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Diverse groups and information sharing: The effects of congruent ties☆

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Abstract

The impact of congruence between social and knowledge ties on performance in diverse groups was examined. Congruence occurs when group members who are socially tied share the same information and a stranger has any unique information. Incongruence occurs when group members who are socially tied possess different information, and one of them shares information with a stranger. In Experiment 1, three-person groups with congruent social and knowledge ties utilized information more effectively, reported more effective group processes, and outperformed groups with incongruent ties. Experiment 2, which involved four-person groups, examined the role of congruence in groups with either a single minority information holder or two equal-sized subgroups. Congruent groups again outperformed incongruent groups, but this was only true when groups had a minority information holder. There was no difference in the performance of congruent and incongruent groups that had equal-sized subgroups. The implications of these findings for analyses of group composition and decision-making are discussed.

Keywords: Congruence; Group process; Decision-making; Information sharing

When a diverse group works on a task, its performance depends not only on who knows what but also on whether that knowledge is shared. The liberal exchange and open discussion of member knowledge, especially knowledge that is not initially available to all group members, is critical (see Argote, Gruenfeld, & Naquin, 2000 for review). However, research has shown that group members often fail to exchange unique knowledge, focusing instead on the knowledge that everyone has in common (e.g., Asch, 1952; Stasser & Titus, 1985, 1987; for a review see Wittenbaum & Stasser, 1996). This bias can be traced to the fact that group members often seek support and validation for their knowledge from one another (Festinger, 1957). Indeed, Wittenbaum, Hubbell, and Zuckerman (1999) have shown that one reason why group members emphasize shared information is that they seek mutual enhancement, "a process whereby group members develop enhanced evaluations of each other's task capabilities when shared information is mentioned" (p. 967).

Most research on this information sharing bias has investigated the framing of the task (e.g., Stasser & Stewart, 1992) and *what* group members know (e.g., Stewart & Stasser, 1995) , rather than *who* knows it. However, interpersonal knowledge and social ties may also be important, especially in on-going groups (e.g., Gruenfeld, Mannix, Williams, & Neale, 1996; Moreland & McGinn, 1999; Wegner, 1987). Similarity, familiarity, and liking among members all promote solidarity within

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groups (Moreland & Beach, 1992; Moreland & Zajonc, 1982). However, some groups contain subgroups that exclude certain members (Murnighan, 1978; O'Reilly, Caldwell, & Barnett, 1989). These subgroups can form on their own for a variety of reasons (see Brewer, 1993; Brewer & Kramer, 1986; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). Organizations can also create subgroups by adding "knowledge specialists" to provide groups with novel perspectives and information, or by creating cross-functional teams (Ancona & Caldwell, 1998; Gruenfeld, Martorana, & Fan, 2000; Mohrman, Cohen, & Mohrman, 1995; Nahavandi & Aranda, 1994). In either case, diverse groups are likely to contain both social subgroups and knowledge subgroups (Granovetter, 1973).

The presence of these subgroups can have important effects. As a first step to understanding the independent effects of social and knowledge subgroups on information sharing, Gruenfeld et al. (1996) studied decision making in groups composed of three strangers, three familiars, or two familiars and a stranger. In each case, group members possessed either unique or completely shared information. When subgroups were not present, familiar groups outperformed stranger groups, but only when each group member possessed unique information. Stranger groups outperformed familiar groups when all information was shared among group members. When subgroups existed (two familiars and a stranger), unique information was pooled just as effectively as in familiar groups. It is important to note that in this experiment, familiar members and strangers all possessed the same kind of information. All three persons had unique information, or all three of them shared information. So, although there was diversity in social ties, there was no diversity of knowledge.

There are other possible subgroup patterns involving both social and knowledge diversity that might yield further insights into the effects of relationships on knowledge sharing in groups. For example, what if familiar members all possessed the same information, while the stranger possessed unique information? This would create a "congruent" situation, in which the social and knowledge subgroups were the same. And what if one familiar member possessed unique information, while the stranger and the other familiar member possessed shared information? This would create an "incongruent" situation, in which the social and knowledge subgroups were different. How would group performance vary across these two situations?

We propose that the ability of group members to share knowledge effectively depends not only on what information is known by group members, but also on whose information overlaps. Drawing on Heider's (1958) original balance theory, and later work by Newcomb (1961) and Crano and Cooper (1973) , we argue that information sharing in diverse groups depends on the match or "congruence" between members' social and knowledge ties. Congruence is helpful for information sharing because group members with social and knowledge ties can (and will) support one another by validating their common knowledge. And unique knowledge seems more acceptable to such persons when it comes from someone who has weak or no social ties to them. This implies that the ability of a group to use the knowledge of a minority member relies in part on the social ties between that person and that majority. We will develop this argument further, and explore the effects of congruence on information sharing and group performance, in two experiments.

Experiment 1

Cognitive psychologists have established that people crave psychological balance in their mental representations (Heider, 1958; Newcomb, 1961), and will thus strive to create, maintain, and restore balance (Aronson, 1961; Aronson & Mills, 1959; Festinger, 1957). Balance is important in social relationships as well, and some theorists have considered the possible interdependence between cognitive and social balance. For example, Doise and Mugny (1984) have argued for the importance of 'social marking' in cognitive development. Social marking occurs when there is consistency between the social relationships in a situation and the cognitive relationships among objects important to that situation. What role might balance play in knowledge sharing? Well, when socially tied group members fail to support one another, they probably experience greater uncertainty about the validity of their own knowledge (Asch, 1952) , as well as greater anxiety (Heider, 1958; Newcomb, 1961). Both uncertainty and anxiety are aversive and thus ought to be avoided. Heider (1958) suggested that people are also disturbed by agreement or support from disliked others, but Newcomb (1961) and Crano and Cooper (1973) presented evidence to the contrary. This is not surprising, because we know that people like others to agree with them in general (Jones & Wein, 1972), and are likely to find disagreement with those they dislike more tolerable than disagreement with those they like.

