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Broadening the Conditions for Illusory Correlation Formation: Implications for Judging Minority Groups

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Perceivers tend to overestimate the relative degree of association between an infrequent or distinctive category of behavior and a minority group or target, an illusory correlation effect with implications for numerous social processes including stereotyping and product perception. We argue that such illusory correlations can form under a broader set of conditions than has been previously shown. Experiments 1 and 2 demonstrated that illusory correlations can emerge even when no distinctive behaviors are presented (i.e., in the absence of co-occurrences of infrequent events). Experiments 2 and 3 showed that perceivers are more likely to form strong illusory correlations when the difference in the amount of information describing majority versus minority groups is large rather than small. These findings support a process account suggesting that illusory correlations can form merely as a result of differences in the amount of information acquired about targets; minority group targets are assumed to have more moderate characteristics than majority group targets because of the relatively limited minority group evidence that is available. We discuss implications regarding stereotyping and intergroup relations as well as perceptions of consumer brands in the marketplace.

People often make judgments about the predictive relations between social characteristics. Indeed, the perception of covariation among characteristics of the social environment (e.g., between ethnicity and behavioral tendencies) is important in a variety of social processes. Unfortunately, as numerous studies have demonstrated, covariation estimation is a difficult task and people commonly form *illusory correlations,* or overestimations of the relation between two characteristics or events (e.g., Chapman & Chapman, 1967; Pryor, 1986; Schaller & Maass, 1989; Shaklee & Mims, 1982; Stroessner, Hamilton, & Mackie, 1992).

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Past studies (e.g., Chapman, 1967; Hamilton & Gifford, 1976) have demonstrated that perceivers are particularly prone to forming a *distinctiveness-based illusory correlation,* or an overestimation of the relative degree of association between an infrequent category of behavior and a minority group. Hamilton and Gifford demonstrated the tendency to form such illusory correlations. Participants in their study read a series of sentences, each of which described a behavior by a member of one of two groups (Group A or Group B), and most of which were either desirable or undesirable. More statements described members of Group A than Group B (i.e., Group B was, by definition, the minority group), but the proportion of favorable to unfavorable statements was the same. Thus, there was no relation between group membership and the favorability of behaviors. Nevertheless, participants evidenced a distinctiveness-based illu-

sory correlation, in that they overestimated the relative degree of co-occurrence between membership in the distinctive group (Group B) and the distinctive (infrequent) category of behavior.[1]

The primary goal of this research was to examine under what conditions such illusory correlations form. At this point, it is important to define the term illusory correlation more clearly. Although one could conceptualize illusory correlations in an absolute sense (i.e., in terms of the accuracy of perceptions in comparison to the information presented), work in social psychology has tended to focus instead on relative perceptions. Research in the area has examined the perceived relative degree of association between two or more targets (e.g., groups) and an attribute (e.g., favorability), where the actual degree of association is equivalent for each target. Thus, an illusory correlation involves the misperception that one target is more associated with a given attribute than is another target. The accuracy of the perceptions are irrelevant to this definition; for any target, the association with the attribute may be overestimated, underestimated, or estimated accurately. It is the perceived relative degree of association that constitutes an illusory correlation (Sanbonmatsu, Shavitt, Sherman, & Roskos-Ewoldsen, 1987).

Note that nothing in the definition of illusory correlation requires the presence of distinctive information in the array of information presented. (Mis)perceptions of covariation can form even if the attribute information does not vary (e.g., all of it indicates possession of the attribute). In this context, an illusory correlation would be the misperception that one target is more strongly associated with that attribute than another is.

We predicted that illusory correlations will form under the following conditions:

1. Even when no distinctive or infrequent information about the target groups is presented. For example, we predicted that, when majority and minority groups are described only by positive information, participants will still perceive the majority group more favorably than the minority group.
2. When there is a large difference in the amount of information describing the majority versus the minority group. We predicted that the greater the disparity in information provided about target groups, the greater the likelihood of illusory correlation formation.

Such findings would have significant implications for stereotyping and intergroup relations, for they would suggest that unflattering perceptions of minority groups can emerge in the absence of any unfavorable information. They would also have implications in many other domains in which perceivers receive less information about some exemplars than others. For instance, in the arena of consumer products, brands that are market leaders typically receive more advertising than do other brands (e.g., store or generic brands), allowing consumers to acquire relatively more information about market leaders. This suggests that, even when competing brands are objectively equal in desirability, market leaders will be perceived more favorably than other brands because of the larger amount of information provided about them.

Later, we offer a process account supporting these predictions and focusing on group perceptions. In demonstrating the role of the hypothesized process, our results show that illusory correlations can form under a much broader set of conditions than has been previously shown.

CONDITIONS FOR ILLUSORY CORRELATION FORMATION

Judgments reflecting illusory correlations include (a) estimates of the number of frequent and infrequent types of descriptors that were associated with the groups and (b) evaluations of the groups.

Hamilton and Gifford's (1976) explanation regarding why distinctiveness-based illusory correlations form focused on the notion that infrequent or distinctive events receive greater attention. The co-occurrence of two infrequent events is particularly attention getting. Thus, these co-occurrences are likely to be more accessible in memory and better recalled than other events when making subsequent judgments. Because people tend to infer the frequency of an event from the accessibility of instances of the event in memory (Tversky & Kahneman, 1973), they overestimate the frequency of the distinctive co-occurrences, an illusory correlation (for evidence of this process, see Hamilton, Dugan, & Trolier, 1985; see also Fiedler, Russer, & Gramm, 1993). This notion provides a cognitive explanation why, for example, members of minority groups might be perceived to be more associated with relatively infrequent behaviors (e.g., criminal acts) than are majority group members even when no actual correlation exists. Note that this explanation relies on the presentation of *paired distinctive information,* information in which a minority group is described by an infrequent category of behavior (Hamilton et al., 1985; Hamilton & Gifford, 1976; see also McConnell, Sherman, & Hamilton, 1994).

However, in recent years, a number of alternative explanations have been proposed to account for this error in covariation estimation (Fiedler, 1991, 1996; McGarty, Haslam, Turner, & Oakes, 1993; Rothbart, 1981; Smith, 1991). The explanations suggest a broader set of boundary conditions for illusory correlation formation than has been assumed. In particular, they suggest that there need not be any

[1]Although it should not be assumed that infrequent event categories are necessarily distinctive, we use the term *distinctive* in this article because of precedence.

paired distinctive information in order for such illusory correlations to form. Although no studies have provided direct evidence for alternative processes in the experimental paradigm used by Hamilton and Gifford (1976), evidence has been provided on conceptual grounds (Fiedler, 1991), through simulations (Fiedler, 1996; Smith, 1991), and through experimental demonstrations using different stimuli and instructions (Fiedler, 1991; McGarty et al., 1993). Smith (1991), for example, argued that illusory correlations may result from the basic encoding and retrieval processes modeled by Hintzman (1986). Alternatively, McGarty et al. (1993) argued that illusory correlations result from the accentuation of perceived differences between target groups.

