number of positive and negative behaviors performed by each. If this was the case, the overattribution of positive behaviors to minority group members might indicate a compensatory effect. That is, children may have tried to attribute closer to half of the positive behaviors to the minority group because they expected the behaviors to be distributed in this way. Thus, they may have perceived that the minority group engaged in more negative behaviors than the majority group, as shown by their frequency estimations, but they may have tried to compensate for this perception on the attribution task by attributing additional positive behaviors to the minority group. Finally, a third explanation is that this effect was due to idiosyncratic stereotypic beliefs that led children to attribute certain behaviors to one gender because they believed that gender group was more likely to perform that behavior.

However, the behaviors used in Study 3 were chosen such that no behavior was consistently rated as masculine or feminine by the children or adults who completed the preliminary behavior ratings. In addition, the behaviors assigned to the majority and minority group were counterbalanced across children, as were the assignments of girls and boys to majority and minority status. Thus, every effort was taken to avoid the systematic influence of gender stereotypes in Study 3.

On the frequency estimation task, children were clearly susceptible to the biasing influence of shared infrequency. Indeed, even Minority group members perceived an illusory correlation between the minority group and negative behaviors on the frequency estimation task. Among Minority group members, ingroup favoritism did not ameliorate this effect. Ingroup favoritism did appear to have influenced group evaluations, however. Minority group members evaluated their own group more positively than the outgroup, despite the opposite perception shown on the frequency estimations.

As in Studies 1 and 2, few age-related effects were found in the formation of illusory correlations. These effects were mostly confined to the attribution task, and were not consistent across ages and group membership status. However, predictions relating to age-related decreases in ingroup favoritism were also partially supported on the evaluations. Second-graders in the Majority group evaluated the ingroup more positively, but fifth-graders in the Majority group showed no differences in their evaluations of the groups. Thus, as expected, ingroup favoritism motives did not lead fifth-grade Majority group children to rate their own group more positively than the outgroup. Among Minority group members, however, there was no age-related decrease in ingroup favoritism. Rather, both second- and fifth-graders evaluated the ingroup more favorably, even though they had perceived an illusory correlation between their own group and negative behaviors, clearly demonstrating the power of ingroup favoritism motives.

Chapter 5

GENERAL DISCUSSION

The most clear-cut conclusion that can be drawn from these three studies is that children tend to form illusory correlations between minority groups and negative behaviors. Furthermore, the illusory correlations children formed, particularly those measured by the frequency estimations, were related to less positive evaluations of the minority group, suggesting that children were responding to the discrepancy in the perceived proportions of positive and negative behaviors in the target groups, and that their affective response to the target groups was based on their perceptions of the groups' behavior.

It appears that this tendency comes not from a general expectation that smaller groups will behave less desirably than larger groups, but to a susceptibility to the biasing effects of infrequency. When one type of behavior is less frequent than another, the less frequent class of behaviors becomes more salient. Likewise, when one social group has fewer members than another, the behaviors of any given member of the minority group are more salient than behaviors of majority group members. When less frequent behaviors are paired with minority group members, this group-behavior combination is especially salient, is remembered more accurately, and becomes overrepresented in children's memory of how the minority group behaved. Therefore, children overestimate

how often the minority group members perform infrequent behaviors, which may often be negative because most people's behavior probably consists of *mainly* positive or neutral acts. Thus, children may falsely associate negative behaviors with the minority group.

In all three studies, children who saw negative behaviors less frequently than positive behaviors formed illusory correlations between the minority group and negative behaviors. Although this effect was not always found on the attribution task, it was found consistently on the frequency estimation task. It did not matter whether children were ostensibly members of one of the target groups or not; they overestimated negative behaviors in the minority group, even if this meant that they reported more negative behaviors by their own social group.

Additional evidence that these illusory correlations are due to the shared infrequency of certain group-behavior associations, rather than preexisting expectations that minority groups will behave more negatively than majority groups, is offered by the findings from the Positive-Infrequent condition in Study 1. When positive behaviors were less frequent than negative behaviors, children overestimated the frequency of the positive behaviors in the minority group, and also evaluated the minority group more positively than the majority group. These findings suggest that it is the frequency of the information, not just the valence of the behaviors, that influences illusory correlations and resulting evaluations. However, it is important to note that there was also evidence that negative behaviors performed by the minority group were also particularly salient in the Positive-Infrequent condition. Thus, illusory correlations between minority groups and negative behaviors are probably more likely than between minority groups and positive behaviors, even if the minority group's observed positive behaviors are relatively infrequent.