This suggests that when congruence is present in diverse groups (familiar members can support one another, and any unique information comes from strangers), they should be better able to benefit from all the information that is available to them. Congruence reinforces group members' expectations about who should support whom, and frees group members to focus on the task, rather than on solidifying their relationships. When incongruence is present in diverse groups, their members are likely to be distracted by unexpected relationships and may be more concerned with reconciling relationship anomalies than with the

task at hand (Heider, 1958; Newcomb, 1961). To restore balance, the members of such groups may withhold information, diminish its importance during discussion, or disregard information that is not consistent with their expectations (Phillips, 2003). All of these strategies would lead to poorer performance.

When we consider the role of the social outsider in congruent and incongruent groups, additional benefits of congruence can be seen. In diverse groups with incongruent social and knowledge ties, the outsider's information is not unique—it is also known to one of the insiders. Thus, the outsider may not seem especially valuable to the group. But in diverse groups with congruent ties, the outsider may seem more valuable because he or she has unique information. Even if he or she is not liked, the outsider fulfills a need, meets expectations, and is legitimized by providing a different perspective, one that is less likely to disturb the insiders (Crano & Cooper, 1973; Newcomb, 1961). So we hypothesize:

Hypothesis 1. Information will be shared and utilized more effectively in diverse groups with congruent social and knowledge ties than in diverse groups with incongruent social and knowledge ties.

Hypothesis 2. Members will report more effective interaction processes in diverse groups with congruent social and knowledge ties than in diverse groups with incongruent social and knowledge ties.

Hypothesis 3. Performance on a decision-making task will be better in diverse groups with congruent social and knowledge ties than in diverse groups with incongruent social and knowledge ties.

Method

Participants

One hundred-and-two Executive MBA students, representing three classes, participated in this experiment. The students had approximately 10 years of work experience on average and 23% of them were female. Participation in this research was part of their regular classroom experience. Thirty-four three-person groups were created, each containing two familiar students and a stranger. In 16 groups, there was congruence between social and knowledge ties, and in 18 groups, there was incongruence between those ties. Nineteen of the groups were composed of all males, 2 were all female, 11 contained 2 males and a female, and 2 contained 2 females and 1 male.

Social ties

The existence of social ties was determined using data from a Network Questionnaire that students completed approximately one week before the experiment. The questionnaire asked each student to "list the 5 people in the class with whom you are most familiar." On subsequent pages, the names of all of the students in the class were listed and participants were asked to rate how well they knew each person: (1) know well, (2) know moderately, (3) know slightly, and (4) do not know at all.

To classify individuals as "familiars" or "strangers," we used two criteria. First, familiar students were those who named one another on their lists of the most familiar class members. Strangers were assigned to a particular pair of familiar students if neither person listed him/her as one of their most familiar classmates and if their names did not appear on his/her list. Second, familiar students were those whose ratings indicated that they knew one another "well." Ratings of the strangers indicated that they were known either "slightly" or "not at all" by the two familiar members of their group, and ratings by the strangers indicated that they knew those persons only "slightly" or "not at all " (cf. Gruenfeld et al., 1996).

Materials

Every participant was given a packet of evidence from an apparent homicide investigation. The evidence consisted of interviews and a variety of supporting materials, including a list of suspects, a map, a personal note, and a newspaper article. All of these materials were adapted from Stasser and Stewart (1992). Within each group, every member received the list of suspects, transcripts of initial interviews with each of the four key suspects, the newspaper article, and maps of the crime scene and surrounding area. Some information was only given to particular group members. This unique information was embedded in additional interviews and a personal note.

The materials contained 42 clues in all, 12 of which were critical for solving the case. Half of the critical clues were incriminating and half were exonerating. These clues were embedded in follow-up interviews with the key suspects and interviews with some additional witnesses. When all of the critical clues were considered together, it was clear that Suspect 1 was guilty. Two members of each group were given exactly the same (shared) information, creating a knowledge tie between them. The third member was given some (unique) information that the others did not receive. Five of the six exonerating clues for Suspects 2 and 3, and two of the incriminating clues for Suspect 1, served as the unique information. A subset of the critical clues was given to the two group members with the knowledge tie and the remaining critical clues were given to the third member. No matter how the information was distributed, however, the three group members together always possessed all of the critical clues. And in all of the groups, a hidden profile existed. That is, the solution to the

mystery was not likely to be discovered unless the unique information was discussed.

Procedure

The experiment was described as a group decision-making exercise that would help participants to learn more about group dynamics. We began by distributing the materials to participants and giving them 30 min to read and review the information contained there. During this period, no interaction was allowed among group members. Participants then completed a short questionnaire that asked them to "...check the name of the one suspect you believe murdered the victim" and to provide a written rationale for that belief. Afterwards, the participants gathered into their assigned three-person groups. They were given up to 60 min to discuss the case and then decide as a group who committed the murder. All group discussions were recorded, with the participants' permission. Once the group decisions were made, participants individually completed another, longer questionnaire on which they reported the group decision and answered questions regarding group process, performance, and management of information, and their own perceptions of group members and the distribution of information in their group. These questions were all answered using seven-point (1–7) rating scales. Finally, participants were fully debriefed. No one was able to guess our research hypotheses.

Discussion coding

Four coders, blind to the research hypotheses and to the conditions of the groups whose output they reviewed, read and coded transcripts of the group discussions, and noted every time one of the 42 clues was mentioned and by whom it was mentioned. Each transcript was reviewed independently by two coders. Coding reliability was assessed using Cohen's κ. The average κ across the coders was .96 (range .91 to .98), which was significant ($p < .05$) and indicated good reliability. Any discrepancies between coders were resolved through further discussion.