Following Smith (1991) and Fiedler (1991, 1996), we (Sanbonmatsu, Shavitt, & Gibson, 1994) suggested that the formation of a distinctiveness-based illusory correlation may result, in part, from the unequal set sizes of the target descriptions. Numerous studies have shown that the extremity of an overall impression is affected by the set size or the amount of evidence that is provided about an object (Anderson, 1967, 1981; Kaplan, 1981; Sloan & Ostrom, 1974; Yamagishi & Hill, 1981, 1983). Objects described by little information tend to be judged less extremely than objects described by a lot of information, even when the evaluative implication or strength of each piece of evidence is held constant. Take, for example, a situation in which twice as many behavioral descriptors are presented regarding one group than the other and, for each group, two thirds of those descriptors are favorable. Because less information is acquired about the minority group, perceivers may make less extreme (in this case, less favorable) assumptions about that group than about the majority group. That is, differences in the set sizes of the group descriptions may contribute to the formation of an illusory correlation in which the minority group is perceived to have performed fewer of the most frequent type of behaviors than the majority group.

Sanbonmatsu et al. (1994) showed that the acquisition of unequal amounts of information underlies the formation of illusory correlations in the perception of salient versus nonsalient targets. In their experiments, participants were presented with equal numbers of statements about different targets (persons in Experiment 1, apartments in Experiment 2). Not surprisingly, the salience of a target influenced the amount of information acquired about it, as participants recalled considerably less about nonsalient targets than about the salient target. The amount of information acquired, in turn, affected judgments; participants who acquired relatively little information about the nonsalient targets tended to underestimate the relative strength of the association between the nonsalient targets and the frequent category of descriptors (i.e., they made less extreme judgments of nonsalient vs. salient targets). Thus, although this research focused on target-salience effects in a paradigm different from Hamilton and Gifford's (1976), it did indicate that the relative amount of information acquired about targets mediates the formation of illusory correlations. In our experiments, using Hamilton and Gifford's original paradigm, we examined how differences in the amounts (set sizes) of information presented about targets influence illusory correlation formation.

HOW THE PREDICTIONS OF EACH ACCOUNT DIFFER

A set-size–based explanation has fundamental implications for the conditions under which illusory correlations are known to form regarding majority and minority groups. To recap, we argue that such covariation misestimations may occur, in part, because of the relatively limited amount of information that is acquired about the minority group. The response is to make less extreme judgments about it. According to this analysis, the difference in how much information describes the majority versus the minority group is important in influencing the likelihood that distinctiveness-based illusory correlations form. However, the distinctiveness of the information may not be criterial in influencing illusory correlation formation.

Evaluative Consistency

As described earlier, the distinctiveness-based explanation relies on presentation of paired distinctive information items. It assumes that such items garner more attention and, as a result, are more accessible in memory, leading to overestimation of the frequency of distinctive co-occurrences and to evaluations that reflect those estimates. Without such items, no illusory correlation formation would be anticipated.

In contrast, according to this set-size analysis, there need not be any paired distinctive items in order for such an illusory correlation to form. Even when the descriptors presented about the target groups are evaluatively consistent, the difference in the amount of information provided about the groups should lead perceivers to make less extreme judgments of the minority group. We expected that perceivers' frequency estimates and evaluations would reflect an underestimate of the relative association between the minority group and the frequent type of information even when both groups were described by all favorable or by all unfavorable information.

It could be suggested that the processes at work when descriptors are evaluatively consistent may be different than those for mixed descriptors. However, we argue that this univalent context is a relevant test condition for a number of reasons. First, it is encapsulated by the basic definition of illusory correlation reviewed earlier. Second, set-size effects would be anticipated regardless of the univalence of the stimuli. Third, a strong test of the implications of the

set-size–based account, in contrast to the distinctiveness-based explanation, would focus on a context in which the latter explanation would not anticipate illusory correlation formation. If the distinctiveness-based account is to be falsifiable, then evidence that distinctive items are not necessary for obtaining the effect cannot be considered irrelevant.

Set-Size Difference

The set-size account indicates that illusory correlations form when people perceive that they have received less information about the minority than the majority group. This should be particularly likely when there is a large difference between the set sizes of the information describing the groups. Under these conditions, perceivers should be more likely to recognize this difference and respond by making less extreme judgments about the minority group. Moreover, the perceived large set of evidence and heightened certainty should contribute to more extreme judgments about the majority group. Thus, set-size difference should be an important factor affecting the magnitude of any illusory correlations that are formed.

RESEARCH FOCUS

These experiments investigated the effects of evaluative consistency and set-size difference on illusory correlation formation. By providing the first empirical evidence for a set-size account of the processes underlying illusory correlation formation, we sought to establish new boundary conditions for illusory correlation effects.

A secondary interest was to examine one potential mediator of the effects of unequal set size on illusory correlation. Previous research (Sanbonmatsu et al., 1994) has suggested that, in some instances, uncertainty underlies the effects of the amount of information acquired on judgmental extremity. When perceivers are uncertain due to limited information, they often adjust their judgments toward a more neutral or middling position (Cialdini, Levy, Herman, & Evenbeck, 1973; Jaccard & Wood, 1988; Sanbonmatsu, Kardes, & Herr, 1992). In the perception of group targets, the acquisition of differential amounts of information may lead to relatively high certainty about the qualities of the majority group and to uncertainty about the minority group. Consequently, relatively extreme judgments may form of the majority group and overly moderate judgments may form of the minority group. In this research, we examined whether uncertainty plays a role in the formation of illusory correlations in this paradigm.

EXPERIMENT 1

The first experiment examined the effects of consistency of descriptions on the likelihood of an illusory correlation characterized by the overestimation of an association between the frequent category of behavior and the majority group. We sought to demonstrate that such illusory correlations would form regardless of whether any paired distinctive behaviors were presented.

Method

Overview and Design

Participants read descriptions of members of two groups, one of which was described by twice as many behaviors as the other. The proportion of favorable to unfavorable behavior descriptions was always the same for both groups. The study was characterized by a 3 × 2 (Consistency of Descriptions × Favorability of Descriptions) between-subjects design.

Participants

Two hundred twenty-four University of Illinois undergraduates participated to receive extra course credit. Participants were run in groups of 15 to 32 per session.

Stimulus Materials

Participants were given a booklet containing several stimulus sentences, one sentence per page. The sentences were similar to those used by Hamilton and Gifford (1976) and Sanbonmatsu, Sherman, and Hamilton (1987). Each sentence described the behavior of a member of one of two target groups, Group A or Group B (e.g., "Bruce, a member of Group A, sent his mother flowers on Mother's Day"). A different male individual was described in each sentence.

Twice as many behaviors described Group A as Group B. The favorability of the descriptions was varied, such that the descriptions were predominantly (or entirely) desirable for half of the participants and predominantly (or entirely) undesirable for the remaining participants. The number of behaviors used in each category is presented in Table 1. In the mixed description conditions, 16 behaviors in the frequent favorability category and 8 in the infrequent favorability category were associated with Group A, whereas 8 frequent and 4 infrequent behaviors were associated with Group B. In the consistent–valence conditions, descriptions were either entirely favorable or entirely unfavorable, with

TABLE 1
Actual Number of Frequent and Infrequent Behaviors as a Function of Consistency of Description: Experiment 1

	Group A Behavior		*Group B Behavior*	
Description	*Frequent*	*Infrequent*	*Frequent*	*Infrequent*
Mixed	16	8	8	4
Consistent	24	0	12	0
Consistent–short	16	0	8	0

24 frequent (and no infrequent) behaviors for Group A and 12 frequent (and no infrequent) behaviors for Group B. Note that the total number of behaviors describing each of the groups was equal in these consistent–valence conditions and the mixed conditions.