The Relative Influence of Distinctiveness and Ingroup Favoritism

The biasing effects of distinctive information and ingroup favoritism appear to affect cognitive and affective measures differently. The distinctiveness of minority-infrequent information, especially negative behaviors by the minority group, affected children's perceptions of the relative frequency of certain behaviors in each of the target groups. That is, distinctiveness influenced children's perceptions of how good or bad each group's behavior was. However, ingroup favoritism had its most powerful effect on group evaluations, which measure an affective component of children's perceptions. Although children's illusory correlations predicted their relative evaluations of the target groups, children's group membership was also a strong predictor. Each variable made an independent contribution to the regression equation, suggesting that children's evaluations were not based entirely on their perceived group-behavior associations, but were also influenced by the motivation to rate the ingroup favorably.

The different avenues of influence of cognitive versus motivational biases are most evident in the perceptions of children assigned to the minority groups. These children perceived their own group to have engaged in proportionally more negative behaviors than the outgroup; nevertheless, they evaluated their own group more positively than the outgroup on such dimensions as goodness, niceness, friendliness, and wanting to play with the target children. Clearly this is a bias owing to a desire to perceive the ingroup more favorably than the outgroup. Thus, on the evaluation measure, motivational forces were able to outweigh the cognitive bias that had caused an association of the ingroup with negative behaviors, resulting in a more positive rating of the ingroup. However, ingroup favoritism was not able to outweigh the cognitive bias on the illusory correlation measures, and minority group members believed the behavior of their own group to have been more negative than the behavior of the majority group.

Age Differences in Illusory Correlation Formation

Age Differences in Cognitive Bias. Although age differences were found on the attribution measure in some conditions across the studies, there were no consistent age differences on this measure. Illusory correlations measured by frequency estimations were very consistent across ages in each of three studies. In every condition, second- and fifth-graders formed similar illusory correlations. The finding that second-graders formed illusory correlations indicates that this tendency develops rather early. The finding that fifth-graders formed similar illusory correlations shows that it is not a tendency that wanes with age. Indeed, previous studies have found consistent evidence of both cognitive and motivational biases that lead to illusory correlations in adults.

The sentence memory subscale from the Stanford-Binet Intelligence Scales showed improvement with age. Scores on this measure also mediated age differences in illusory correlations in Study 1, and removed some variance in responses on other measures in Study 2 so that differences in perceptions of the target groups became statistically significant. However, illusory correlations are apparently not due entirely to differences in the ability to remember the information in these studies. Rather, they appear to be due to a bias in the perception of infrequent information that makes this information become overrepresented in memory. Furthermore, this bias does not appear to have changed substantially from second- to fifth-grade, or indeed by adulthood. This bias is perhaps more related to frequency perception than to memory, per se. Frequency perception appears to be governed by an automatic encoding process, which Hasher and Zacks (1984) argued is innate (Antell & Keating, 1983; Starkey & Cooper, 1980) and undergoes no developmental change (Hasher & Zacks, 1979).

Despite other developmental changes that occur between second- and fifth-grade, such as improvements in memory (e.g., Bjorkland & Muir, 1988; Brainerd, 1981; Chi & Ceci, 1987; Ornstein et al., 1975; Ruff & Lawson, 1990; Stodolsky, 1974; Strutt et al., 1975), base-rate estimation (Jacobs et al., 1995; Jacobs & Potenza, 1991), and judgment of covariation (e.g., Shaklee & Mimms, 1981; Shaklee & Paszek, 1985), there was no

substantial age-related change in susceptibility to illusory correlations between the second- and fifth-grades. The lack of age differences suggests that the perceptual bias underlying illusory correlations is at least a very early developing bias. Given that the ability to perceive frequency is arguably innate (Hasher & Zacks, 1984), the bias towards paying more attention to infrequent information may also be innate. However, an innate tendency or early developing bias does not preclude any developmental change. Other cognitive abilities certain play a role in social perception, and must also play a role in the processes involved in illusory correlation formation. It is possible that the age range tested was not large enough to show consistent age differences. Perhaps more dramatic age differences would appear if other age groups were tested, for example, infants and toddlers using modified methodologies. If the bias leading to illusory correlations is indeed innate, however, the overall trend of illusory correlation formation might remain similar at all testable ages. If the tendency to overassociate infrequent stimuli with a smaller group is present at all ages, then children should not show dramatic variation in the tendency to associate negative behaviors with minority groups. Any observed differences might be specific to certain measures requiring other types of abilities, rather than to large changes in the cognitive bias leading to illusory correlation.

Support for an overall trend in illusory correlation formation while specific age-related changes are observed can be found in a recent study on illusory correlation formation in young adults and older adults (Mutter, 1999). This study found nearly identical patterns of frequency estimation in older and younger adults, but slightly different patterns of attributions among younger and older adults on the attribution task. These age differences appeared to be due to differences in information processing strategies, which were probably related to memory decreases in older adults. However, the findings indicated that older adults were not more or less susceptible to illusory correlations than younger adults, although the cognitive accessibility of specific group-behavior associations declined with age.

