Pooling of Unshared Information in Group Decision Making: Biased Information Sampling During Discussion

Garold Stasser
Miami University

William Titus
Briar Cliff College

Decision-making groups can potentially benefit from pooling members' information, particularly when members individually have partial and biased information but collectively can compose an unbiased characterization of the decision alternatives. The proposed biased sampling model of group discussion, however, suggests that group members often fail to effectively pool their information because discussion tends to be dominated by (a) information that members hold in common before discussion and (b) information that supports members' existent preferences. In a political caucus simulation, group members individually read candidate descriptions that contained partial information biased against the most favorable candidate and then discussed the candidates as a group. Even though groups could have produced unbiased composites of the candidates through discussion, they decided in favor of the candidate initially preferred by a plurality rather than the most favorable candidate. Group members' pre- and postdiscussion recall of candidate attributes indicated that discussion tended to perpetuate, not to correct, members' distorted pictures of the candidates.

Decision-making groups must often choose from a set of specified alternatives (e.g., guilty and not guilty for a jury, a set of applicants for a selection committee), and this choice is typically preceded by discussion of the merits of each alternative. One goal of discussion is to achieve a consensus among the group's members. Another goal is to pool members' expertise and knowledge. In principle, pooling information permits a group decision that is more informed than the decisions of members acting individually. In particular, discussion can perform a corrective function when members individually have incomplete and biased information but collectively can piece together an unbiased picture of the relative merits of the decision alternatives. Notwithstanding the potential of discussion to serve such a corrective function, group discussion may often fall short of its potential. Discussion is rarely a systematic and balanced exploration of the relevant issues. On the contrary, it is often thematic and consensus confirming; that is, discussion tends to focus on particular issues and to support an existing or emergent consensus (cf. Fisher, 1980). Such patterns may counter effective pooling of information and may perpetuate biases that members bring to the group.

In this article, we explore the dynamics of discussion within the framework of an information sampling model. This model highlights the role of the pregroup information distribution, a summary of which group members are exposed to what information before discussion. The distribution of information among group members may give rise to several types of bias. Informational bias occurs when individual group members are given partial sets of information that do not reflect the balance of available supporting arguments for the various decision alternatives. Such biased sets of information may, in turn, result in preferential bias: individual members' preferring alternatives at the onset of discussion that they would not prefer if they had complete information. Finally, the sampling model suggests that the pregroup biases in information and preference may act to bias the content of subsequent discussion.

Thus the content of discussion tends to reflect but not to correct biases introduced by the distribution of information over group members before discussion.

Pregroup Information Distributions

For many topics of group discussion and decision, we can think of a set of relevant information and arguments (cf. Burnstein & Vinokur, 1977). Members are usually aware of some subset of these arguments before the group convenes and, on the basis of this subset, have a tentative preference for one of the alternatives. During group discussion, members exchange arguments and reevaluate their initial preferences. The information and arguments that members collectively bring to the group guide the emergence of a consensus in two ways. On the one hand, such information shapes the initial preferences of the group members; these initial preferences define the degree of consensus that exists at the onset of discussion. On the other hand, the content of discussion is drawn from the existing pool of information and arguments, and the balance of arguments favoring one position relative to another partly determines which preferences are likely to be strengthened or changed during the course of discussion.

It is important to consider not only how much supporting information exists for each alternative but also how this information is distributed across a group's members before their discussion. In the extreme, there are two kinds of pregroup information distributions: *shared* information is familiar to all group members, whereas *unshared* information is held by only one of the group's members. (Of course, there are degrees between these two extremes in that an argument or fact may be shared by several but not all members; for our purposes, we shall only consider these two extreme cases.) Burnstein and Vinokur (1977) made a similar distinction in their persuasive arguments theory of group polarization. We will use an example suggested by their analysis to illustrate the distinction between shared and unshared information distributions.

Consider a simple case in which a three-person group must decide between two alter-natives, A and B. Suppose that there exist seven items of information favoring A (denoted as a_1, a_2, . . . , a_6, and a_7) and four items of information favoring B (denoted as b_1, b_2, b_3, and b_4). For ease of discussion, we assume that these 11 items of information are equally convincing. In Table 1 we present four ways in which this information could be distributed across the group members before discussion. In Case 1, all information is shared; that is, every member is aware of the seven pro-A and four pro-B pieces of information. In this case, we would expect that each member would prefer A before discussion and thus an initial unanimous consensus would occur. Group discussion would serve primarily to reassure the members that they were aware of all the critical information. This reassurance might increase members' confidence in their preferences, but discussion would provide little impetus for modifying initial preferences.

In Case 2, some information about both A and B is unshared. We refer to this case as an unbiased distribution of unshared information because each individual possesses a ratio of pro-A to pro-B that is nearly identical to the ratio in the total information pool. Members bring three pro-A and two pro-B items to the group and, if information exchange is exhaustive, would leave the group with seven pro-A and four pro-B items. Thus members should prefer A both before and after group discussion.