In an additional set of consistent conditions, the consistent–short conditions, only 16 frequent behaviors described Group A and 8 frequent behaviors described Group B. These consistent–short conditions were included to permit comparison with the mixed conditions by providing equivalence in terms of the number of frequent behaviors presented. Note that there were only 8 more statements in the consistent versus consistent–short conditions. No differences between these conditions were anticipated.

In all conditions, the set of statements describing each of the two target groups was selected based on pretest ratings so as to be equal in mean desirability.

Procedure

Participants were told that the experiment was "concerned with how people process and retain information about people" and that they would be reading descriptions of behaviors performed by members of two groups. Participants then read the booklets one page at a time. They were instructed every 7 sec to turn to the following page. When all the statements had been read, the booklets were collected, and the dependent measures were distributed.

Dependent Measures

Frequency estimates. Participants were told how many statements described each target group. For each group, they were asked to estimate how many of those statements described the group as having performed some undesirable behavior and how many described the group as having performed some desirable behavior.

Evaluations. The favorability of participants' overall impression of each target group was assessed on a 9-point scale ranging from –4 (*very unfavorable*) to +4 (*very favorable*).

Judgmental confidence. The amount of confidence characterizing participants' impressions of each of the target groups was assessed on a 9-point scale ranging from 1 (*not at all confident*) to 9 (*highly confident*).

Results

Frequency Estimates

Each participant's frequency estimates were used to calculate a phi coefficient reflecting the participant's perceived association between group membership and desirability of behavior. For each participant, we constructed a 2 × 2 (Group A vs. Group B × Frequent Behavior vs. Infrequent Behavior) contingency table. Phi coefficients were calculated such that a positive phi would reflect a perceived relation between Group A and the frequent type of behavior. The phi coefficients were converted to Fisher's *Z* scores for statistical analysis. The mean estimated frequent and infrequent behaviors for each group and the mean converted phi coefficients are presented in Table 2.

A 3 × 2 (Consistency of Description: Mixed vs. Consistent vs. Consistent–Short × Valence of Description: Favorable vs. Unfavorable Frequent Behavior) analysis of variance (ANOVA) was performed on the converted phi coefficients. The main effect of consistency was not signifi-

TABLE 2
Mean Estimated Frequent and Infrequent Behaviors and Mean Converted Phi Coefficients as a Function of Consistency of Description and Valence of Description: Experiment 1

	Behavior Frequency Estimates				
	Group A		*Group B*		
Description	*Frequent*	*Infrequent*	*Frequent*	*Infrequent*	*Phi*
Mixed					
Favorable	16.56	6.97	5.83	6.42	.24*
Unfavorable	13.61	9.94	7.11	6.22	.05
Consistent					
Favorable	20.92	2.78	10.76	2.19	.08
Unfavorable	20.49	2.74	9.44	2.31	.09*
Consistent–short					
Favorable	14.94	0.64	7.47	0.97	.11*
Unfavorable	13.39	2.42	7.47	1.29	.01

Note. Participants' frequency estimates for one or both groups sometimes exceeded the actual number of statements they read. Error mean square for analysis of phi coefficients was .06.

Significantly greater than zero; *$p < .05$.

cant, $F(2, 216) = 2.24$, $p = .11$, $\eta^2 = .02$, indicating that the magnitude of the illusory correlation effect did not vary significantly as a function of the consistency of the behavioral descriptions. Further analyses indicated that the overall phi scores were significantly greater than 0 in all three consistency conditions: mixed ($\phi = .15$), $t(71) = 4.50$, $p < .0001$; consistent ($\phi = .08$), $t(75) = 2.63$, $p < .01$; and consistent–short ($\phi = .06$), $t(73) = 2.29$, $p < .05$. Thus, illusory correlations were formed in all of these conditions.

The analysis yielded a significant main effect of valence, $F(1, 216) = 7.86$, $p < .01$, $\eta^2 = .03$, reflecting the fact that Group A was more strongly associated with the frequent category of behavior in the favorable than the unfavorable description conditions. Finally, the Consistency × Valence interaction was marginally significant, $F(2, 216) = 2.72$, $p = .07$, $\eta^2 = .02$, indicating that the effect of valence on the strength of the illusory correlations emerged in the mixed and consistent–short conditions but not in the consistent condition.

Evaluations

Participants indicated their evaluations of Group A and Group B on separate scales. These ratings were examined to determine whether the pattern of illusory correlations observed in the frequency estimates was also reflected in relative evaluations of the groups. A relative evaluation index was created for each participant by subtracting the evaluation of Group B from that of Group A. Thus, a positive score indicates a more favorable evaluation of Group A than B, and a negative score indicates a more favorable evaluation of Group B than A. The means of these relative evaluation scores and of the raw evaluations are presented in Table 3.

A 3 × 2 (Consistency of Description × Valence of Description) ANOVA on the relative evaluations yielded a significant main effect of valence, $F(1,218) = 24.78$, $p < .0001$, $\eta^2 = .10$, as expected, reflecting the fact that participants who received predominantly favorable descriptions evaluated Group A more positively than Group B ($M = 0.70$) but evaluated Group A more negatively than Group B when the predominant information was unfavorable ($M = –0.64$). This effect of valence was significant within all three consistency conditions: mixed, $F(1,73) = 5.25$, $p < .05$, $\eta^2 = .07$; consistent, $F(1,75) = 5.94$, $p < .05$, $\eta^2 = .08$; and consistent–short, $F(1,70) = 14.69$, $p < .0001$, $\eta^2 = .17$. There was also a significant main effect of consistency, $F(2, 218) = 2.98$, $p = .05$, $\eta^2 = .02$, reflecting a negative relative evaluation overall of Group A versus Group B in the consistent description conditions ($M = –0.42$) compared to a positive relative evaluation in the mixed ($M = 0.16$) and consistent–short ($M = 0.36$) conditions. This was due to a particularly strong negative relative evaluation in the consistent unfavorable cell (see Table 3). The Consistency × Valence interaction was not statistically significant, $F(2, 218) = 2.31$, $p = .10$, $\eta^2 = .02$. Overall, the relative evaluations indicate as expected that Group A was perceived to be more strongly associated than Group B with the frequent behavior in all of the consistency conditions.

Judgmental Confidence

Participants rated their level of confidence in their assessments of Group A and Group B on separate scales. These ratings were examined to determine whether participants were more confident in their judgments of Group A versus Group B. A relative confidence index was created for each participant by subtracting the confidence rating associated with judgments of Group B with that for Group A. Thus, a positive score indicates greater confidence in judging Group A than B. The means of these relative confidence scores and raw confidence ratings are presented in Table 4.