Dependent variables

To measure information sharing, we used the mentioning (at least once) of clues as an indication that they were shared with the group. To measure information utilization, we used the repetition of clues as an indication that they were integrated into the group's decision-making process. Both of these measures are consistent with past research on information sharing in groups (e.g., Stasser & Stewart, 1992; Stasser & Titus, 1985). Our measures of effective interaction process were taken from the second questionnaire. Group members were asked to rate on seven-point (1–7) scales how comfortable they felt, how satisfied they were with the group's performance, how effectively they thought group members worked together, how concerned with "winning" arguments others seemed (reverse-scored), and how comfortable they were expressing disagreement during the group discussion. Finally, to measure group performance, we noted whether or not the group chose the correct suspect.

Results

Preliminary analyses

There was no evidence that the gender of participants, the gender composition of the groups, or particular configurations of clues had any effects on the results, so these variables will not be considered further.

Manipulation checks

To check our manipulation of social ties, participants were first asked which group member (if any) they knew best. Regardless of experimental condition, the two familiar students named each other 95% of the time (62/65), and never named the stranger as the person they knew best. In three instances, one of the familiar persons claimed to know the other two group members equally well. But in each of these instances, the second familiar person reported knowing the other one best. Because only one familiar group member did not acknowledge his or her relationship with the other, we felt that these groups should be retained in the sample. The strangers tended to report (78% of the time) that they were equally (un)familiar with each of the other group members. When the stranger did report knowing one of the other group members better than the other, that person did not reciprocate. These responses, along with the initial network questionnaire, strongly suggested that we successfully manipulated social ties within the groups.

We also checked whether students we classified as familiar were more likely to be named on the network questionnaire than students we classified as strangers. This was important to ensure that familiar and stranger participants did not differ in other important ways that might be confounded with our manipulation. Specifically, we were concerned that the strangers might be less popular or less socially skilled than the familiar students. We compared the number of network ties possessed by students in each category and found that strangers were listed as one of five familiar classmates as often ($M = 5.0$) as familiar students were ($M = 4.8$).

Finally, we asked participants to rate on a seven-point (1–7) scale the extent to which the information they received was the same as the information given to others in their group. We averaged the responses of the two individuals who were given the same information, because they were in the same role in the group. Although most participants recognized that there were differences in their information (most responses were

below the midpoint on the scale), group members who were given the same information ($M = 2.79$, $SD = 1.47$) rated that information as more similar, $t(66) = 1.78$, $p < .05$ (one-tailed), than did group members who were given different information ($M = 2.21$, $SD = 1.19$). We did not expect any differences in these ratings as a function of social ties, because familiar students and strangers shared information equally often across conditions. And, in fact, the two people who knew each other ($M = 2.64$, $SD = 1.38$) perceived their information to be just as different as those who knew no one ($M = 2.52$, $SD = 1.44$).

Information sharing

Our first hypothesis was that information would be shared and utilized more effectively in diverse groups with congruent rather than incongruent social and knowledge ties. There was no significant difference in how many of the 42 clues were mentioned by congruent ($M = 26.5$, $SD = 4.55$) vs. incongruent groups ($M = 25.83$, $SD = 5.78$) ($t < 1$). However, congruent groups ($M = 106.50$, $SD = 34.60$) repeated clues significantly more often, $t(32) = 1.87$, $p < .05$, than did incongruent groups ($M = 84.56$, $SD = 33.88$), providing partial support for our prediction. When we focused only on the unique clues, we again found no significant difference in how many clues were mentioned by congruent ($M = 5.94$, $SD = 1.06$) vs. incongruent groups ($M = 5.44$, $SD = 1.54$). But again, the congruent groups ($M = 26.75$, $SD = 10.80$) repeated those clues significantly more often than did the incongruent groups ($M = 19.94$, $SD = 10.84$), $t(32) = 1.83$, $p < .05$.

We also found that mentioning critical clues was significantly correlated with solving the murder mystery, $r = .39$, $p < .03$. The more critical clues a group discussed, the more likely it was to choose the correct suspect.

Group process

Our second hypothesis was that the members of diverse groups would report better interaction processes when there was congruence rather than incongruence between social and knowledge ties. The five process items were combined into a single scale by averaging ratings ($\alpha = .77$). An analysis of scale scores showed that although most people thought their group process was effective (mean responses were significantly above the midpoint of the response scale), congruent groups ($M = 5.77$, $SD = .56$) reported better group process, $t(32) = 1.83$, $p < .05$, than did incongruent groups ($M = 5.40$, $SD = .65$), just as we predicted.

There was no significant correlation, however, between group process scores and the ability of the groups to solve the murder mystery. The correlation might have been stronger if the range of process scores among the groups had not been so narrow.

Group performance

After reading the materials, but before discussing them in groups, the participants indicated their private beliefs about who committed the murder. There were no significant differences between familiar students and strangers in this regard. About 44% of the participants identified the correct person (Suspect 1) on their own.

Our third hypothesis was that diverse groups with congruent social and knowledge ties would outperform groups with incongruent ties on the decision-making task. Table 1 shows how often groups in the two conditions chose each suspect as the murderer. A logistic regression analysis was conducted because the dependent variable was dichotomous. We controlled for how many group members were correct going into the discussion. This variable proved to be a significant covariate, $\beta = 1.62$ ($SE = .60$), $p < .01$. The more group members who were correct before the group discussion, the more likely the group was to make the correct choice after discussion. And there was a significant effect for congruence, $\beta = 2.03$ ($SE = 1.07$), $p < .05$ (one-tailed), just as we predicted. Although group performance was generally good (about 62% of the groups identified the correct suspect), 75% of the congruent groups were correct, compared with 50% of the incongruent groups (controlling for pre-discussion individual accuracy).

Several other trends encouraged us to examine the performance data further. First, the fact that groups became more likely to choose the correct suspect as the accuracy of their individual members increased is consistent with past research into the impact of group members' initial preferences on group decisions (e.g., Davis, 1973; Hollingshead, 1996; Stasser, Stewart, & Wittenbaum, 1995). Second, we were curious whether congruent and incongruent groups were equally able to capitalize on the accuracy of their individual members.