Age Differences in Ingroup Favoritism Effects. Although ingroup favoritism has been shown to decrease sharply by about 10 years of age, fifth-graders in this study

tended to show as much ingroup favoritism as second-graders in their group perceptions. The most apparent case of a decrease in ingroup favoritism among fifth-graders was in Study 3, in which Majority group members did not evaluate the ingroup more favorably than the outgroup, whereas Majority group second-graders did. Another case in which ingroup favoritism may have influenced perceptions is in Minority group fifth-graders' frequency estimations in Study 2. These children did not estimate more negative behaviors in the minority group, whereas second-graders in the Minority group, as well as second- and fifth-graders in the Majority group did overestimate minority group-negative behaviors. This instance could suggest an effect of *increased* ingroup favoritism among Minority group fifth-graders, which could have led them to estimate fewer negative behaviors in their own group, or proportionally more negative behaviors in the majority group. However, this finding is far from unequivocal because this result could have been due to better memory or attention to the stimuli, or better base-rate or covariation judgment, which simply made this group of children more accurate at perceiving the equality of the two groups.

The findings relating to ingroup favoritism suggest that there was certainly no decrease in ingroup favoritism among fifth-graders assigned to the Minority groups. The only decrease in ingroup favoritism effects was found in fifth-graders assigned to a Majority group. These findings are particularly interesting when considered in light of adult studies on the self-esteem buffering effects of social identity for minority group members. Research has shown that minority group members can protect themselves from the negative psychological effects of experiencing prejudice by increasing their identification with their minority social group (Branscombe, Schmitt, & Harvey, 1999; Ruggiero & Major, 1998; Ruggiero & Marx, 1999; Ruggiero & Taylor, 1995; 1997). When identification with a social group increases, the individual's attitude towards the group is likely to become somewhat more favorable as well (Branscombe & Ellemers, 1998). Furthermore, when social identity is threatened, for instance, by negative attitudes about one's group from outgroup members, group members tend to respond by increasing attempts to positively differentiate the ingroup from the outgroup (Brown, 1995). Thus,

members of the threatened group may show increased ingroup favoritism when group members perceive that others see the group as inferior. A similar effect might have taken place with children assigned to Minority groups in the present research. Minority group children might have responded to their perceived association between their group and negative behavior by increasing their ingroup favoritism. Although ingroup favoritism did not affect their perceptions of the number of negative behaviors performed by each group, it did affect their group evaluations. The fact that fifth-graders in the Minority group did not show a decrease in ingroup favoritism effects on the evaluations in either Study 2 or Study 3, while fifth-graders in the Majority group did show a decrease in Study 3, may suggest a compensatory effect of ingroup favoritism motivated by a need to protect collective self-esteem among Minority group members. This question is certainly worthy of further research to determine whether children do react to minority group status by employing such strategies as negotiating their social identity.

Comparison of Illusory Correlations in Children and Adults. It is important to note that the findings from the current research on the effects of self-relevance of the group-behavior associations on illusory correlations are not consistent with those of adult studies. Schaller and Maass (1989) found that being a member of one of the target groups affected both attributions and frequency estimations. On frequency estimation tasks, adults estimated the ingroup to have performed proportionally more positive behaviors than the outgroup, even when they were assigned to the minority group, demonstrating a biasing effect in ingroup favoritism. In contrast, they attributed more negative behaviors to the ingroup on the attribution task, and also recalled more ingroup-behavior behaviors on a free recall measure, presumably because reconciling the ingroup-negative behaviors with their positive expectations for the ingroup required more effortful processing of this information, making it more available in memory. However, adult illusory correlations in situations in which participants are ostensibly members of one of the target groups are due partly to on-line processing of the group-behavior associations, rather than memory-based judgments made when completing the illusory correlation tasks (Schaller & Maass, 1989). That is, adults' impression formation appears

to begin early in the presentation of the group-behavior information, and is continuously updated as new information is presented. This kind of processing leads to a perceived association between the groups and *more frequent* information, whereas memory-based judgments lead to a perceived association between the *smaller group* and *infrequent* information. Thus, ingroup favoritism motivates adults to view the ingroup more positively before presentation of the group-behavior associations, and on-line processing of the information allows adults to confirm their notions that the ingroup did indeed perform many positive behaviors.

Children's illusory correlations showed a somewhat different pattern than adults' illusory correlations when the children were assigned to one of the target groups. Both Majority and Minority group children's illusory correlation between the minority group and negative behaviors suggests that children in the current studies did not engage in on-line processing while attending to the group-behavior associations. This may be an important developmental change that emerges in children older than the fifth-graders in these studies. On-line processing necessarily requires more working memory than memory-based judgments. When memory-based processing is used in illusory correlation studies, during the presentation of the group-behavior associations, the group-behavior information must receive only enough processing to go into long-term memory store to be made available for later recall. When asked to make judgments about the target groups, the information can be accessed from long-term store, and group impressions can then be made. In on-line processing of such information, the group-behavior associations must be held in working or short term memory in order to compare new information with the information presented previously. In addition, comparisons of the relative proportion of positive and negative behaviors in each group must be made as the new information is received. Such processing demands may be beyond the capability of second- and fifth-graders.