Overall, the mean relative confidence score was .21, which was significantly greater than 0, $t(223) = 1.97$, $p < .05$. Thus, judgments of Group A were made with significantly

TABLE 3
Mean Evaluations and Relative Evaluations of Group A Versus Group B as a Function of Consistency of Description and Valence of Description: Experiment 1

	Mean Evaluation		
Description	*Group A*	*Group B*	*Relative Evaluation of Group A Versus Group B*
Mixed			
Favorable	1.86	0.44	1.42
Unfavorable	–0.19	0.50	–0.69
Consistent			
Favorable	3.13	2.92	0.21
Unfavorable	–2.33	–1.31	–1.03
Consistent–short			
Favorable	3.49	2.97	0.51
Unfavorable	–2.53	–2.34	–0.18

Note. Error mean square for analysis of relative evaluation index was 4.04.

TABLE 4
Mean Confidence and Relative Confidence Associated With Judgments of Group A Versus Group B as a Function of Consistency of Description and Valence of Description: Experiment 1

	Mean Confidence		
Description	*Group A*	*Group B*	*Relative Confidence for Group A Versus Group B*
Mixed			
Favorable	5.92	5.44	.47
Unfavorable	4.53	4.64	–.11
Consistent			
Favorable	6.76	6.68	.08
Unfavorable	6.18	5.95	.23
Consistent–short			
Favorable	6.76	6.35	.41
Unfavorable	5.53	5.37	.16

Note. Error mean square for analysis of relative confidence index was 2.44.

more confidence overall than judgments of Group B. A 3 × 2 (Consistency of Description × Valence of Description) ANOVA on the relative confidence scores yielded no significant effects, all Fs(1 or 2, 218) ≤ 1.09, ps > .05, all η^2s < .01.

Relations Among the Dependent Variables

Partial correlations controlling for the effects of consistency and valence of description were calculated between the dependent measures to assess their interrelations. The phi coefficient correlated with the relative evaluation index (recoded to adjust for valence condition) at $r(216) = .60$, $p < .0001$, and with the relative confidence index at $r(216) = .20$, $p < .005$. Relative evaluation and relative confidence were correlated at $r(216) = .22$, $p < .001$.

Discussion

As expected, participants' frequency estimates and evaluations indicated that the majority target (Group A) was more strongly associated with the frequent category of behavior than was the minority target (Group B). This illusory correlation emerged in each description condition, even when the behaviors presented were all of the same valence. That these errors in covariation estimation can occur when descriptions are evaluatively consistent suggests that the conditions under which illusory correlations occur may be broader than previously thought.

Note that these effects are difficult to explain with the distinctiveness-based account generally applied to illusory correlations in which a minority target is seen as more strongly associated with the infrequent category of behavior. That account relies on superior attention to and recall of paired distinctive (minority target and infrequent behavior) items. However, in the consistent and consistent–short conditions, there were no such items.

Our results suggest that this error in covariation assessment may result, in part, from the unequal set sizes of the descriptions of the different targets. Perceivers may make less extreme judgments about the minority than the majority targets because less information is acquired about the minority group. Judgments of the minority group may be moderated in part because of uncertainty characterizing impressions of this group. The confidence data provided suggestive evidence for this possibility, as participants reported greater confidence in making judgments about the majority than the minority group.

We also found, unexpectedly, that the valence of the descriptions significantly affected the magnitude of the illusory correlations observed. That is, Group A was more strongly associated with the frequent category of behavior when descriptions were favorable versus unfavorable (in the mixed and consistent–short conditions). It is possible that participants were simply less willing to ascribe extreme qualities to Group A when the predominant evidence describing the groups was unfavorable. However, when the evidence suggested more favorable qualities, participants may have been more willing to judge Group A accordingly.

EXPERIMENT 2

The second experiment further explored the conditions under which illusory correlations are formed. Specifically, we examined whether set-size difference affects the likelihood of an illusory correlation. If, as argued here, the unequal set sizes of the majority and minority group descriptions triggered the illusory correlations observed in the previous experiment, then the greater the difference in the set sizes, the stronger the illusory correlation one would expect to observe.

In addition, as in the first experiment, some participants received mixed-valence descriptions of the majority and minority groups, whereas others received consistent descrip-

tions (no behaviors in the infrequent category). We again expected that, regardless of the evaluative consistency of the descriptions, the majority group would be more strongly associated with the frequent category of behavior than the minority group.

Method

Overview and Design

The experiment was characterized by a 2 × 2 × 2 (Consistency of Descriptions × Set-Size Difference × Favorability of Descriptions) between-subjects design.

Participants

One hundred forty-two University of Utah undergraduates participated to receive extra course credit.

Stimulus Materials

As in the previous experiment, participants were given a booklet containing several stimulus sentences that described members of Groups A and B. The favorability of the descriptions was varied in the same manner as in the previous study. The difference in the set sizes of the items describing Groups A and B were varied as follows. In the small set-size difference conditions, twice as many behaviors described Group A as Group B, as was the case in the previous study. In the large set-size difference conditions, four times as many behaviors described Group A as Group B. The number of behaviors used in each category is shown in Table 5.

Experiment 1 indicated that the likelihood of an illusory correlation in the consistent–valence conditions did not vary as a function of whether the number of statements describing each group equaled the total number of behaviors in the mixed condition or the number of frequent behaviors in the mixed condition. Thus, in this experiment, the number of behaviors presented in the consistent–valence condition was always the same as the number of frequent behaviors in the mixed condition.

In all conditions, the set of statements describing each of the two target groups were selected based on pretest ratings so as to be equal in mean desirability.

TABLE 5
Actual Number of Frequent and Infrequent Behaviors as a Function of Consistency of Description and Set Size Difference: Experiment 2

	Group A Behavior		*Group B Behavior*	
Description	*Frequent*	*Infrequent*	*Frequent*	*Infrequent*
Mixed				
Small difference	12	6	6	3
Large difference	24	12	6	3
Consistent				
Small difference	12	0	6	0
Large difference	24	0	6	0

Procedure and Dependent Measures

The procedures and dependent measures were the same as in the previous experiment.

Results

Frequency Estimates

Phi coefficients were calculated as in Experiment 1 and converted to Fisher's Z scores for statistical analysis. The mean estimated frequent and infrequent behaviors for each group and the mean converted phi coefficients are in Table 6.

A 2 × 2 × 2 (Consistency of Description: Mixed vs. Consistent × Valence of Description: Favorable vs. Unfavorable Frequent Behavior × Set-Size Difference: Large vs. Small) ANOVA revealed a significant main effect of set size, $F(1, 130) = 7.99$, $p < .005$, $\eta^2 = .06$, as participants' judgments in the large set-size difference condition showed an illusory correlation ($M = 0.10$), whereas participants in the small set-size difference condition did not ($M = –0.01$). The overall phi score was significantly greater than zero in the large set-size difference condition, $t(64) = 3.67$, $p < .0001$, and did not differ from zero in the small set-size difference condition, $t(74) = .29$, $p > .05$. Therefore, as expected, the likelihood of forming an illusory correlation depended on the difference in the set sizes describing the majority and minority groups. However, the fact that no illusory correlation was observed in the small set-size difference condition, on this and on subsequent measures, was unexpected. We return to this issue shortly.