We split the groups into those containing one or more accurate member(s) and those containing no accurate members. Table 2 relates this variable to group congruence. The table suggests that the reason why incongruent groups did not perform as well as congruent groups is not because the incongruent groups lacked accurate members. Instead, the incongruent groups seemed less able to convert member accuracy into correct decisions, $\chi^2(1, n = 27) = 3.06$, $p < .08$. As the top

Table 1
Experiment 1: group suspect choices as a function of congruence between social and knowledge ties

Social and knowledge ties	Suspect 1	Suspect 2	Suspect 3	Other[a]
Congruent	12	0	1	3
Incongruent	9	1	4	4

[a] Most selections in this category reflect the choice of more than one suspect.

Table 2
Experiment 1: group accuracy as a function of individual accuracy and congruence

	Suspect 1	Others
One or more correct		
Congruent groups	12	1
Incongruent groups	9	5
All incorrect		
Congruent groups	0	3
Incongruent groups	0	4

half of Table 2 shows, when congruent groups contained at least one accurate member, they almost always chose the correct suspect (92%). This was less likely to occur, however, for incongruent groups that contained at least one accurate member (64%). In fact, a closer look at the data showed that incongruent groups often (33% of the time) failed to choose the correct suspect even when two of their members were accurate. This never occurred in comparable congruent groups.

Discussion

The goal of Experiment 1 was to examine the ability of diverse groups with varying social and knowledge ties to share information during decision making. We found that groups worked together and utilized information more effectively when there was congruence rather than incongruence between social and knowledge ties. We also found that congruent groups performed better than incongruent groups—congruent groups chose the correct suspect in the Murder Mystery more often than did incongruent groups. Moreover, a closer look at the ability of groups to capitalize on the knowledge and abilities of their individual members revealed an important difference between congruent and incongruent groups. When one or more group members had already identified the murderer prior to group discussion, congruent groups almost always chose the correct suspect. Incongruent groups did not.

These findings are interesting to consider in terms of the literature on minority influence. None of our participants had minority *opinions*, but some of them did possess unique knowledge that placed them in a kind of minority position vis-a-vis other group members. In previous research, this kind of "knowledge minority" has been found to produce greater cognitive flexibility in the majority (e.g., Nemeth, 1986; Wood, Lundgren, Ouellette, Busceme, & Blackstone, 1994). For example, when newcomers are moved from one work group to another, oldtimers in their new groups become more flexible in their discussions of group issues (Gruenfeld & Fan, 1999; Gruenfeld et al., 2000). Similarly, we found in Experiment 1 that the presence of a stranger who possessed unique knowledge had a positive effect on group performance. But when the person with unique knowledge was socially tied to another group member, his or her presence was less beneficial.

Two important issues arise as a result of our results. First, are these results unique to three-person groups? Such groups only allow for coalitions of two against one during discussions. All of our three-person groups were composed of two familiar students and one stranger, and only one person held unique information. This limits the extent to which we can draw conclusions about the importance of social ties as a variable that is independent of majority/minority status on the one hand, and unique vs. common knowledge on the other hand. According to research on crossed-categorization and faultlines, the presence of two or more incongruent subgroups (each containing one familiar member and one stranger who share the same information) may minimize the salience of social ties and allow groups to focus more on the task than on relationships (e.g., Lau & Murnighan, 1998; Marcus-Newhall, Miller, Holtz, & Brewer, 1993). Of course, congruent groups containing equal-sized subgroups might actually suffer because of their congruence. In this case, there would be two equally sized subgroups, one with familiars and one with strangers. This might lead groups to focus on differences in social ties, be less willing to cooperate with and trust "out-group" members, and hinder group performance (Brewer & Kramer, 1986; Tajfel, 1982; Turner et al., 1987). In Experiment 2, we explored this issue by studying four-person groups.

Second, we have suggested that the most influential aspect of congruence is for socially tied individuals to mutually support one another and validate the importance of one another's information (Crano & Cooper, 1973; Newcomb, 1961). In Experiment 2, we operationalized social ties in a different manner, to generalize beyond interpersonal familiarity to social ties that are based on common group membership—another important aspect of organizational settings. Because familiarity, similarity, and liking tend to be correlated (Moreland & Beach, 1992; Moreland & Zajonc, 1982), common group membership should increase them all and thus operate in the same way as familiarity in Experiment 1.

Experiment 2

The ability of numerical minorities to enhance performance in diverse groups relies on several factors. At the very least, a minority must be willing to voice its knowledge, and the rest of the group must be willing to consider that knowledge. Research has repeatedly shown that single individuals with a minority opinion are more likely to conform than to assert their own position (Asch, 1952; Latane & Wolf, 1981; Tanford & Penrod, 1984) , and that their ability to be influential often depends on such behavioral factors, as persistence and consistency (e.g., Nemeth, 1985; Wood et al., 1994).

We have already suggested that minorities may be willing to behave in these ways when groups are congruent. Experiment 2 was designed to assess another possibility, namely that information-sharing in a diverse group depends on the extent to which social outsiders and/or knowledge minorities have social support (cf. Allen & Levine, 1971; Bragg & Allen, 1972).

Numerical minorities may experience doubts about the validity of their knowledge in incongruent groups when they do not agree with familiar others, as in the incongruent groups from Experiment 1. But a different dynamic may arise in groups that have equal-size subgroups, rather than a minority. As the size of subgroups change, so do the dynamics of social influence (Moscovici, 1976). In a series of studies designed to assess these dynamics, Allen and his colleagues showed that the presence of a social supporter who sided with a minority member reduced conformity significantly, whether the support was given in public or in private (Bragg & Allen, 1972). This effect was attributed to the independent assessment of "reality" that a social supporter can provide for a minority. For this reason, a supporter who seems more knowledgeable is more effective at reducing conformity (Allen & Levine, 1971).