However, on-line versus memory-based judgments have not been examined in children, and it is unknown what the age-related limitations and developmental course of on-line processing are. In Mutter's (1999) study on illusory correlations in young and

older adults, participants were expected to use on-line processing in their perception of the group-behavior associations. She found that young adults' memory and judgment data suggested that they used on-line processing in their group perceptions, but older adults used a mix of on-line and memory-based processing. Perhaps the memory requirements of on-line processing were too considerable for older adults to be able to use a primarily on-line processing strategy, and they therefore relied partially on memory-based processing to make judgments.

If memory decrements in older adults can impede the use of on-line processing in illusory correlation tasks, then perhaps children's less developed memories also impede on-line processing. Thus, on-line processing of group-behavior information may be one important developmental achievement that leads to later age-related changes in illusory correlations. The development of on-line processing strategies in children could actually improve minority group members' ingroup perceptions, because employing on-line processing results in illusory correlations between the minority group and positive behaviors among minority group perceivers.

Limitations of the Current Studies

Perhaps the greatest limitation of these studies was due to the attribution task adapted from the adult literature. Because this task is particularly sensitive to slight variations in memory for the specific group-behavior associations, it may be less appropriate for use with children than the frequency estimation and evaluation tasks, which measure more general group impressions. The unexpected results on the attribution tasks may have occurred because children cannot be expected to show the same consistency of attention and recognition as adults. Whereas adults make mistakes in their attributions, they tend to make very consistent mistakes of overattribution of the infrequent behaviors to the minority group. Children in these studies, on the other hand, showed inconsistency in their patterns of attributions across conditions and across studies. Furthermore, because children's "guesses" about which group performed each

behavior were assessed, it is difficult to determine from these data whether children's unexpected attributional patterns resulted from salience of group-behavior associations other than those hypothesized to be most salient, prior expectations about the types of behaviors each group would perform, particularly where the behaviors were self-relevant, or simply to memory decrements across all types of group-behavior associations. Although children's attributions in these studies were quite accurate, with proportions of correct attributions falling between 70% and 95%, it is not clear what proportion of these were actually correctly remembered and what proportion were simply good guesses. Thus, certain group-behavior associations could appear to have been highly salient due to high rates of correct attributions, but they could represent luck in making attributions rather than real memory due to the salience of the stimuli.

Perhaps a better of method of determining whether illusory correlations result from increased salience of minority-infrequent behavior, and whether minority-infrequent behaviors are more likely to be highly salient when the infrequent behaviors are negative than when they are positive would be to assess the group-behavior associations that children *think* they remember correctly. In essence, this amounts to measuring children's free recall of the information, as more salient information should be better remembered on free recall tasks. However, this type of assessment can be modified to ease the demands on children's memory. For example, the experimenter might show each child the photographs depicting the target behaviors, place the pictures of a majority and minority group member on either side of the photograph to facilitate recognition, and ask whether the child is sure she remembers the association or is only guessing.

Another major limitation to these studies is that in Studies 2 and 3, cognitive and motivational biases could, and indeed were expected to exert simultaneous influence on children's judgments. It is therefore difficult to determine unequivocally the extent to which each type of bias affected judgments. To be able to parse out the effects of each, only one type of bias can be possible when making judgments. However, because illusory correlations have been traditionally viewed as primarily due to a specific cognitive bias, illusory correlation studies have usually compared frequent and infrequent

behaviors in majority and minority groups. Testing only the effects of ingroup favoritism on illusory correlations would require removing the possibility of a cognitive bias due to group size and stimuli frequency, but such a methodology would amount to essentially a study of ingroup favoritism rather than a study of self-relevant illusory correlations. However, a careful comparison of illusory correlations where children are not members of the target groups, where participants are members of the target groups, and assessment of ingroup favoritism effects when cognitive biases are removed, using the same behaviors across these conditions to eliminate any effects that particular behaviors might have on salience of group-behavior associations or on group-level judgments, might provide more insight into just how these cognitive and motivational biases influence illusory correlations, and why illusory correlations may be different among children assigned to a Majority group versus a Minority group.