No other main effects or interactions were significant, all Fs$(1, 130) \leq 3.06$, ps $> .05$, all η^2s $\leq .02$. Thus, as in the previous experiment, the magnitude of the illusory correlation effect did not vary with the evaluative consistency of the behavioral descriptions.

Evaluations

A relative evaluation index was created for each participant as in Experiment 1. See Table 7 for the means of the relative evaluations and the raw evaluations.

A 2 × 2 × 2 (Valence of Description × Consistency of Description × Set-Size Difference) between-subjects ANOVA on the relative evaluations yielded a significant main effect of valence, $F(1, 134) = 4.48$, $p < .05$, $\eta^2 = .03$, as expected, indi-

TABLE 6
Mean Estimated Frequent and Infrequent Behaviors and Mean Converted Phi Coefficients as a Function of Consistency of Description, Set Size Difference, and Valence of the Description: Experiment 2

	Behavior Frequency Estimates				
	Group A		*Group B*		
Description	*Frequent*	*Infrequent*	*Frequent*	*Infrequent*	*Phi*
Mixed					
Small difference					
Favorable	9.68	7.95	4.95	4.05	.01
Unfavorable	9.20	8.67	5.67	3.80	–.09
Large difference					
Favorable	23.44	12.25	4.75	4.13	.12*
Unfavorable	23.27	12.73	4.60	4.40	.12*
Consistent					
Small difference					
Favorable	10.16	1.63	5.53	0.68	–.05
Unfavorable	10.37	1.42	5.26	1.00	.08
Large difference					
Favorable	22.88	1.12	5.29	0.71	.11*
Unfavorable	21.75	0.88	5.06	0.88	.07

Note. Participants' frequency estimates for one or both groups sometimes exceeded the actual number of statements they read. Error mean square for analysis of phi coefficients was .05.
Significantly greater than zero; *$p < .05$, one-tailed.

TABLE 7
Mean Evaluations and Relative Evaluations of Group A Versus Group B as a Function of Consistency of Description, Set Size Difference, and Valence of Description: Experiment 2

	Mean Evaluation		
Description	*Group A*	*Group B*	*Relative Evaluation of Group A Versus Group B*
Mixed			
Small difference			
Favorable	0.96	1.18	–0.23
Unfavorable	–0.07	–0.27	0.20
Large difference			
Favorable	1.94	1.25	0.69
Unfavorable	–0.88	0.29	–1.18
Consistent			
Small difference			
Favorable	2.84	2.89	–0.05
Unfavorable	–1.75	–1.40	–0.35
Large difference			
Favorable	3.18	2.88	0.29
Unfavorable	–2.56	–1.50	–1.06

Note. Error mean square for analysis of relative evaluation index was 4.18.

cating that participants who received predominantly positive information evaluated Group A more favorably than Group B ($M = 0.19$), but evaluated Group A less favorably than Group B when the predominant information was negative ($M = –0.60$). This main effect was qualified by a significant Set Size × Valence interaction, $F(1, 134) = 5.79$, $p < .05$, $\eta^2 = .04$, such that participants in the large set-size difference condition evaluated Group A more extremely than Group B in the direction of the frequent behavior (favorable frequent condition: $M = 0.48$; unfavorable frequent condition: $M = –1.12$), whereas participants in the small set-size difference condition did not (favorable frequent condition: $M = –0.15$; unfavorable frequent condition: $M = –0.45$). No other main effects or interactions were significant, all Fs$(1, 134) < 1.00$, ps$ > .05$, all η^2s$ < .005$.

In sum, the relative evaluation findings paralleled the frequency estimate data in indicating that the likelihood of

forming an illusory correlation depended on the difference in the set sizes describing the majority and minority groups.

Judgmental Confidence

A relative confidence index was created for each participant as in Experiment 1. The means of these relative scores and raw confidence ratings are presented in Table 8.

A 3 × 2 × 2 (Consistency of Description × Valence of Description × Set-Size Difference) ANOVA on the relative confidence scores yielded a marginally significant main effect of set-size difference, $F(1, 134) = 3.65$, $p < .06$, $\eta^2 = .03$, indicating that greater confidence was expressed in judgments of Group A relative to Group B when the set-size difference was large ($M = 0.27$) but not when it was small ($M = –0.09$). In the large set-size difference condition, this relative confidence score was marginally significantly different from zero, $t(65) = 1.74$, $p < .09$, but it was not in the small set-size difference condition, $t(75) = 0.84$, $p > .05$. No other effects were significant, all Fs$(1, 134) \leq 1.12$, ps $> .05$, all η^2s $< .01$.

Relations Among the Dependent Variables

Partial correlations controlling for the effects of consistency and valence of description and for set-size difference were calculated between the dependent measures to assess their interrelations. The phi coefficient correlated with the relative evaluation index (recoded to adjust for valence condition) at $r(140) = .73$, $p < .01$, and with the relative confidence index at $r(140) = .20$, $p < .05$. Relative evaluation and relative confidence were correlated at $r(140) = .10$, *ns*.

Discussion

Participants' frequency estimates and evaluations indicated a tendency to associate the majority target (Group A) more strongly than the minority target (Group B) with the frequent category of behavior. As in the previous experiment, the strength of this effect was not influenced by the evaluative consistency of the behavioral descriptions presented. Participants formed illusory correlations even when all of the presented behaviors were of the same valence (i.e., when there were no paired distinctive items). Again, these results are difficult to explain in terms of distinctiveness-based processes.

Importantly, however, the likelihood of an illusory correlation was influenced by the difference between the set sizes of the majority and minority groups. When the set-size difference was large, a significant illusory correlation was observed. However, when the set-size difference was relatively small, no illusory correlation was formed. This pattern emerged across both frequency estimates and evaluations of the target groups and is consistent with our account of the underlying process. Because of the unequal set sizes of the majority and minority group descriptions, participants acquired less information about the minority group. As a result, they made less extreme judgments about the minority than the majority groups. The greater the set-size difference, the more likely this effect was to emerge.

Participants may have moderated their judgments of the minority group in part because they harbored greater uncer-

TABLE 8
Mean Confidence and Relative Confidence Associated With Judgments of Group A Versus Group B as a Function of Consistency of Description, Set-Size Difference, and Valence of Description: Experiment 2

	Mean Confidence		
Description	*Group A*	*Group B*	*Relative Confidence of Group A Versus Group B*
Mixed			
Small difference			
Favorable	5.27	5.59	–.32
Unfavorable	5.27	5.40	–.13
Large difference			
Favorable	6.38	5.94	.44
Unfavorable	5.94	5.71	.24
Consistent			
Small difference			
Favorable	6.05	6.11	–.05
Unfavorable	4.75	4.60	.15
Large difference			
Favorable	5.82	5.65	.18
Unfavorable	5.81	5.56	.25

Note. Error mean square for analysis of relative confidence index was 1.27.

tainty in judging them. As in the previous experiment, confidence judgments provided some evidence for this possibility. Greater confidence was expressed in judgments of the majority relative to the minority group when the set-size difference was large but not when it was small.