This suggests that in diverse groups of four persons, which contain neither a single social outsider nor a single knowledge minority, there may be more freedom for everyone to share information. In such groups, every member would always have the support of another person, because of the information they share. Indeed, a recent study showed that in four-person groups, there was a significant increase in the proportion of unique information that was mentioned and repeated when that information was given to two group members instead of just one (Schittekatte & Van Hiel, 1996). Unfortunately, the task in that study was judgmental rather than intellective, so no conclusions could be drawn about group performance. We might infer, however, that groups containing equal-sized knowledge subgroups would have a performance advantage. This is also consistent with Laughlin's (1980) work on social combination processes, which shows that when intellective tasks have easily demonstrable solutions, one correct group member is sufficient for the group to find the solution. In contrast, when intellective tasks have solutions that are difficult to demonstrate, a group is unlikely to find the solution unless at least two of its members are correct (cf. Asch, 1952; Laughlin & Ellis, 1986). Each correct member provides social support for the other.

Groups containing equal-sized knowledge subgroups, however, also face the potentially negative effects of in-group/out-group biases, especially when there is congruence between social and knowledge ties. Scholars have suggested that as groups are divided by more differences among their members (such as race, gender, or age differences), they are more likely to be affected by "faultlines" that reduce the ability of group members to work together as a team (Lau & Murnighan, 1998). A large tradition of research on cross-categorization has explored the impact of multiple categorization on how individuals evaluate others. There is some evidence that cross-cutting categorizations can reduce intergroup bias (e.g., Deschamps & Doise, 1978; Vanbeselaere, 1991), but a recent meta-analysis by Urban and Miller (1998) highlighted the variance of outcomes in the literature. They suggest that there are several moderating factors that must be considered, such as the level of personalized interaction, mood valence, and cognitive factors. Eurich-Fulcer and Schofield (1995) identified yet another factor—the degree of correlation between the two categories under consideration—that affects the ability of cross-categories to reduce intergroup bias. Many researchers agree, however, that in theory cross-cutting categories can decrease intergroup bias by reducing the salience and the importance of existing social categories (Brewer & Miller, 1984, 1988; Brown & Turner, 1979; Stephan, 1985; Wilder, 1986). More research, especially that examining interacting decision-making groups, should be conducted to help clarify the situations under which cross-cutting categorizations can benefit teams.

If the reasoning that cross-cutting categorizations reduces intergroup bias is extended to social ties and knowledge, then one might argue that having congruence will actually decrease information sharing and performance in groups that have equal-sized knowledge subgroups instead of a minority. In congruent groups, the presence of a faultline (e.g., two agreeing familiars vs. two agreeing strangers) may decrease the willingness of "in-group" members to consider the perspective of the "out-group," and increase the importance of social ties. In contrast, groups with incongruent social and knowledge ties have "cross-cutting" social categories—there are two equal knowledge subgroups, each containing one familiar person and a stranger. Cross-cutting social and information ties may diminish the salience and importance of maintaining the social ties, so that group members become more willing to share all of their information (Lau & Murnighan, 1998; Marcus-Newhall et al., 1993). For four-person groups, we thus hypothesize:

Hypothesis 4. When groups contain a minority member, there will be more effective interaction processes in groups that are congruent rather than incongruent. In contrast, interaction processes will be less effective in congruent rather than incongruent groups when groups contain two subgroups of equal size.

Hypothesis 5. When groups contain a minority member, performance will be better in groups that are congruent rather than incongruent. By contrast, performance will be worse in congruent rather than incongruent groups when groups contain two subgroups of equal size.

Method

Participants

One hundred and seventy-two MBA students, representing four classes, participated in this experiment. The students had approximately 4 years of work experience on average and 27% of them were female. Participation in this research was part of their regular classroom experience. Forty-three four-person groups were created. Each group contained two familiar individuals and two strangers. Twenty-four groups had congruent ties; 15 of these contained a knowledge minority and 9 did not. Nineteen groups had incongruent ties; 9 of these had a knowledge minority and 10 did not (see Table 3 for a depiction of the design). Thirteen of the groups were composed of all males, 16 groups contained 3 males and 1 female, 12 groups contained 2 males and 2 females, and 2 groups contained 1 male and 3 females. There were no all female groups.

Social ties

The existence of social ties was determined using preassigned study groups in the four classes. Students worked in these groups for five weeks across several different courses (Management, Accounting, and Economics). Experimental groups were composed of two individuals from the same study group (familiars) and two individuals (strangers) whose study groups differed from one another and from those of the familiars. Experimental groups were randomly assigned to the four cells of the research design (see Table 3).

Materials

Every participant was given materials similar to those described earlier (adapted from Stasser & Stewart, 1992). However, we altered the materials slightly to make discovery of the correct suspect more difficult. This was accomplished by strengthening (not adding) clues regarding the motives of the innocent suspects. It should be noted that none of the motive clues was actually relevant to solving the case; the solution relied heavily on physical evidence and comparing different eyewitness reports. None of the critical clues was altered.

Once again there were 42 clues in all, 12 of which were critical for solving the case. Half of the critical clues were incriminating and half were exonerating. When all of the critical clues were considered together, it was clear that Suspect 1 was guilty. Five of the six exonerating clues for Suspects 2 and 3, and two of the incriminating clues for Suspect 1, were treated as unique clues. These were divided into two sets. All packets of materials were identical except for these unique clues. Sets 1 and 2 were distributed among group members as shown in Table 3. If only one group member had a particular information set, then he or she was the minority member. All other group members shared their unique information with at least one other person. No matter how the information was distributed, however, the four group members together always possessed all of the critical clues. And once again, a hidden profile existed in all of the groups.

Table 3
Design of Experiment 2 ($N = 43$ groups)

	Minority		No minority	
Congruent	F_1 F_1 S_1	S_2	F_1F_1	S_2 S_2
Incongruent	F_1 S_1 S_1	F_2	F_1 S_1	F_2 S_2

Note. F represents "Familiar" individuals and S represents "Strangers." The subscripts represent the information sets that individuals held, Information Set 1 or Information Set 2.

