Journal of Personality and Social Psychology
1998, Vol. 74, No. 2, 371-377

Copyright 1998 by the American Psychological Association, Inc.
0022-3514/98/$3.00

Information Pooling: When It Impacts Group Decision Making

Jennifer R. Winquist and James R. Larson, Jr.
University of Illinois at Chicago

Three-person groups decided which of 2 professors was nominated for a teaching award. Prior to discussion, half of the information available for this decision was given to every group member (shared information), whereas the rest was evenly divided among them (unshared information). Further, this information was distributed in such a way that the correct choice was not obvious to members prior to discussion. As predicted, discussion focused more on members' shared than unshared information. However, decision quality was affected only by the amount of unshared information discussed and by member's prediscussion choice preferences. The amount of shared information discussed did not affect decision quality. These results suggest a dual-process model of how the prediscussion distribution of decision-relevant information impacts group decision-making effectiveness.

Important decisions in everyday life are frequently left to groups rather than individuals under the assumption that groups can bring more intellectual resources to bear on a problem, thereby increasing the probability that a high quality decision will result. One such resource is the diverse store of information that group members hold. Because of differences in training, experience, role demands, and the like, members may often hold a certain amount of decision-relevant information that others in the group do not possess. We refer to this uniquely held knowledge as *unshared information,* and contrast it with the *shared information* that every group member holds. By pooling their unshared information, groups have at least the potential for making a more informed choice than would otherwise be the case were the decision left to any single individual.

Despite its potential benefits, however, there is a growing body of evidence to suggest that groups actually pool much less of their unshared information during open group discussion than they do of their shared information (e.g., Larson, Christensen, Abbott, & Franz, 1996; Larson, Foster-Fishman, & Franz, in press; Larson, Foster-Fishman, & Keys, 1994; Stasser, Taylor, & Hanna, 1989; Stasser & Titus, 1985, 1987). Furthermore, when their shared and unshared information have different decisional implications, the choice alternative eventually selected by the group tends to be the one implicated by their shared information (e.g., Christensen et al., 1997; Larson, Christensen, Franz, & Abbott, in press; Stasser & Titus, 1985). This tendency poses a significant threat to the quality of group decision making anytime members' shared information points to a suboptimal choice alternative—the very situation in which the potential benefits of group decision making ought to be greatest.

Jennifer R. Winquist and James R. Larson, Jr., Department of Psychology, University of Illinois at Chicago.

We would like to thank Jon Ratzel and Marion Serwe for their assistance in conducting this research.

Correspondence concerning this article should be addressed to Jennifer R. Winquist, Department of Psychology (m/c 285), University of Illinois at Chicago, 1007 West Harrison Street, Chicago, Illinois 60607-7137. Electronic mail may be sent to winquist@uic.edu.

The Uncertain Role of Information Pooling

The tendency of groups to pool more of their shared than unshared information during discussion appears to be a direct consequence of the prediscussion distribution of that information. Specifically, because only one member need mention a given item of information to bring it to the attention of the group as a whole, the more members there are who can mention that item, the more likely it is that that item will in fact be discussed. Thus, shared information is more readily pooled than unshared information because more members are potentially able to mention it (cf. Larson, 1997; Stasser & Titus, 1987).

Less clear, however, is why the decisions eventually made by groups also tend to favor their shared rather than unshared information. Gigone and Hastie (1993) identified two possibilities. One is that group decisions simply reflect the content of discussion. That is, groups may tend to make decisions favoring their shared information because they are better able to pool their shared information and because pooled information has a strong influence on group decision making. From this perspective, group discussion is mainly a venue for informational influence, in which judgments about the appropriate course of action are shaped by the evidence and arguments brought to light (cf. Bernstein, 1982; Kaplan & Miller, 1987). Most research concerned with the discussion of shared and unshared information by decision-making groups has proceeded from this point of view (see especially Stasser & Stewart, 1992).