Although the pattern of illusory correlations observed here was consistent with our hypotheses about the process responsible for these effects, the fact that no illusory correlation was observed when the set-size difference was small is surprising. One might instead have expected an illusory correlation to be formed in all conditions, only to be strengthened as the set-size difference increased. One possible reason is the absolute size of the stimulus sets employed. In the small difference condition, the smallness of these sets (i.e., only 12 frequent behaviors for Group A and 6 for Group B) may have allowed participants to keep relatively good track of the actual distribution of items across groups and, thus, may have made them less likely to perceive differences between groups. The smallness of these sets may also have led participants to perceive that information about both groups was limited and, thus, to form moderate impressions of Group A as well as Group B.

EXPERIMENT 3

The third experiment was conducted to establish more clearly the role of set-size difference in moderating illusory correlation formation. In Experiment 2, set-size difference was manipulated by varying the absolute number of exemplars of the majority group. In Experiment 3, we sought to demonstrate that set-size difference affects the likelihood of an illusory correlation when the number of exemplars of the minority group is varied.

We also sought to establish that the pattern of illusory correlations observed in Experiment 2 was indeed due to differences between the set sizes of items describing Groups A and B and not (solely) to the smallness of the stimulus sets in the small set-size difference conditions. Thus, the total number of items in that condition was increased, but the ratio of items describing Groups A and B was kept the same as in Experiment 2 in all conditions.

Method

Overview and Design

The experiment was characterized by a 2 × 2 (Set-Size Difference × Favorability of Descriptions) between-subjects design.

Participants

One hundred and sixteen University of Utah undergraduates participated to receive extra course credit.

Stimulus Materials

As in the previous experiments, participants were given a booklet describing members of Groups A and B. All descriptions were of mixed valence. The valence of the descriptions was varied in the same manner as before. The number of behaviors in each category is shown in Table 9. In the small set-size difference conditions, twice as many behaviors described Group A as Group B, as in the previous studies. In the large set-size difference conditions, as in Experiment 2, four times as many behaviors described Group A as Group B. Statements describing each of the groups were selected based on pretest ratings so as to be equal in mean desirability.

Procedure and Dependent Measures

The procedures and dependent measures were the same as in the previous experiments.

Results

Frequency Estimates

Phi coefficients were calculated as in the previous experiments and converted to Fisher's *Z* scores for statistical analysis. The mean estimated frequent and infrequent behaviors for each group and the mean converted phi coefficients are presented in Table 10. A 2 × 2 (Valence of Description: Favorable vs. Unfavorable Frequent Behavior × Set-Size Difference: Large vs. Small) ANOVA yielded, as expected, a main effect for set-size difference, $F(1, 110) = 4.62$, $p < .05$, $\eta^2 = .04$. Participants were more likely to overestimate the proportion of frequent behaviors describing Group A relative to Group B when the set-size difference was large ($M = .15$) as opposed to small ($M = .06$). The difference between the overall phi score and zero was significant in the small set-size difference condition, $t(58) = 1.76$, $p < .05$, and in the large set-size difference condition, $t(54) = 5.34$, $p < .0001$. No other effects were significant, all Fs$(1, 110) < 1.00$, ps $> .05$, all η^2s $< .005$.

Thus, as expected, illusory correlations were formed in both set-size difference conditions, but the strength of this ef-

TABLE 9
Actual Number of Frequent and Infrequent Behaviors as a Function of Set-Size Difference: Experiment 3

	Group A Behavior		*Group B Behavior*	
Set-Size Difference	*Frequent*	*Infrequent*	*Frequent*	*Infrequent*
Small	24	12	12	6
Large	24	12	6	3

TABLE 10
Mean Estimated Frequent and Infrequent Behaviors and Mean Converted Phi Coefficients as a Function of Set-Size Difference and Valence of Description: Experiment 3

	Frequency Estimates				
	Group A		*Group B*		
Description	*Frequent*	*Infrequent*	*Frequent*	*Infrequent*	*Phi*
Small difference					
Favorable	20.07	15.10	9.45	8.59	.05
Unfavorable	19.67	14.77	9.93	9.47	.06
Large difference					
Favorable	24.69	11.20	4.76	4.28	.16*
Unfavorable	23.11	12.18	5.88	5.30	.15*

Note. Participants' frequency estimates for one or both groups sometimes exceeded the actual number of statements they read. Error mean square for analysis of phi coefficients was 0.05.
Significantly greater than zero; *$p < .05$.

fect depended on the difference in the set sizes describing the majority and minority groups.

Evaluations

Table 11 shows the means of the raw evaluations and relative evaluations. A 2 × 2 (Valence of Description × Set-Size Difference) ANOVA yielded, as expected, a main effect of valence, $F(1, 111) = 10.89$, $p < .001$, $\eta^2 = .09$. When the majority behavior was negative, participants evaluated Group A more negatively than Group B ($M = –0.97$), whereas when the majority behavior was positive, participants evaluated Group A more positively than Group B ($M = 0.59$). This main effect was qualified by a significant Set Size × Valence interaction, $F(1, 111) = 5.59$, $p < .05$, $\eta^2 = .04$, reflecting the fact that the effect of valence on relative evaluations was significant when the set-size difference was large, $t(111) = 4.03$, $p < .001$, but not when it was small, $t(111) = .72$, $p > .05$. Thus, the relative evaluation data paralleled the frequency estimates in demonstrating that the strength of the illusory correlation effect depended on the difference in the set sizes describing the majority and minority groups.

Judgmental Confidence

The means of the relative confidence scores and raw confidence ratings are presented in Table 12. A 2 × 2 (Valence of Description × Set-Size Difference) ANOVA on the relative confidence scores yielded no significant effects, all Fs(1, 111) ≤ 3.0, ps > .05, all η^2s < .03. However, the relative confidence score was significantly greater than zero in the positive valence conditions, ($M = 0.39$), $t(55) = 2.10$, $p < .05$, but not in the negative valence conditions, ($M = –0.03$), $t(58) = .21$, $p > .05$.

Relations Among the Dependent Variables

Partial correlations controlling for the effects of valence of description and set-size difference were calculated between the dependent measures to assess their interrelations. The phi coefficient correlated with the relative evaluation index (recoded to adjust for valence condition) at $r(114) = .60$, $p < .01$, and with the relative confidence index at $r(114) = .35$, $p < .01$. Relative evaluation and relative confidence were correlated at $r(114) = .25$, $p < .01$.

TABLE 11
Mean Evaluations and Relative Evaluations of Group A Versus Group B as a Function of Set-Size Difference and Valence of Description: Experiment 3

	Mean Evaluation		
Description	*Group A*	*Group B*	*Relative Evaluation of Group A Versus Group B*
Small difference			
Favorable	1.17	1.07	0.10
Unfavorable	0.00	0.37	–0.37
Large difference			
Favorable	2.19	1.07	1.11
Unfavorable	–0.45	1.14	–1.59

Note. Error mean square for analysis of relative evaluation index was 6.37.