Procedure

Again, the experiment was described as a group decision-making exercise that would help participants to learn more about group dynamics. Because of time constraints, participants were given the Murder Mystery materials several days before the key class met, and asked to read those materials before that meeting. During this period, students were unaware of their group assignments, so they could not gather together to discuss the case. And in any event, the participants were instructed not to discuss the materials with anyone. Participants were told that it should take them about 30 min to read the materials and make their own decision about who committed the crime.

When the class meeting began, participants were first given a brief questionnaire to complete. The questionnaire asked them to "...check the name of the one suspect you believe murdered the victim" and to provide a written rationale for that belief. Afterwards, the participants gathered into their assigned four-person groups. They were given up to 45 min to discuss the case and then decide as a group who committed the murder. Because the group discussions occurred during class time and in a limited space, we were not able to obtain recordings of the group discussions. Once the group decisions were made, the participants individually completed another, longer questionnaire on which they reported their group decision and answered questions regarding group process, performance, and management of information, and their own perceptions of group members and the distribution of information in the group. These questions were all answered using seven-point (1–7) rating scales. Finally, the participants were fully debriefed. Again, no one was able to guess our research hypotheses.

Dependent variables

The second questionnaire again provided our measures of effective interaction process. The same five

variables measured in Experiment 1 (how comfortable group members felt (overall and with expressing disagreement), how satisfied they were with the group's performance, how effectively they thought everyone worked together, and how concerned with "winning" arguments others seemed) were included (the last measure was reverse-scored), along with several new variables involving perceptions of each group member. Finally, we again measured group performance by noting whether or not the group chose the correct suspect.

Results

Preliminary analyses

Once again, there was no evidence that the gender of participants, the gender composition of their groups, or the particular configurations of clues had any effects on the results, so these variables will not be discussed further. In the other analyses reported below, changes in degrees of freedom reflect missing data, unless otherwise noted.

Manipulation checks

To check for our manipulation of social ties, participants were asked how well they knew each of the other three members in their group. These ratings were made on seven-point (1–7) scales. Each group member received two scores—how well he or she knew familiar(s) in the group and how well he or she knew stranger(s) in the group.[1] Analyses were conducted at the individual level, first for the familiars and then for the strangers. Familiars were expected to know one another better than they knew strangers, and we expected no difference in how well strangers knew those in the familiar and stranger roles. This was supported by two paired-sample t tests. The first test showed that familiars ($N = 83$ with 3 missing observations) indeed knew other familiars ($M = 5.36$, $SD = 1.34$) significantly better, $t(82) = 8.85$, $p < .001$, than strangers knew them ($M = 3.67$, $SD = 1.02$). As for the strangers, there was no difference in how well familiars ($M = 3.85$, $SD = 1.06$) and strangers knew them ($M = 3.58$, $SD = 1.50$). Thus, participants who were part of the same study group knew each other better than did participants who were not part of the same study group. This gave us confidence that this manipulation, and the manipulation used in Experiment 1, elicited similar expectations because of the social ties present in both cases.

[1] Familiars thus received two scores, namely (a) the average of how well they knew the stranger's, and (b) how well the other familiar knew him or her. Similarly, the strangers received two scores, namely (1) how well the other stranger knew him or her, and (b) the average of how well the familiars knew him or her. The scores and analysis were treated in this way because of the potential interdependence between the ratings of those in the same role (stranger or familiar).

We also asked the participants to rate, on seven-point (1–7) scales, the extent to which the information they received was the same as the information given to others in their group. We expected the minority members (S_2 and F_2 in the "Minority" column of Table 3) to rate their information as significantly less similar to the information of other group members, and that is indeed what we found. Minority members ($M = 2.32$, $SD = 1.13$) rated their information as significantly less similar to the information of others, $t(165) = 4.67$, $p < .001$, than did other group members ($M = 3.74$, $SD = 1.36$). There was no difference between familiars and strangers in this regard.

Group process

An ANOVA examining the effects of (a) social and knowledge tie congruence and (b) a minority information holder on the combined scale score of the five measures of effective group process revealed no significant differences. The mean scores (respectively) were 5.14 and 5.33 for congruent groups with and without a minority, and 5.21 and 5.15 for incongruent groups with and without a minority. The overall mean score was 5.20, with a standard deviation of .48. The results thus failed to support Hypothesis 4.

As in the first experiment, there was no significant correlation between group process scores and the ability of the groups to solve the murder mystery. Again, a stronger correlation might have been found if the range of process scores among the groups had not been so narrow (most participants evaluated their groups very positively).

Group performance

As in the first Experiment, participants stated their private beliefs about who committed the murder after reading the materials, but before discussing them in groups. As expected, these beliefs were similar for familiar participants and strangers, and for knowledge minority and other members. About 33% of the participants identified the correct suspect on their own. Table 4 shows the groups' suspect choices across the four cells of the design.

Table 4
Experiment 2: group suspect choices as a function of congruence between social and knowledge ties and minority knowledge

	Suspect 1	Suspect 2	Suspect 3	Other[a]
Minority				
Congruent	9	4	2	0
Incongruent	1	1	4	3
No minority				
Congruent	3	1	3	2
Incongruent	5	0	2	3

[a] Selections in this category reflect the choice of more than one suspect.