The other possibility identified by Gigone and Hastie (1993) is that group decisions reflect little more than members' prediscussion preferences. That is, groups may tend to make decisions favoring their shared information because shared information can influence every member's prediscussion choice preference whereas unshared information cannot, and because it is the overall pattern of prediscussion preferences that ultimately determines the decisions groups make. From this perspective, group discussion is mainly an occasion for normative influence, in which members negotiate the weighting of their varying prediscussion opinions (cf. Davis, 1973, 1996). It is important to note that information pooling during discussion is presumed to

have no additional impact on group decision making beyond the impact of that information on members' prediscussion preferences. Thus, group discussion and group decision making are seen as collateral phenomena with a common cause (the prediscussion distribution of information among group members) but no causal connection between them.

Gigone and Hastie (1993, 1997) have conducted the only empirical studies designed to test between these two explanations for the greater decisional impact of shared information. They had three-person groups either estimate the course grades received by 32 psychology students or decide which member of 32 pairs of students received the higher grade, on the basis of several pieces of background information (e.g., each student's high school grade point average, class attendance, self-rated enjoyment of the class). Prior to discussion, some of this information was given to all three group members (completely shared), some was given to two members (partially shared), and some was given to just one member (unshared). As in other studies, it was found that the more widely shared a piece of information was (a) the more often it was pooled during discussion and (b) the stronger its impact on group decision making. Further, more widely shared information had a stronger impact on decision making even when controlling for whether or not it was pooled. This indicates that information pooling is not a necessary condition for the prediscussion distribution of information to affect group decision making. However, it does not rule out the possibility that information pooling may partially mediate this effect.[1] Moreover, in the few cases (5 percent) observed by Gigone and Hastie (1997) where an initial prediscussion majority was overturned, unshared information had a stronger impact than shared information. This latter result hints that the role of information pooling may be more complex than either of the models described above suggest.

When Information Pooling Matters

Gigone and Hastie's (1993, 1997) work calls attention to an alternative means by which the prediscussion shared–unshared distribution of problem-relevant information can impact group decision making: through members' prediscussion choice preferences. Further, their findings indicate the need for a conceptual analysis of the role of information pooling in group decision making that takes those prediscussion preferences into account. We offer such an analysis here, making use of the following example.

Consider a group that is faced with a choice between two mutually exclusive courses of action. A majority of the available information bearing on this decision favors one course of action over the other, a course that we define as the *objectively best choice alternative.* Assume that each group member is aware of some, but not all, of the available information prior to discussion. It is important that, whereas certain items of information about each course of action are known to all group members (shared information), others are known to only one member or another (unshared information). In the aggregate, however, the group collectively possesses all of the available information about both choice alternatives.

Now, suppose that the subset of information known to each group member prior to discussion is not representative of the full set of information available to the group as a whole. This means that the decisional implication of each member's subset differs from that of the full set. This might happen, for example, if a majority of the information favoring the best choice alternative was unshared and thus widely dispersed among members. Under these conditions, the information pointing to the best course of action would be diffuse, making its decisional implications impossible for any one member to appreciate. As a result, members' prediscussion preferences would not be likely to favor the best choice alternative. Such situations are said to have a *hidden profile,* because the best choice alternative is hidden from members as they consider their prediscussion information (Stasser, 1988).

It is precisely when a hidden profile exists that information pooling during discussion is likely to impact group decision making. However, this will be true only for unshared information. The more unshared information members pool, the more they will expose one another to facts that most were not aware of originally, and the more likely it is that the overall pattern of support for the two choice alternatives will become evident to all. By contrast, pooling shared information should make relatively little difference, because doing so can at best only remind members of information that they were already aware of and that they presumably took into account when forming their prediscussion choice preferences.

The situation is different, however, when a hidden profile does not exist. That is, suppose the subset of information known to each member prior to discussion is representative of the full set of information available to the group as a whole, so that the decisional implication of each member's subset is identical to that of the full set. This would occur if the information favoring the best choice alternative was just as likely to be shared as unshared information prior to discussion. In this case, despite not having access to all of the available information, each member's prediscussion preference should still favor the best choice alternative. As before, pooling unshared information during discussion will expose members to facts that most were unaware of previously, whereas pooling shared information will not. In this case, however, the pooled unshared information will not change the apparent balance of support for the two choice alternatives, because by definition that balance will be the same in the shared and unshared information. Consequently, when a hidden profile does not exist, the pooling of neither shared nor unshared information should affect the decisions groups make.