TABLE 12
Mean Confidence and Relative Confidence Associated With Judgments of Group A Versus Group B as a Function of Set-Size Difference and Valence of Description: Experiment 3

	Mean Confidence		
Description	*Group A*	*Group B*	*Relative Confidence of Group A Versus Group B*
Small difference			
Favorable	6.24	5.97	.28
Unfavorable	5.17	5.10	.07
Large difference			
Favorable	6.07	5.56	.52
Unfavorable	6.03	6.17	–.14

Note. Error mean square for analysis of relative confidence index was 1.75.

Discussion

As expected, illusory correlations were formed for the frequency estimates in both the small and large set-size difference conditions. However, when the difference between the set sizes of the majority and minority groups was large, a significantly stronger illusory correlation emerged than when the set-size difference was small.

This effect of set-size difference was consistent with our account of the process responsible for illusory correlations in these experiments. Because of unequal set sizes, participants acquired less information about the minority group. As a result, they made less extreme judgments about that group. This manifested in an illusory correlation in which the majority group was more strongly associated with the frequent category of behavior than the minority group. The greater the set-size difference, the stronger this effect was.

We suggested that participants may moderate their judgments about the minority group in part due to greater uncertainty in judging that group. However, in this experiment, set-size differences did not influence the relative confidence participants associated with judgments of Group A versus Group B. Possible reasons for this are considered next.

GENERAL DISCUSSION

In many situations, perceivers make judgments about the relation between social characteristics (e.g., "Are members of this fraternity sociable?"; "Do good-looking people tend to be intelligent?"). Unfortunately, estimating such covariations is difficult, and people are error prone in judging the relation between two characteristics or events. Prior research has indicated that perceivers are particularly prone to forming illusory correlations characterized by an overestimation of the relative degree of association between an infrequent category of behavior and a minority group (e.g., Chapman, 1967; Hamilton & Gifford, 1976). The three reported experiments reinforce the robustness of this effect and further our understanding of when it occurs.

Experiments 2 and 3 demonstrated that the tendency to form illusory correlations increases as differences in the amount of evidence about the targets increases. Covariation misperceptions are particularly likely when there are marked discrepancies in the quantity of information acquired about different groups. The findings suggest that increasing the amount of information about minority groups, outgroups, or both may diminish illusory correlation formation and the formation of negative stereotypes. This is consistent with research suggesting that increasing contact with and, hence, knowledge about outgroups may facilitate better intergroup relations in some circumstances (e.g., Cook, 1985; Wilder, 1984).

The implications are not limited to person perception. For example, in the consumer domain, the findings suggest that the manufacturing of superior brands and the implementation of ad campaigns that explicitly differentiate brands may not be necessary for strong brand preferences to form. In some instances, simply increasing the amount of information consumers have about a good brand may be sufficient to induce a preference for it, even though the brand may not be objectively better than its less known competitors. Indeed, market leaders may enjoy a significant advantage over less known and less advertised brands due in part to such illusory correlation processes.

The experiments also broaden our conception of the conditions under which illusory correlation occurs. Experiments 1 and 2 confirmed that perceivers actually evaluate majority and minority groups differently even when both groups are described by all favorable or all unfavorable information. Previous studies have demonstrated the formation of illusory correlations after presenting participants with evaluatively inconsistent information (i.e., with information in both frequent and infrequent favorability categories about each target; for reviews, see Hamilton & Sherman, 1989; Mullen & Johnson, 1990). However, our experiments demonstrated that illusory correlations form even when no distinctive, infrequent, or inconsistent behaviors are presented. At some

level, this is not altogether surprising. For example, one might expect that product perceptions would be more favorable when a brand is known to have eight as opposed to only six positive attributes. Nevertheless, the finding is intriguing because it suggests that differential judgments about targets may result even when the evidence about them is entirely positive or entirely negative. Thus, less favorable impressions may form of an unfamiliar minority outgroup than of an ingroup, even though all of the information about the outgroup may be positive.

Some readers may question whether the behaviors presented in the consistent conditions were, indeed, evaluatively consistent. One might speculate that some of the behaviors were not perceived to have the intended valence, especially given that some participants in the consistent conditions estimated a proportion of the behaviors to be of the opposite category. It should be noted, however, that only a very small number of infrequent behaviors were estimated in these conditions (on average, only slightly more than one). Moreover, only behaviors that were pretested to be extremely positive or extremely negative were featured in the experiment. For example, the mean rating of the positive behaviors presented in Experiment 1 was 9.7 on an 11-point scale (with a midpoint of 6), with the least positive behavior being "wrote an articulate letter to the editor of his local newspaper." The mean rating of the negative behaviors presented was 2.7, with the least negative behavior being "was passed over for promotion because of consistently mediocre work." Thus, it is extremely unlikely that the behaviors were commonly construed or interpreted as being of a different evaluative category than was intended. The tendency to estimate behaviors of the infrequent category likely reflects a response bias driven by the group impressions that were formed.

Perhaps more significantly, many of the frequency estimates in the consistent description conditions were completely accurate. Seventy-five participants in the consistent conditions of Experiments 1 and 2 perfectly estimated the frequencies of positive and negative behaviors by the two groups. That is, they correctly estimated that no behaviors of the infrequent category were presented. As expected, even these participants tended to form illusory correlations characterized by differential evaluations of the two groups. A post hoc analysis indicated that Group A tended to be evaluated more extremely than Group B by these participants, $t(74) = 1.88$, $p = .07$. Thus, the formation of illusory correlations in the consistent conditions cannot be attributed to a failure to present behaviors of a subjectively consistent valence.

The illusory correlations we observed are comparable in magnitude to the effects that we have obtained in other contexts (Sanbonmatsu et al. 1994; Sanbonmatsu, Shavitt, & Sherman, 1991) as reflected by the size of phi coefficients and the differences in evaluations of Groups A and B. Indeed, evaluations of the two groups sometimes straddled the neutral point, even though the favorability of information presented about each group was always the same.

In addition to furthering our understanding of the conditions under which illusory correlations are likely to form, the findings suggest much about the underlying processes. The three experiments support the basic theoretical position that differences in the amount of information presented about the targets may underlie illusory correlation formation. Moreover, they provide the first empirical demonstration that something other than a distinctiveness-based process can contribute to illusory correlations in the group perception experimental paradigm used by Hamilton and Gifford (1976).

Frameworks for Predicting a Set-Size Effect

A number of processes may contribute to the effect of unequal set sizes on covariation perception. For example, the amount or frequency of information may affect basic associative or retrieval processes. Frequent pairings between a target and behavior of a particular evaluative category may increase the strength of the target–evaluation association, heighten the likelihood of the retrieval of evaluative behaviors, or do both, thus contributing to more extreme judgments (see Downing, Judd, & Brauer, 1992).