A third possible constraint on the interpretation of the results is that the same number of targets were used for second- and fifth-graders. If the 18 group-behavior associations were easy for fifth-graders to remember, this might explain the lack of significant phi coefficients among fifth-graders in several conditions across the three studies. However, the number of targets was sufficient to produce illusory correlations in fifth-graders on the frequency estimation tasks. Primi and Agnoli (1998) used only 21 targets in their illusory correlation studies, and found memory barely above chance for children in the same age groups; thus, it is difficult to predict the most appropriate number of targets. In addition, children in the current studies showed slightly better memory for the group-behavior associations in the studies in which they were assigned membership in a target group than in Study 1. Because children participated in all three studies and the studies were conducted in the same order to avoid certain spill-over effects, it is impossible to determine from these data whether children's attributions were more correct in Studies 2 and 3 because the information was self-relevant, or because of practice effects.

The materials used in these studies could have caused some of the inconsistencies in the findings. Any aspect of the materials or methodology could have influenced

results in an undesirable way, including the colors chosen for the groups, the use of minimal groups or gender groups as targets, the order, speed, or method of presenting the group-behavior associations, or the way in which participants were assigned group membership. Perhaps the most questionable materials were the target behaviors, the pictures of target children, and the types of target groups employed. Although the behaviors were pilot tested to test for consistency of their valence and extremity, some behaviors may nonetheless have been better suited to the experimental manipulation than others. In particular, certain behaviors may have stood out more than others, increasing their salience independent of the frequency and group association manipulations, and thus causing unexpected variations in children's memory for those group-behavior associations.

The use of minimal groups has been shown to be effective in many studies with children, particularly in studies of ingroup favoritism (Brown, 1994). Nevertheless, children's group-level judgments on illusory correlation tasks may be different for minimal groups and real social groups. This possibility was examined by using gender groups in Study 3, but gender groups could be a unique example of majority and minority groups because they are equal in the general population, and Study 3 relied on the inequality of gender groups in a given situation. Without a comparison to other real social groups, it is impossible to know whether illusory correlations in perceptions of other groups, for examples, Blacks and Whites, would be similar to those obtained for gender groups or minimal groups.

Likewise, the stimuli representing target children in these studies were simple line drawings, and the same drawing represented all the children in each group. There is some possibility that children would respond differently to more realistic drawings, or even to videotaped children or photographed children with their faces and bodies shown, or to target groups consisting of distinct children rather than the same stimulus representing each child.

Finally, the experimental design and stimuli used in these studies were not ecologically valid. Like most experiments, they have the advantage of controlling for

many unwanted variables and presenting a situation in which the presence of particular biases can be assessed, but they do not closely resemble a real world social situation. Until illusory correlations are tested using more realistic stimuli and more realistic social situations, the generalizability of these findings can only be speculated. However, these studies are among the first research on illusory correlation in children, and this first step to understanding whether children form illusory correlations under carefully controlled circumstanced needed to be taken.

Practical Implications

Perhaps the most important implication of children's illusory correlations is that these perceptions may lead to negative stereotypes about and prejudice towards minorities. Stereotypes are stable cognitive representations of behaviors and characteristics that are perceived to be associated with one group, and prejudice is an affective attitude towards a group, which is likely to be based on the stereotypes. The illusory correlations measured in these studies assessed only a momentary perceptual and affective response to a specific set of stimuli. While it is likely that these perceptions *could* lead to stable stereotypes, the possibility has not been tested.

Stereotypes formed from illusory correlations may not have the "grain of truth" that some stereotypes have. Thus, they could be rooted in a totally false perceptual basis. Not only would the generalization of the stereotypes to individual group members be incorrect and unfair, but also the belief that the group in general is more likely to engage in certain behaviors could be unfounded. Unfortunately, the possibilities for illusory correlations between minority groups and negative behaviors are pervasive. Minorities are often portrayed negatively on television and in movies (Graves, 1993; Huston et al., 1992), and even real examples of minority group members' negative behavior may lead to false stereotypes due to illusory correlations. For example, a non-Black child watching a newscast in which a photograph of an Black man is shown while this man's recent violent behavior is reported may perceive an association between Blacks and violence.

The relative infrequency with which the child witnesses the behavior of Blacks, combined with the salience of the negative behavior, may make this association more salient than cases in which the child has witnessed Blacks behaving positively, which are likely to be more numerous. The association between the Black man and violent behavior could become a cognitive representation of Blacks, or Black men, in general, and this stereotype could then lead to prejudice towards Blacks, and aversion to and discrimination against Blacks as a group. In contrast, consider the example of a White child who watches a similar newscast featuring a story about a White man who committed the same violent act. Because the White child's experience with other Whites is likely to be so vast, an illusory correlation between Whites and violent behavior is unlikely.

Another important implication of children's tendency to form illusory correlations is that minority group members may also be likely to develop negative impressions of their own social groups, simply because the negative behaviors of the smaller group are so salient. What does forming negative stereotypes about one's own group, but having more favorable evaluations the group mean for overall group and self-impressions? Can these contradictory perceptions be reconciled so as to preserve a positive group attitude? It is possible that over time, if negative stereotypes about one's own minority social group persist, evaluations of the ingroup may also become less favorable than evaluations of the majority group. Again, the more positive ingroup evaluations in the current research are only based on a small time frame. It is unclear what the long-term implications of illusory correlations are on stereotypes and attitudes towards the target groups.