The Present Study

This analysis suggests that group decision making should be affected by the amount of unshared information pooled during

[1] Gigone and Hastie (1993, 1997) did not perform the relevant statistical test necessary to assess this possibility. Specifically, they did not test whether when controlling for information pooling, the effect of the prediscussion distribution of information was significantly diminished. If it was diminished, even though not completely eliminated, then partial mediation would be concluded (Baron & Kenny, 1986). Also relevant, when controlling for the prediscussion distribution of information, Gigone and Hastie (1993) did find that more frequently pooled information had a greater impact on group judgments.

discussion but not by the amount of shared information pooled, and then only when a hidden profile exists. The present study provides a partial test of this idea. Three-person groups decided which of two professors was nominated for a teaching award on the basis of written comments allegedly taken from the student evaluations of courses taught by those professors. Half of these comments were shared information prior to discussion and half were unshared, with most of the unshared information favoring the better choice alternative. Further, these comments were distributed in such a way that each group member initially held an equal amount of information favoring each professor. Thus, a hidden profile was created that did not at the same time bias members' prediscussion preferences toward the less desirable choice alternative (cf. Stasser & Titus, 1985). We predicted that groups would pool (discuss) more of their shared than unshared information overall. However, we also predicted that the more unshared information groups pooled, the more likely they would be to select the better choice alternative. Further, we expected that the amount of shared information they pooled would be unrelated to selecting the better choice alternative.

Method

Design and Participants

A 2 (biology vs. history case) by 2 (shared vs. unshared prediscussion information distribution) mixed-factorial experimental design was used, in which information distribution was a within-groups factor. Participants were 102 male and 102 female undergraduate students who were organized into 68 three-person same-sex groups. The students received credit in their introductory psychology course for participating.

Task and Materials

The task used in the study is referred to as the Silver Circle Teaching Award (SCTA) task. It requires three-person groups of students to decide which of two hypothetical professors was nominated for the SCTA on the basis of written comments allegedly taken from the student evaluations of courses taught by those two professors. Participants were told that one of the professors was nominated for the teaching award, whereas the other professor, although demographically similar to the nominee, had never been nominated for the award.

Participants individually studied two lists of course evaluation comments, each pertaining to one of the two professors, and then met in 3-person groups to decide which professor was most likely to have been the SCTA nominee. The study lists were drawn from two master lists, or profiles, each containing 12 comments. One profile consisted of 10 positive (e.g., "He was genuinely interested in my progress") and 2 negative (e.g., "[Name] was really sarcastic") comments. The other consisted of 6 positive and 6 negative comments. These profiles were constructed so as to create two realistic choice alternatives, with one being clearly better than the other when all of the comments were considered.

Six of the 12 comments about each professor were included in the study lists given to all 3 group members and were thus shared information. The remaining 6 comments about each professor were divided among the study lists given to members and were thus unshared information. Within these constraints, each study list was constructed so as to contain the same balance of positive and negative comments. Specifically, each member received 6 positive (4 shared, 2 unshared) and 2 negative (both shared) comments about the correct professor (i.e., the one whose profile contained more positive and fewer negative comments overall), and 6 positive (all shared) and 2 negative (both unshared) comments about the incorrect professor. Thus, even though the group collectively held clear evidence favoring one professor over the other, before discussion each member should have perceived the two professors as about equally likely to have been the SCTA nominee.

To ensure that the obtained results were not due to the specific content of the student comments, two versions of the task were used. One allegedly involved two biology professors, whereas the other involved two history professors. Different sets of comments were used for each. However, the amount of information available about the two professors, and the overall way in which that information was distributed among group members, was the same in both cases. Thirty-three groups decided the biology case and 35 decided the history case.

Procedure

When they first arrived, participants were told that the purpose of the experiment was to see whether students can determine which of two professors was nominated for a teaching award on the basis of comments drawn from the student evaluations of courses taught by those professors. A cover story was provided that linked the SCTA task to the course evaluations published by the university's student government. Participants were told that after an individual study period, they would be formed into 3-person groups and asked to decide which of the two professors was the SCTA nominee.