Inference processes may also operate that lead to relatively extreme judgments of majority targets and to moderate judgments of minority targets (Fiedler, 1991; Sanbonmatsu et al., 1994). When people perceive that the information available about a target is incomplete or limited, they may draw inferences that go beyond the information given (Bruner, 1957; Ford & Smith, 1987; Huber & McCann, 1982; Jagacinski, 1991; Johnson, 1987; Meyer, 1981; Slovic & MacPhillamy, 1974). In social perception, a person or group may be assumed to have performed behaviors that are typical or average. Indeed, Fiedler (1991) demonstrated that observers infer that target individuals perform behaviors that are typical of other persons present. Moreover, unknown attributes are often assumed to have typical or middling values (Yamagishi & Hill, 1981, 1983). Consequently, a minority group may be assumed to have middling characteristics whereas a majority group may be evaluated more in terms of the evidence in the frequent favorability category, resulting in a more extreme evaluation of the majority than the minority group.

A final possibility that was suggested earlier is that perceivers adjust their judgments of the minority group to a relatively moderate position because of the uncertainty or low confidence that results from the acquisition of limited information about that group. Such an adjustment may occur because a moderate stance is easy to justify and can be readily altered as additional information becomes available (Cialdini et al., 1973; Jaccard & Wood, 1988; Sanbonmatsu

et al., 1992). Moreover, moderate judgments are more conservative and, hence, less likely to lead to grossly erroneous judgments. Thus, judgments of a minority target, once made, may be adjusted toward a relatively neutral position because of uncertainty, whereas judgments of the majority group are likely to remain relatively extreme.

In Experiments 1 and 2, as reported earlier, confidence did vary as expected as a function of group membership; participants were generally less confident in their impressions of Group B than Group A. However, the results of additional analyses, not reported earlier, yielded mixed evidence on the role of confidence in these experiments. Correlational analyses showed that relative confidence correlated significantly with the evaluations and frequency estimates in Experiments 1 and 2. The greater the confidence associated with judgments of Group A versus Group B, the stronger the illusory correlation that was observed. However, a covariation analysis did not show that the phi coefficients and relative evaluations were mediated by the confidence associated with judgments of Group A versus Group B. This appears inconsistent with some of our earlier work (Sanbonmatsu et al., 1994) that found confidence to be an important mediator of illusory correlation and set-size effects in other contexts.

There are a number of plausible explanations for why the results did not demonstrate mediation by confidence. One possibility is that our measure of confidence was insensitive because of a lack of specificity. Participants were asked to indicate their confidence in their impression of each of the groups. The vagueness of the measure may have allowed a variety of responses. In particular, some participants may have conveyed the belief that their judgment was appropriate given the limited evidence rather than the belief that their judgment was correct.

A related problem is that measures were taken of confidence in the completed evaluation rather than the uncertainty that was felt before the evaluation that was made. Some participants may not have remembered the uncertainty that they felt in making the judgment whereas others may have made an active effort to reduce uncertainty after making the judgment by justifying their responses (Festinger, 1957). Consequently, responses on the confidence measure may not have reflected the uncertainty that was felt before judgments were made.

Role of Other Processes

The tendency to observe illusory correlations even in the absence of distinctive behavior and the role of inference processes in forming those judgments were suggested by an experiment by Fiedler (1991, Demonstration 1). Participants in an observation study listened to statements made by men or women about various topics. Men (not women) made statements about sports, whereas women (not men) made statements about traveling. Participants subsequently reported hearing statements about sports by women and statements about traveling by men, despite the fact that these events did not occur. Presumably, these judgments occurred because of a loss of information about the specific sources of the statements; participants remembered statements about sports and traveling and inferred that they were made by both men and women (for a related algorithmic model that accounts for numerous judgment biases, see Fiedler, 1996).

The consistent information conditions of Experiments 1 and 2 were unique among previous studies in that all of the behaviors were of the same evaluative category. Illusory correlations may have formed, in part, because of information loss and middling inferences. Participants may not have remembered the favorability of all of the behaviors and inferred that some distinctive qualities characterized the groups. These middling inferences are more likely to have been made about the minority group than the majority group because the predominant qualities of the minority group were less well-known.

As we noted earlier, however, in some cases illusory correlations were formed in the consistent description conditions despite little loss of information on the part of participants. A sizeable proportion of participants in the consistent description conditions of Experiments 1 and 2 correctly estimated that no behaviors of the infrequent category were presented. These findings suggest that additional processes contributing to judgmental moderation, possibly other mechanisms discussed by Fiedler (1991), must have operated.

Obviously, when information about a multiplicity of groups is presented in a context, the evaluations of each are not independent of one another. The amount of information that is perceived to have been acquired about a target undoubtably varies as a function of the evidence acquired about other targets in the context. As a consequence, the extremity characterizing judgments of a particular target may be affected by the set sizes of the descriptions of others (Sanbonmatsu, Kardes, Posavac, & Houghton, 1997). Moreover, the ability of observers to acquire information about a target may be affected by the amount of evidence about others. When a large amount of information is presented about other targets, the ability to integrate all of the relevant evidence about a target may be disrupted, affecting judgmental extremity. Finally, when the scale points of the measures are ill defined, judgments of one target undoubtably serve as an anchor for judgments of others.

This analysis of how evidence about other objects in the context affects target judgments may help to explain some unexpected findings in our studies. We anticipated that minority group rather than majority group evaluations would be affected by the manipulation of the set-size difference in Experiment 3. However, it was unexpectedly the evaluations of the majority group that were affected most when diminished evidence was presented about the minority group in the large set-size difference conditions. We suggest that, when the

amount of information presented about the minority group was relatively large (small set-size difference conditions), participants may have encountered difficulty in processing all of the evidence about the majority group, thus reducing the extremity of evaluations of the majority group. However, when the amount of information presented about the minority target was relatively small (large set-size difference conditions), participants may have been able to form a clearer impression of the majority group, thus leading to more extreme evaluations of the majority group. We also suggest that, in some instances, participants may have used the minority target as an anchor and adjusted judgments of the majority target outwards. This may have occurred because of the usage of measures with poorly defined scale points in the experiment.

Additional Implications

Our findings suggest that differences in the perceived amount of information about groups contributes to the formation of illusory correlations. However, there may be important limitations to this effect. In some instances, people may perceive that they have sufficient knowledge to judge both groups. Consequently, extreme judgments of both the minority and majority may form, and illusory correlations may not occur even though the amount of information presented about the groups differs. Thus, factors that elicit efforts to learn about all of the groups, such as an impression set (Pryor, 1986) or high involvement (Sanbonmatsu et al., 1991; Schaller & Maass, 1989), diminish the likelihood of an illusory correlation.

The likelihood of an illusory correlation may be similarly affected by the number of exemplars describing both groups. A meta-analysis by Mullen and Johnson (1990) indicates that, as the amount of information describing both groups increases, the tendency to misperceive the pattern of covariation is heightened. Our analysis suggests a possible limit to this effect: When the number of exemplars describing each group is extremely large, the likelihood of an illusory correlation may diminish as strong impressions of both groups may form.

The likelihood of illusory correlation formation may also be reduced when conditions prevent learning about the groups. In this case, observers may feel that they lack adequate information about all groups and, as a result, may form moderate judgments of both the majority and minority. Thus, illusory correlations may not form when the number of exemplars is extremely small or when conditions prevent the acquisition of much of the available evidence.

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