The apparent inevitability of illusory correlations may paint a bleak picture for the status of minority group members. If their negative behaviors are likely to be highly salient simply because they make up a smaller proportion of the population, either in general or in a given setting, then how are negative stereotypes about minority groups ever going to be decreased and attitudes towards minorities improved? Findings from illusory correlation studies suggest that there is a simple cognitive bias that is likely to

facilitate the formation of negative stereotypes about minorities. This same bias may possibly be used to promote attention to the positive behaviors and achievements of minority group members. Infrequency seems to be an automatic road to saliency, but behaviors can be made salient by many other means as well. Parents and teachers are in a particularly good position to point out positive acts and the many accomplishments of minorities to children, thus making the minority group members' positive characteristics highly noticeable, and hopefully facilitating the formation of positive minority group stereotypes. Study 1 suggested that infrequency alone might not increase the salience of minority-positive behaviors above the level of salience of minority-negative behaviors. In addition, few minority group members engage in *mostly* negative behaviors. The majority of any individual's behaviors are likely to be positive; thus, the infrequency of negative behaviors, combined with their ability to attract more attention, make them far more salient than positive behaviors. However, focusing children's attention on positive behaviors by explicitly making note of them should dramatically increase the availability of these events in children's memory, and may help change children's impressions of minority groups for the better.

There are numerous everyday situations in which this could be accomplished. For example, a teacher with a class with only a few minority students, but many majority group students, could make a special effort to praise the minority students for their good work, achievements, honors, and good behavior. Likewise, because the minority group children's behaviors will stand out simply because of the smaller number of minority students in the class, the teacher could avoid public reprimands and publicly calling attention to negative behaviors and poor school achievement. Instead, he or she may choose to discuss such problems in private with the minority students. Although such a discrepancy in behavior towards minority and majority group children may seem unfair, the benefits to the minority students in the class, and possibly to other members of those minority groups, may be substantial.

Increasing the salience of positive behaviors can occur at institutional levels and through the media as well. Multicultural appreciation programs can increase positive

stereotypes about minority groups, but these programs need to be employed continuously. Public service announcements may also expose children to repeated examples and reminders that minority group members do behave positively, or even extraordinarily, and have made many outstanding accomplishments. School and television programs featuring topics such as Black history, women scientists, or Hispanic political figures could improve children's appreciation of the accomplishments of minorities in areas in which they have historically been seen negatively or are underrepresented. Finally, television shows such as Sesame Street that feature positive relations between majority and minority group members need to call more attention to those relationships by explicitly discussing racial and cultural issues, leaving no ambiguity as to the message they mean to transmit.

One way to decrease illusory correlations may be to increase contact among majority and minority group members. In addition, ingroup favoritism can be used to facilitate positive relations among majority and minority group members by creating new social groups, especially competitive groups, that include members of various naturally occurring majority and minority social groups. For instance, ensuring that little league sports teams are racially integrated would create a new social grouping within each team, both increasing interracial contact and increasing positive feelings towards the fellow group members. Adding a competitive component to these new social groups by having the teams compete competitively would likely encourage even more favorable attitudes, cooperation, and friendship among ingroup members. Thus, by creating dynamic social groups in which children of different naturally occurring social groups (e.g., different races, ethnicities, religions, socio-economic status, or genders) must work together towards a common goal, the positive attitudes that are formed about specific group members might generalize to other members of the natural social groups.

Future Research Directions

Many other questions about the effects of minority group status on illusory correlations in children are raised by the current research. It will be important to replicate and extend this work to children of other ages, and to perceptions of other real social groups. Children's ability to form similar illusory correlations in more ecologically valid situations, i.e., when viewing majority and minority group children's behavior in a natural setting, should be examined, as well as the potential for illusory correlations to become stable representation of the target groups.

Perhaps the most interesting questions relate to illusory correlation formation among minority group children. The long-term consequences of minority group children's tendency to perceive illusory correlations between their own group and negative behaviors on their ingroup perceptions, attitudes, self-concept, and self-esteem should be investigated. In addition, the different social experiences of majority and minority group children may greatly influence whether minority group children form illusory correlations about their own groups in real situations. The fact that minority group members tend to have more contact with other members of the same minority group than majority group members is likely to affect whether minority group children form the same illusory correlations as majority group children would when real social groups are involved. If minority group children have more contact with other minority group members, they may, hopefully, be less influenced by the shared infrequency of minority group-negative behaviors because the more examples of minority group behavior they have, the less salient any one minority group member's behavior should be. However, if minority group children's contact with other minority group members is primarily within their own families, but school settings involve contact with mostly majority group members, minority group children may still be likely to form illusory correlations between the minority group and negative school-related behaviors, which could lead to specific academic problems such as academic de-identification.