Next, the lists of student course evaluation comments were randomly distributed, and participants were given 5 min to study them privately. Participants were cautioned to study the lists carefully because they would not be able to refer to them once their group discussion began. They were also warned that some of the comments they read about each professor might be different from comments read by other participants. It was explained that this was being done to simulate the real world, where people often enter into group discussions with somewhat different background information. At the end of the study period, participants privately rated how likely each professor was to have been the SCTA nominee.

We then assembled 3-person groups. These groups were led to separate discussion rooms where they were given up to 20 min to decide as a group which professor was the SCTA nominee. The experimenter was not present during these discussions. The discussions were recorded by means of an audiotape recorder placed in plain view of the group members. At the end of discussion, each group recorded its decision and was debriefed.

Discussion Coding

Two research assistants who were unaware of the study hypotheses independently listened to the audiotaped group discussions and coded every course evaluation comment that was mentioned. To be coded, statements had to be unambiguously understood to refer to a single comment and professor. Remarks that could refer to more than one comment or professor were not coded. Negations were also not coded (e.g., "My list didn't say anything about him being sarcastic" would not be coded). Finally, repetitions of the same comment were coded, but only when separated by other conversation (i.e., immediate echoes were ignored). Each coder listened to approximately two thirds of the biology discussions and two thirds of the history discussions, with 24 discussions coded twice. These twice-coded discussions were used to assess intercoder reliability (reported in parentheses in the following paragraph). Once these reliabilities were determined, coder disagreements were resolved by referring back to the audiotape recordings.

Dependent Measures

The dependent measures of primary interest were the group members' prediscussion ratings of how likely each professor was to have been the

SCTA nominee, the proportions of shared (r = .92) and unshared (r = .95) course evaluation comments pooled during discussion (i.e., the number of shared and, separately, unshared items mentioned at least once, each divided by 12), and the group's final decision about which professor was the SCTA nominee. In addition, we analyzed the extent to which already-pooled shared (r = .91) and unshared (r = .69) information was repeated. (The lower-than-expected reliability for the latter measure appears to have been due to range restriction.)

Results

Member Prediscussion Preferences

Before discussion, each participant privately rated on separate scales the likelihood that each professor was the SCTA nominee (1 = *not at all;* 9 = *extremely likely*). From these, a single 17-point prediscussion preference index was constructed for each participant by subtracting from the rating given to the correct professor the rating given to the incorrect professor. Because participants eventually assigned to the same group studied different (though overlapping) pairs of course evaluation comment lists, we examined whether the means for participants given different pairs of study lists differed significantly from one another and whether the means for participants receiving the same pair of lists differed significantly from 0 (i.e., the point of indifference). For the history case, the means for participants given different pairs of study lists did not differ significantly from one another ($F < 1$) nor were any of them significantly different from 0, $t(34) < .82$, for each. For the biology case, on the other hand, a one-way analysis of variance and post hoc Tukey's tests revealed that the mean for participants given one pair of study lists ($M = -1.06$, $SD = 3.41$) did differ significantly from the mean for participants given one other pair of lists ($M = 1.06$, $SD = 2.89$), $F(2, 96) = 4.62$, $p < .05$, with the mean for participants given the third pair of lists being intermediate between, and not significantly different from, these two ($M = 0.61$, $SD = 2.59$). Note, however, that the two means that are significantly different from one another are on opposite sides of the scale midpoint, indicating a tendency for these participants to have opposing preferences. Further, only the latter of these two means is by itself significantly different from 0, $t(33) = 2.11$, $p < .05$. Thus, participants did not appear to have a strong, uniform predisposition toward preferring one choice alternative over the other, indicating that, as intended, we were relatively successful in creating a hidden profile that did not at the same time systematically bias members toward the less desirable choice alternative. It is important to note, however, that although there was little evidence of a systematic preference across participants for one choice alternative over the other prior to discussion, there nevertheless was a good deal of variability in participant preferences, and, as will be seen, this variability significantly predicted the choices that groups eventually made.