Overall about 40% of the groups identified the correct suspect (Suspect 1). Hypothesis 5 predicted an interaction between group congruence, and the presence of a minority, on this outcome. Again, we conducted a logistic regression analysis, because the dependent variable was dichotomous (correct vs. incorrect), and we controlled for how many group members were correct going into the discussion. This variable proved to be a significant covariate, $\beta = 1.48$ ($SE = .43$), $p < .01$. The more members who were correct before the group discussion, the more likely the group was to make the correct choice after discussion. When the main effects for congruence and presence of a minority were entered into the equation, a significant main effect for congruence was found, $\beta = 1.87$ ($SE = 1.00$), $p < .05$ (one-tailed). Congruent groups (50%) were more likely than incongruent groups (32%) to choose the correct suspect. Finally, the interaction effect was marginally significant, $\beta = 3.84$ ($SE = 2.02$), $p < .06$. Groups with a minority member performed better when they were congruent (60%), $\chi^2(1, n = 24) = 5.53$, $p < .02$, rather than incongruent (11%), as the top half of Table 4 shows. Likewise, incongruent groups with equal-size subgroups (50%) outperformed, $\chi^2(1, n = 19) = 3.32$, $p < .05$ (one-tailed), incongruent groups with a minority member (11%). However, there was no significant difference in the performance of congruent (33%) and incongruent groups (50%) when they had two equal-sized subgroups. Likewise, congruent groups did not differ whether they had equal-size subgroups (33%) or minority members (60%). These results provide partial support for Hypothesis 5.

Subsequent analyses, like those conducted in Experiment 1, examined the ability of groups to capitalize on the accuracy of their individual members. Again, we split the groups into those containing one or more accurate member(s) and those containing no accurate members. Table 5 relates this variable to group congruence and having a minority member. First, looking at groups with a minority member, congruent groups (73%) were better able than incongruent groups (14%) to convert member accuracy into group accuracy, $\chi^2(1, n = 18) = 5.84$, $p < .02$. Likewise, incongruent groups improved their ability to convert individual accuracy into group accuracy when they had equal-sized subgroups (71%) than when they did not (14%), $\chi^2(1, n = 14) = 4.67$, $p < .04$. This table again suggests that the reason why incongruent groups with a minority member did not perform as well as congruent groups, or incongruent groups with equal-size subgroups, is not because the incongruent groups lacked accurate members. Instead, the incongruent groups with a minority member seemed less able to convert member accuracy into correct decisions.

Table 5
Experiment 2: group accuracy as a function of individual accuracy, congruence, and minority knowledge

	Minority		No minority	
	Suspect 1	Other	Suspect 1	Other
One or more correct				
Congruent groups	8	3	2	3
Incongruent groups	1	6	5	2
All incorrect				
Congruent groups	1	3	1	3
Incongruent groups	0	2	0	3

Discussion

Experiment 2 was meant to (a) expand our analysis of congruence to four-person groups; (b) explore the effects of social support in the context of congruence; and (c) examine social ties based on common group membership. The performance results generally supported our prediction. As in Experiment 1, groups with congruent social and knowledge ties were more likely to choose the correct suspect than groups with incongruent ties. Moreover, groups with a minority member were more successful when they maintained congruence than when they did not. In contrast, groups that had two equal-sized subgroups did not differ in performance in the congruent and incongruent conditions. Analyses of the questionnaire data, however, did not support our predictions that perceptions of group process would be most positive for congruent groups with a minority member and for incongruent groups without such a member.

Congruence may have allowed the expectations of group members to be fulfilled, turning their focus away from social relationships in the group and toward the task instead (Phillips, 2003). Familiars expect other familiars to agree with them, whereas disagreement or unique knowledge should come from strangers (e.g., Allen & Wilder, 1975, 1979; Heider, 1958; Jost, Kruglanski, & Nelson, 1998; Phillips, 2003; Wilder, 1984; Wilder & Allen, 1978). The results of Experiment 2 suggest that when familiars do not share the same information (incongruence), the overall performance of the group suffers, but creating equal-sized subgroups can weaken the normative pressures felt by familiars in incongruent situations, thereby improving group performance.

These results also help to clarify our understanding of the interaction between social and knowledge ties. Congruent groups were more successful than incongruent groups at solving the mystery only when there was a minority present. In this case, the minority person was also a social outsider (stranger). Such individuals are similar to a "double minority," because even though they are not advocating a deviant opinion, they are different from others both in the information they possess and in their social standing within the group (Maass, Clark III, & Haberkorn, 1982). Past research on

double or out-group minorities has consistently found that they are less effective at influencing others than are single or in-group minorities (e.g., Clark & Maass, 1988; David & Turner, 1996; Maass et al., 1982; Martin, 1988, 1992; McGuire & McGuire, 1988; Nemeth & Wachtler, 1983). Our results are not consistent with these findings and suggest that there is more complexity in the minority influence process than has yet been considered (Phillips, 2003).

When we moved from groups with a minority member to groups in which everyone had informational support from a second person, things changed. Suddenly, incongruence between social and knowledge ties became a potential advantage for group performance. Groups were better able to convert member accuracy into group accuracy, perhaps because they better utilized all of the information that group members possessed. At this point, we cannot tell whether having equal-sized subgroups helped incongruent groups because there were more individuals to share the unique information (two instead of one in the minority conditions), or because there was less focus on social categorization and more focus on the task in those groups. Research on information sharing, faultlines, and crossed-categorization in groups would suggest that both of these things may have occurred, but it remains an issue for future research (e.g., Gruenfeld et al., 1996; Lau & Murnighan, 1998; Marcus-Newhall et al., 1993).

General discussion

Previous research has demonstrated that groups are often unable to take full advantage of all the information that their members possess. Our research contributes to this stream of work, emphasizing the social psychological factors that can affect the performance of diverse groups. Focusing on information distribution, we have demonstrated some of the ways in which minority influence can be strengthened or weakened. Previous research has shown that single minorities are most influential when they advocate a position consistently and with confidence (Moscovici, Lage, & Naffrechoux, 1969; Nemeth, 1985). Our research shows that the distribution of social and knowledge ties in a group is another important factor in minority influence. When the expectations of members in diverse groups are met through congruence, having someone in the group who is a "double-minority" (both a social and a knowledge outsider) may actually improve group process and performance.

Psychological balance between social and knowledge ties seems to help congruent groups operate more effectively, a conclusion supported by the questionnaire and performance results from Experiment 1. The comfort level felt by all group members in the congruent condition probably allowed them to focus directly on the task, without being distracted by imbalance between social and knowledge ties. We found, for example, that congruent groups repeated clues more often than incongruent groups, suggesting more attention to and better use of information by the congruent groups. We also found that congruent groups were better able to convert inaccurate pre-discussion opinions into accurate solutions, suggesting that these groups were actually integrating information, rather than simply aggregating opinions (cf. Gigone & Hastie, 1993; Gruenfeld et al., 1996).