In sum, children's tendency to form illusory correlations is a potentially rich topic of study from both a theoretical standpoint, and a practical standpoint. From a theoretical perspective, the study of children's illusory correlations provides an opportunity to examine the innateness or developmental changes in perceptual biases, and to relate these biases to social perception, other developing cognitive and social abilities, and developmental changes in self-enhancement motivations. In addition, it provides a potential explanation for the early development of certain stereotypes. Finally, understanding how the cognitive and motivational biases involved in illusory correlation formation work could aid in stereotype and prejudice reduction by helping parents and educators to use children's biases in social perception to their own advantage, thus increasing the success of programs aimed at reducing stereotyping and promoting positive intergroup relations.

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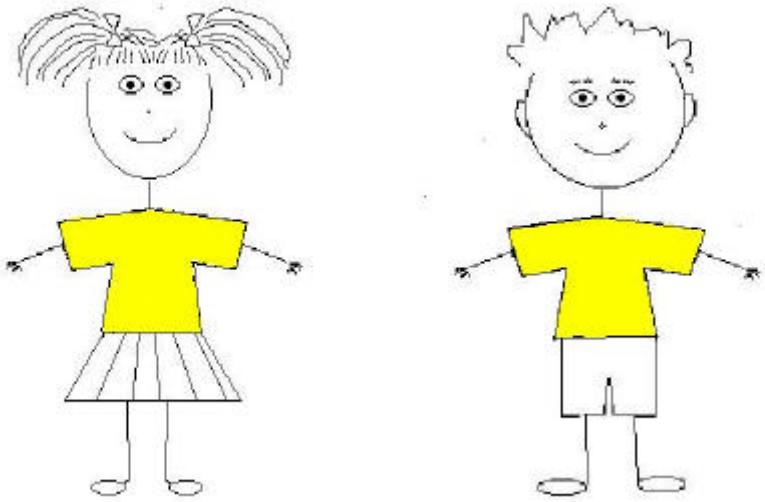
Appendix A

Target Children Used in Group-Behavior Assignments and Attribution Task



Appendix B

Lists of Behaviors Assigned to Target Groups

Set A: Study 1 Negative-Infrequent Condition, and Study 2

Positive Behaviors	*Negative Behaviors*
1. volunteered to help the teacher erase the chalkboard	1. makes bad grades in school
2. likes to help put away classroom supplies	2. steals pencils from other children
3. offered to help vacuum the house	3. doesn't share her/his toys with other people
4. reads a lot	4. breaks other people's things on purpose
5. likes to help shovel snow in the winter	5. puts her/his fingers in her/his nose
6. never forgets to feed the cat	6. erases notes the teacher wrote about her/his bad behavior
7. offers to help other children with their homework	
8. always shares her/his school supplies	
9. offers to help sweep the house	
10. offers to help carry in groceries from the car	
11. always pets her/his dog nicely	
12. always keeps her/his room clean	

Set B: Study 1 Negative-Infrequent Condition, and Study 2

Positive Behaviors	*Negative Behaviors*
1. always does her/his homework on time	1. cheats at games
2. eats neatly at the table	2. knocks other people's papers off their desks on purpose
3. likes to help other children clean up messes	3. usually doesn't finish her/his homework on time
4. makes good grades in school	4. eats cookies when her/his parents said not to
5. usually writes without mistakes on her/his schoolwork	5. doesn't clean up her/his toys at home
6. helps other children carry heavy books	6. throws rocks at windows
7. sets the table without being asked	
8. likes to help mow the lawn	
9. clears the dishes from the table after dinner without being asked	
10. never forgets to walk the dog	
11. likes to share her/his toys	
12. offered to help wash the dishes	

Set C: Study 1 Positive-Infrequent Condition

Negative Behaviors

1. won't help other children clean up toys after playing
2. makes bad grades in school
3. trips other children on the playground
4. steals pencils from other children
5. won't help shovel snow in the winter
6. doesn't share her/his toys with other people
7. breaks other people's things on purpose
8. doesn't help sweep the floor when her/his parents asked her/him to
9. puts her/his fingers in her/his nose
10. copies other children's homework
11. makes a mess when eating at the table
12. erases notes the teacher wrote about her/his bad behavior

Positive Behaviors

1. volunteered to help the teacher erase the chalkboard
2. likes to help put away classroom supplies
3. never forgets to feed the cat
4. always shares her/his school supplies
5. always pets her/his dog nicely
6. always keeps her/his room clean