Pooling Shared and Unshared Information

We predicted that groups would pool more of their shared than unshared information. This hypothesis was tested by using a 2 × 2 mixed-design analysis of variance, in which case (biology vs. history) was a between-groups factor and the prediscussion distribution of information (shared vs. unshared) was a within-groups factor. This analysis revealed a significant information distribution main effect, $F(1, 66) = 10.58$, $p < .002$. As predicted, groups mentioned a larger percentage of their shared than unshared information in both the history (shared: $M = 0.30$, $SD = 0.21$; unshared: $M = 0.24$, $SD = 0.15$) and biology (shared: $M = 0.33$, $SD = 0.21$; unshared: $M = 0.24$, $SD = 0.15$) case. The simple main effect of information distribution was significant in both cases ($p < .05$ in each). Neither the case main effect nor the Case × Information Distribution interaction approached significance, $F(1, 66) < 1.00$, *ns*, for each. Thus, information distribution affected both cases in about the same way. Because completely different course evaluation comments were used in the two cases, it seems unlikely that these results were due to some unique feature of the content of the shared versus unshared information.

Repeating Shared and Unshared Information

Besides being more readily pooled, previous research has found that shared information is often repeated more than unshared information (e.g., Larson et al., 1994; Larson et al., 1996; Stasser et al., 1989). To determine whether this occurred in the present study, we counted the number of times shared and (separately) unshared information was repeated, and divided the totals by the number of shared and unshared items, respectively, that were mentioned at least once. This yielded a per-mentioned-item repetition rate for both shared and unshared information.

A 2 × 2 mixed-design analysis of variance revealed a significant information distribution main effect, $F(1, 54) = 9.28$, $p < .01$.[2] Consistent with prior research, in both the history (shared: $M = 0.56$, $SD = 0.45$; unshared: $M = 0.28$, $SD = 0.36$) and biology case (shared: $M = 0.34$, $SD = 0.31$; unshared: $M = 0.26$, $SD = 0.34$) already mentioned shared information was repeated more often than already mentioned unshared information. Neither the case main effect nor the Case × Information Distribution interaction were significant in this analysis. However, the simple main effect of information distribution was statistically significant in the history case only ($p < .01$). Thus, although the means were in the expected direction in both cases, the effect of prediscussion information distribution on the repetition of shared and unshared information appears to have been stronger in one case than in the other.

The Decisional Impact of Information Pooling

The foregoing results indicate that the group discussions focused more heavily on members' shared than unshared information. Of primary interest in the present study was the extent to which this differential focus impacted the quality of the group decisions. We predicted that the more unshared information groups pooled, the more likely they would be to select the better choice alternative. By contrast, pooling more shared information was not expected to affect the group decisions.

Across both cases, 41 groups selected the correct professor and 27 selected the incorrect professor. To assess the decisional

[2] Twelve groups mentioned no unshared information at all and are therefore not included in this analysis. This explains the lower-than-expected degrees of freedom.

impact of information pooling, we used the proportions of shared and unshared information mentioned during discussion to predict decision accuracy (1 = *correct;* 0 = *incorrect*) in a standard logistic regression analysis; $LR\ \chi^2\ (2, N = 68) = 7.90$, $p < .02$. This analysis revealed a significant effect only for unshared information; standardized maximum likelihood estimate (*smle*) = 0.43, $\chi^2\ (1, N = 68) = 6.11$, $p < .02$, for unshared information; *smle* = −0.05, $\chi^2\ (1, N = 68) = 0.09$, *ns,* for shared information. Groups that eventually chose the correct professor pooled significantly more of their unshared information ($M = 0.28$, $SD = 0.14$) than groups that chose the incorrect professor ($M = 0.18$, $SD = 0.15$). Even when it was the only predictor in the model, the effect for pooling shared information was not significant; *smle* = 0.14, $\chi^2\ (1, N = 68) = 1.00$, *ns.*