As both experiments demonstrated, the desire for balance is a strong force, but it is a force that can both help and harm group performance. Congruence in social and knowledge ties allows group members to maintain social order and use an existing cognitive schema as the basis for monitoring information relevant to the task. But as Experiment 2 showed, congruence can also create strong divisions between subgroups, undermining the ability of groups to perform effectively. Congruence was helpful only when a single person had unique information. When there were two knowledge groups of equal size, group performance was not enhanced by congruence. In fact, groups performed slightly better than if they were incongruent rather than congruent. Theoretically, this confirms the importance of cross-categorization and extends the idea of faultlines beyond demographic variables to other factors related to diversity—including knowledge and social ties. The lack of definitive results in this regard suggests that future research is warranted.

Limitations and future research

Our results are limited in ways that suggest some directions for future research. In Experiment 1, for example, the performance results were weaker than in Experiment 2. One reason for this may be that the first murder mystery was too easily solved in the time allocated. Perhaps the mystery was too transparent for Executive MBA students. In Experiment 2 we solved that problem by shortening the time limit and including some misleading (and irrelevant) clues. To better understand group decision processes, researchers should be careful to use difficult tasks that require the complex integration of multiple pieces of information. It might also be useful to directly examine the effects of congruence on different types of tasks, such as intellective tasks vs. judgment tasks (cf. Laughlin & Ellis, 1986). In that way, it would be possible to compare the effects of congruence on information vs. opinion diversity.

In Experiment 1 we were able to obtain and analyze group discussion data. This allowed us to better understand how clues were shared and utilized. Although incongruent groups did not discuss fewer clues than congruent groups, incongruent groups did repeat fewer clues than congruent groups. This suggests that infor-

mation was utilized less effectively by incongruent groups. Unfortunately, because of data collection constraints, we were not able to examine group discussions in Experiment 2. Interesting questions thus remain about the mechanisms by which information is shared and influence exerted in congruent vs. incongruent groups, and in groups with and without a minority member. For example, the behavioral styles of minority members who possess unique information are worth exploring, so that previous work on minority influence can be integrated with work on group composition (Phillips, 2003).

We argued that one of the main ways in which incongruence harms groups is through the distraction it creates. Familiars expect other familiars to agree with them, whereas disagreement (or unique knowledge) should come from strangers. When these expectations are not upheld, group members are distracted from the task, leading to poor group performance. We have some evidence that group processes are indeed less effective in incongruent groups, but this finding was limited to the first experiment. And the performance results from Experiment 2 suggest that incongruence is less problematic when the cross-cutting of subgroup occurs, indicating that other factors are also at work. Because we did not directly assess expectations or levels of distraction, however, further research is clearly needed.

Finally, we focused on a specific type of social tie—familiarity. Although we measured familiarity in different ways in the two experiments, we did not directly examine differences in affect or attraction among group members. What if familiar group members dislike one another or have had negative past experiences? And to what extent might other types of diversity, such as demographic differences, tenure in the group, or divergent values, affect the nature of congruence and the impact of cross-cutting subgroups? Future research might address these issue in ongoing groups and thereby integrate this work with some of the recent research on diversity in teams (e.g., Jehn, Northcraft, & Neale, 1999; Pelled, Eisenhardt, & Xin, 1999).

Practical implications

Our findings have important implications for the common organizational practice of trying to improve work-group performance by infusing groups with members who have diverse knowledge and perspectives. In organizational settings, broadening a group's knowledge and perspectives can be advantageous, especially when complex problems must be solved. Many theorists have argued that knowledge diversity can improve group performance by enhancing a group's ability to be creative, discover novel solutions, and search for even more information (Damon, 1991; Jehn, 1995; Levine, Resnick, & Higgins, 1993; Nemeth, 1986; Nemeth & Rogers, 1996). Our findings indicate, however, that the mere presence of diverse information may not guarantee such benefits. The information must be shared and then integrated during group discussions for it to have an influence on group decisions.

Common sense suggests that unique information is more likely to be shared and integrated during group discussion if it is held by a social insider, and by more than just one person. Yet our findings show that such information is more likely to be used if it is held by a social outsider, especially if he or she is alone. Social insiders with unique information seem to be less effective at sharing their information with a group, and they may be more comfortable with disruption in their social ties when it occurs to both of them rather than just one of them. These findings have important implications for the integration of social outsiders into work groups, as well as the groups to which they want to contribute. The constellation of ties within a group clearly plays an important and complex role in group performance.

Groups with congruent social and knowledge ties may find that they work most effectively when there is a core group of familiars who have similar knowledge, and a smaller, peripheral set of temporary members who have unique or specialized knowledge. These specialists could rotate in and out of the group on an "as needed" basis. Social outsiders who have unique knowledge often experience intense, unpleasant social pressure (Levine, 1989; Nemeth, 1986). Social outsiders not only experience pressure to fit into the group, but also pressure to prove their competence, and to demonstrate that they can contribute something of value. If social outsiders were explicitly brought in as experts, and not expected to become permanent group members, then that might alleviate some of the pressures they experience and enable the group to perform more effectively.

When there are informational subgroups, information is most transparent if subgroup members have social ties to members of other informational subgroups. This may reflect what some managers have already discovered—the performance of cross-functional teams is enhanced when social ties are developed in ways that make them orthogonal to informational ties that exist among workers with similar expertise. Thus, providing marketing and engineering specialists with adjacent offices can enhance information exchange, perhaps far beyond what would occur through task demands or organizational imperatives alone. The question of "who knows what" in groups is one that requires more attention from researchers, for the sake of understanding the social psychological factors that affect diverse groups, and to determine the factors that influence the performance of work teams in organizations.

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