Set D: Study 3 Behaviors

Positive Behaviors

1. volunteered to help put away supplies when the class was finished working
2. shared his/her markers with other children
3. finished his/her part of the project on time
4. made a good grade on his/her part of the project
5. volunteered to help clean up a mess after working on the project
6. found lots of good pictures to use in the project
7. offered to help another child who was having trouble
8. always brought extra supplies in case anyone ran out
9. helped someone pick up crayons that had fallen all over the floor
10. lent his/her scissors to someone whose scissors were broken
11. offered to help another child carry heavy supplies
12. wrote everything correctly on his/her part of the project

Negative Behaviors

1. took another child’s construction paper without asking
2. turned in his/her part of the project late
3. glued things badly so they fell off the poster
4. broke other people’s crayons on purpose
5. wrote messily when the teacher said to write neatly
6. copied somebody else’s work

Appendix C

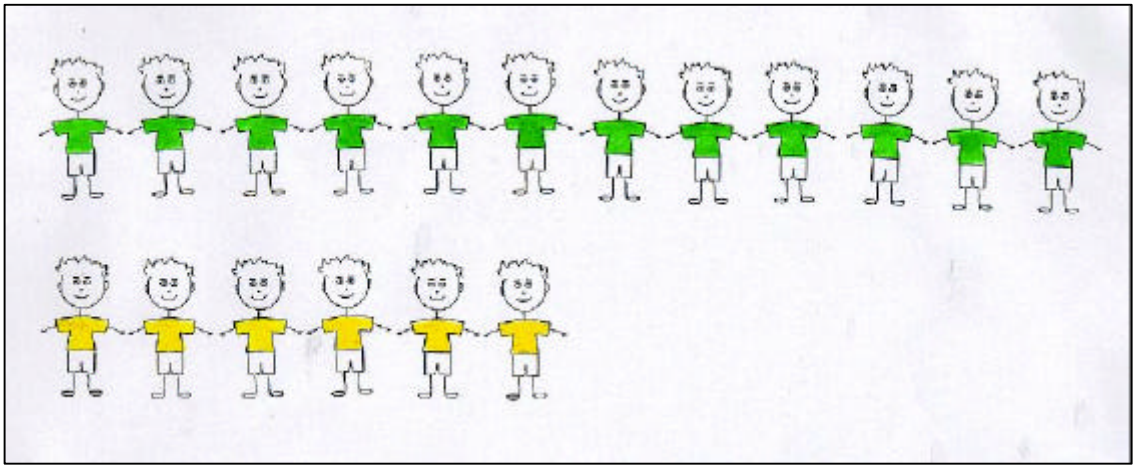
Examples of Photographs Used for Group-Behavior Assignments

"always pets her/his dog nicely"

"breaks other people's things on purpose"

Appendix D

Example Graphic for Frequency Estimation Task



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AWARDS AND HONORS

1999 Grant-in-Aid, APA Division 9, Society for the Psychological Study of Social Issues
1999 First Place, Penn State Graduate Research Exhibition
1998 Dissertation Support Grant, Penn State Research and Graduate Studies
1998 Honorable Mention, Penn State Graduate Research Exhibition
1995 Thesis Support Grant, Department of Psychology
1994 Phi Beta Kappa National Honor Society

PUBLICATIONS AND MANUSCRIPTS IN PREPARATION

Johnston, K.E., Madole, K.L., Bittinger, K., & Smith, A. (2000). *Developmental changes in infants' and toddlers' attention to gender categories*. Accepted pending revisions, *Merrill-Palmer Quarterly*.

Johnston, K.E. (1999). Influences on preschoolers' toy choices for the self and others. Manuscript under revision.

Johnston, K.E., Swim, J.K., & Stangor, C. (1999). *The effects of enhancing gender identity on the perception of gender discrimination against the self*. Manuscript in preparation.

SELECTED CONFERENCE PRESENTATIONS

Johnston, K.E. (2000, June). *Children's illusory correlations: Cognitive and motivational biases*. Paper presented at the Meeting of the Society for the Psychological Study of Social Issues, Minneapolis, Minn.

Johnston, K.E. (2000, June). *Effects of gender identity on perception of personal gender identity*. Poster presented at the Meeting of the Society for the Psychological Study of Social Issues, Minneapolis, Minn.

Madole, K.L., & Johnston, K.E. (1999, October). *Infants' attention to appearance-function correlations: The role of color, shape, and labels*. Poster presented at the Meeting of the Cognitive Development Society, Raleigh, N.C.

Johnston, K.E. (1997, April). *Influences on preschoolers' novel toy preferences for the self and others*. Poster presented at the Biennial Meeting of the Society for Research in Child Development, Washington, D.C.

Johnston, K.E., & Madole, K.L. (1997, April). *Fourteen- and eighteen-month-olds' attention to gender categories*. Poster presented at the Biennial Meeting of the Society for Research in Child Development, Washington, D.C.