To determine whether the pooling of unshared information influenced group decision making above and beyond the impact of the group members' prediscussion preferences, we performed a hierarchical logistic regression analysis in which a single index of the group's prediscussion preference was entered first, followed by the proportions of shared and unshared information mentioned at least once. The group prediscussion preference index was computed from the members' prediscussion preference indexes by using Davis's (1996) social judgment scheme model. This model estimates a group's collective response on a continuous judgment scale (such as the prediscussion preference index) on the basis of the individual responses of its members and does so in a way that gives greater weight to those responses that are more central in the distribution of member responses. This differential weighting scheme is consistent with a variety of theories of social influence and, absent an exchange of unshared information, has been shown to be a better predictor of actual group judgments than other combinatorial schemes (see Davis, 1996, for a review). The social judgment scheme model is defined as:

$$G = \sum_{j=1}^{n} c_j x_j, \tag{1}$$

where G is the predicted group response, x_j is the jth member's response, c_j is a weight given to the jth member's response, and n is the total number of members in the group. c_j is defined as:

$$c_j = \frac{\sum_{j'=1}^{n} e^{-\theta(|x_j - x_{j'}|)}}{\sum_{j=1}^{n}\sum_{j'=1}^{n} e^{-\theta(|x_j - x_{j'}|)}}, j \neq j', \tag{2}$$

where e is the base of the natural logarithms (2.7183), and θ is a positive constant. In the research described by Davis (1996) and Davis et al. (1993), θ was set to 1.00. This was also done in the present study.

As noted above, although there was no systematic tendency across participants to favor one professor over the other prior to discussion, there nevertheless was variability in the participants' prediscussion preferences, and when aggregated to the group level those preferences accounted for a significant amount of variance in the final group decisions, *smle* = 1.86, $\chi^2(1, N = 68) = 15.76$, $p < .01$. It is important to note, however, that even when controlling for these prediscussion preferences, the amount of unshared information pooled was still a significant predictor of group choice, *smle* = .75, $\chi^2(1, N = 68) = 6.32$, $p < .02$, whereas the amount of shared information pooled was not. Thus, even after controlling for the effect of prediscussion preferences, the pooling of unshared, but not shared, information impacted group choice.

Finally, in an exploratory analysis we also examined whether the repetition of shared or unshared information, or both, accounted for any additional variance in group choice when added to the logistic regression model. Neither variable did so.

Discussion

Consistent with previous research, the present study found that groups both pooled and repeated more of their shared than unshared information during discussion. As predicted, however, only the pooling of unshared information significantly influenced the quality of their decisions. The more unshared information groups pooled, the more likely they were to select the better choice alternative, even when controlling for members' prediscussion choice preferences. In contrast, the amount of shared information groups pooled did not influence which choice alternative they selected.

These results, in conjunction with those reported by Gigone and Hastie (1993, 1997), suggest a dual-process model of how the prediscussion shared–unshared distribution of decision-relevant information impacts group decision making. This model posits two key mediating variables: the prediscussion choice preferences of group members, and information pooling during discussion. The model holds that the impact of shared information on group decision making is mediated primarily by members' prediscussion preferences, whereas the impact of unshared information is mediated primarily by group discussion.

Consider first the mediational role of members' prediscussion choice preferences. Because shared information is more widely distributed prior to discussion, it has greater opportunity than unshared information to affect the overall pattern of prediscussion preferences across members. To the extent that group decisions are influenced by such preference patterns (e.g., Davis, 1973, 1996), shared information should have greater decisional impact than unshared information even in the absence of discussion. The findings reported by Gigone and Hastie (1993, 1997) support this portion of the model.

Group discussion provides an opportunity to counteract this initial imbalance in informational influence. When discussing their unshared information, members expose one another to facts that most were not aware of originally, thus giving that information wider currency and so greater opportunity than before to affect the choice preferences of everyone in the group. This stands in contrast to discussing their shared information, which already had a chance to influence every group member. Thus, whereas shared information can exert greater influence prior to discussion, unshared information has greater influence potential during discussion.

However, despite its potential for exerting influence during discussion, the dynamics of information pooling tend to limit the discussion, and hence decisional impact, of unshared infor-

mation. In comparison with shared information, unshared information is less likely to be pooled during group discussion simply because there are fewer members who potentially can mention it (Larson, 1997; Stasser & Titus, 1987). Consequently, groups often fail to discuss a significant portion of their unshared information, with the result that such information does not get the opportunity to exert all of the decisional influence it is potentially capable of exerting. Shared information should therefore have greater decisional impact than unshared information not only because of its greater effect on members' prediscussion preferences, but also because unshared information is not adequately pooled during discussion. Said differently, the dual-process model posits that both common knowledge (prior to discussion) and biased information pooling (during discussion) contribute to the greater decisional influence of shared information.

There are, however, at least three boundary conditions that delimit the circumstances within which the dual-process model is expected to hold. First, and as suggested above, it should hold only when a hidden profile exists, that is, when the decisional implications of members' shared and unshared information differ. When, on the other hand, a hidden profile does not exist, pooling unshared information will not alter the apparent pattern of evidence supporting the various choice alternatives, and so should not affect the decisions groups eventually make.

Second, the mediational influence of group discussion should be strongest when, as in the present study, members do not have uniform prediscussion preferences favoring one particular choice alternative. Dissensus of opinion prior to discussion gives the information that is pooled during discussion the greatest possible opportunity to influence group decision making. That no such influence was observed for pooled shared information in the present study, even in this seemingly optimal environment, adds emphasis to our conclusion that the discussion of shared information should have little impact on group decision making over and above its impact prior to discussion (i.e., by means of members' prediscussion choice preferences).

Finally, the dual-process model assumes that information has its primary influence on members at the time it is first encountered. This assumption seems reasonable as long as the decision-making task involves items of information that are relatively independent of one another with respect to their meaning and importance. In particular, although the impact of the various pieces of information may be affected by the order in which they are encountered (e.g., Hogarth & Einhorn, 1992), later encountered information should not influence the perceived significance of earlier encountered information. If, on the other hand, the available information is configural, with certain items taking on new meaning or importance when cast in relation to certain other items, it is quite conceivable that later encountered (i.e., during discussion) information might dramatically alter the impact of earlier encountered (i.e., prior to discussion) information. Under such circumstances group decision-making effectiveness should be related to the pooling of shared as well as unshared information. The pooling of shared information should become important here because this action increases the probability that members will consider that information in relation to the pooled unshared information, and so come to perceive whatever configural meaning the two types may jointly contain.

In addition to testing these boundary conditions, the results of the present study suggest two other directions for further research. First, researchers need to better understand those factors that affect information pooling, especially the pooling of unshared information. It is clear that the prediscussion distribution of information among group members is one important factor, but it cannot be the only one. As Stasser and Titus (1987) suggest, other factors are likely to bear on members' ability to recall the information and on their motivation and opportunity to participate in discussion (see Stasser, 1992; Wittenbaum & Stasser, 1996, for relevant reviews).

Second, if we are correct in our supposition that the dual-process model holds only when a hidden profile exists, then there is a need to better understand the frequency with which hidden profiles occur in natural field settings, as well as the social and organizational factors that give rise to them. Although it is clear that in everyday decision-making groups members frequently possess a mix of shared and unshared information, it less clear how often that mix is systematically biased such that the unshared information favors a better choice alternative than does the shared information. Shedding light on the frequency and causes of naturally occurring hidden profiles would provide useful information about the external validity of this entire area of research.

In sum, building on the work of Gigone and Hastie (1993, 1997), the present research offers a more complex view of how the prediscussion distribution of information among group members impacts group decision-making effectiveness. This view suggests a dual-process model in which members' prediscussion choice preferences and information pooling during group discussion have different mediational roles. The present study tested this model only in part. There is a need for further research not only to test more completely the model's main propositions and underlying assumptions, but also to better understand the situational variations within which the pooling of information during discussion is most likely to impact the decisions that groups eventually make.

References

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173–1182.

Bernstein, E. (1982). Persuasion as argument processing. In H. Brandstatter, J. H. Davis, & G. Stocker-Kreichgauer (Eds.), *Group decision making* (pp. 103–124). London: Academic Press.

Christensen, C., Larson, J. R., Jr., Abbott, A., Ardolino, A., Franz, T., & Pfeiffer, C. (1997). *Decision making of clinical teams: Communication patterns and diagnostic error.* Manuscript submitted for publication, University of Hartford, Hartford, Connecticut.

Davis, J. H. (1973). Group decision and social interaction: A theory of social decision schemes. *Psychological Review, 80,* 97–125.

Davis, J. H. (1996). Group decision making and quantitative judgments: A consensus model. In E. Witte & J. H. Davis (Eds.), *Understanding group behavior: Consensual action by small groups* (Vol. 1, pp. 35–59). Mahwah, NJ: Erlbaum.

Davis, J. H., Stasson, M. F., Parks, C. D., Hulbert, L., Kameda, T., Zimmerman, S., & Ono, K. (1993). Quantitative decisions by groups and individuals: Voting procedures and monetary awards by mock civil juries. *Journal of Experimental Social Psychology, 29,* 326–346.

Gigone, D., & Hastie, R. (1993). The common knowledge effect: Infor-

mation sharing and group judgment. *Journal of Personality and Social Psychology, 65,* 959–974.

Gigone, D., & Hastie, R. (1997). The impact of information on small group choice. *Journal of Personality and Social Psychology, 72,* 132–140.

Hogarth, R. M., & Einhorn, H. J. (1992). Order effects in belief updating: The belief-adjustment model. *Cognitive Psychology, 24,* 1–55.

Kaplan, M. F., & Miller, C. E. (1987). Group decision making and normative vs. informational influence: Effects of type of issue and assigned decision rule. *Journal of Personality and Social Psychology, 53,* 306–313.

Larson, J. R., Jr. (1997). Modeling the entry of shared and unshared information into group discussion: A review and BASIC language computer program. *Small Group Research, 28,* 454–479.

Larson, J. R., Jr., Christensen, C., Abbott, A. S., & Franz, T. M. (1996). Diagnosing groups: Charting the flow of information in medical decision making teams. *Journal of Personality and Social Psychology, 71,* 315–370.

Larson, J. R., Jr., Christensen, C., Franz, T. M., & Abbott, A. S. (in press). Diagnosing groups: The pooling, management, and impact of shared and unshared case information in team-based medical decision making. *Journal of Personality and Social Psychology.*

Larson, J. R., Jr., Foster-Fishman, P. G., & Franz, T. M. (in press). Leadership style and the discussion of shared and unshared information in decision-making groups. *Personality and Social Psychology Bulletin.*

Larson, J. R., Jr., Foster-Fishman, P. G., & Keys, C. B. (1994). The discussion of shared and unshared information in decision-making groups. *Journal of Personality and Social Psychology, 67,* 446–461.

Stasser, G. (1988). Computer simulation as a research tool: The DISCUSS model of group decision making. *Journal of Experimental Social Psychology, 24,* 393–422.

Stasser, G. (1992). Pooling of unshared information during group discussion. In S. Worchel, W. Wood, & J. A. Simpson (Eds.), *Group process and productivity* (pp. 48–67). Newbury Park, CA: Sage.

Stasser, G., & Stewart, D. D. (1992). Discovery of hidden profiles by decision-making groups: Solving a problem versus making a judgment. *Journal of Personality and Social Psychology, 63,* 426–434.

Stasser, G., Taylor, L. A., & Hanna, C. (1989). Information sampling in structured and unstructured discussions of three- and six-person groups. *Journal of Personality and Social Psychology, 57,* 67–78.

Stasser, G., & Titus, W. (1985). Pooling of unshared information in group decision making: Biased information sampling during discussion. *Journal of Personality and Social Psychology, 48,* 1467–1478.

Stasser, G., & Titus, W. (1987). Effects of information load and percentage of shared information on the dissemination of unshared information during group discussion. *Journal of Personality and Social Psychology, 53,* 81–93.

Wittenbaum, G. M., & Stasser, G. (1996). Management of information in small groups. In J. L. Nye & A. M. Brower (Eds.), *What's social about social cognition?: Research on socially shared cognition in small groups* (pp. 3–28). Thousand Oaks, CA: Sage.

Received May 27, 1997
Revision received September 25, 1997
Accepted September 25, 1997 ■