In Case 3, three of the pro-A items of information (viz., a_5, a_6, and a_7) are unshared, but all of the pro-B information is shared. Each group member still has more pro-A than pro-B information; however, from each member's perspective, the advantage to A appears proportionately less than if they were aware of all of the available information. Thus members would be likely to bring a relatively weak preference for A to the group's discussion, but discussion could strengthen these initial preferences because each member could inform the others of a pro-A argument of which they were previously unaware. As suggested by Burnstein and Vinokur (1977), pregroup distributions of information similar to those in Cases 2 and 3 would probably result in group polarization (cf. Myers & Lamm, 1976); that is, group discussion should

Table 1
Some Possible Pregroup Distributions of Seven Pro-A (a_i) and Four Pro-B (b_i) Items of Information Over Three Group Members

Item position	Group member		
	X	Y	Z
Case 1: All information shared			
Pro-A	$a_1, a_2, a_3, a_4, a_5, a_6, a_7$	$a_1, a_2, a_3, a_4, a_5, a_6, a_7$	$a_1, a_2, a_3, a_4, a_5, a_6, a_7$
Pro-B	b_1, b_2, b_3, b_4	b_1, b_2, b_3, b_4	b_1, b_2, b_3, b_4
Case 2: Unbiased distribution			
Pro-A			
Shared	a_1	a_1	a_1
Unshared	a_2, a_3	a_4, a_5	a_6, a_7
Pro-B			
Shared	b_1	b_1	b_1
Unshared	b_2	b_3	b_4
Case 3: Mildly biased distribution			
Pro-A			
Shared	a_1, a_2, a_3, a_4	a_1, a_2, a_3, a_4	a_1, a_2, a_3, a_4
Unshared	a_5	a_6	a_7
Pro-B[a]	b_1, b_2, b_3, b_4	b_1, b_2, b_3, b_4	b_1, b_2, b_3, b_4
Case 4: Severely biased distribution			
Pro-A			
Shared	a_1	a_1	a_1
Unshared	a_2, a_3	a_4, a_5	a_6, a_7
Pro-B[a]	b_1, b_2, b_3, b_4	b_1, b_2, b_3, b_4	b_1, b_2, b_3, b_4

[a] All shared.

enhance the initial predispositions of the members to select A.

Case 4 in Table 1 is a more extreme version of Case 3. In this version, only one pro-A item of information (viz., a_1) is shared and the other six are unshared; thus group members should tend to prefer B rather than A at the onset of discussion because they each possess only three pro-A pieces of information. When pregroup distributions of information are sufficiently biased to shift pregroup preferences in this way, we refer to them as *severely* biased (as opposed to mildly biased distributions that tend to weaken but not change initial preferences). An extension of the logic of Burnstein and Vinokur's (1977) persuasive arguments theory suggests that group discussion could counter this initial bias in favor of B. By exchanging information, each group member can gain several items of new pro-A information but no new pro-B information. Ideally, even a group having a pregroup distribution of information severely

biased against A could conclude discussion favoring A.

Thus in all cases presented in Table 1, exhaustive information exchange could result in members' preferring A after discussion and in the group's choosing A as its decision. Nonetheless, Case 4 presents the most challenging situation. In this case, for the group to eventually choose the best alternative (best in terms of the total available information[1]),

[1] In this article, we use term *best* in a very restricted way. The *best* alternative, in our sense, is the alternative that is supported by the preponderance of the information that is collectively available to the group. We do not mean that this alternative is correct. Indeed, criteria of correctness are usually undefined or unavailable for the kinds of decision tasks that we are considering (viz., judgmental tasks; cf. Laughlin, 1980). Furthermore, we recognize that in practice the information that is collectively available to a particular group may be incomplete, and thus the best alternative, relative to the informational resources of that group, may not be the best alternative in view of a more complete set of information.

the initial preferences of the members must be changed, whereas in the other cases a group would choose the best alternative by simply acting on the initial predispositions of the members. As a result, group discussion is critical to effective decision making when pregroup distributions of information are severely biased against the best alternative.

Case 4 also illustrates a situation in which a group's decision should be better than the decisions of individuals acting alone. A potential advantage of group versus individual decision making is that groups can pool information and thus make a more informed decision. In practice, groups are often composed of members who are believed to have unshared information (e.g., experts or representatives of special-interest populations). This strategy would have the greatest potential benefit when the total information pool favors one alternative but individuals have information that is severely biased in favor of another alternative. However, the following biased sampling model of group discussion suggests that this potential advantage of group decision making may often be unrealized.

Biased Sampling Model of Group Discussion

The biased sampling model identifies several sources of bias in unstructured, face-to-face discussion when a group is confronted with a consensus requirement. Moreover, we are concerned primarily with decision tasks for which there is no commonly accepted system of logic that would lead to an unambiguously correct decision. In Laughlin's (1980) terms, we are restricting our attention to *judgmental* rather than *intellective* decision tasks. For such tasks, according to the model, the content of discussion is biased in two ways. First, discussion is biased in favor of shared information: An item of information is more likely to enter discussion if it is shared rather than unshared. Second, discussion is biased in favor of the current preferences of group members: An item of information is more likely to enter discussion if it favors rather than opposes the existent preferences of group members.

According to the biased sampling model, group members rarely exhaust their store of information during discussion but sample a subset of the information to contribute to discussion. At the level of the individual member, sampling is biased by the member's current preference. Preference consistent information is more salient and thus more likely to be recalled during discussion (cf. Fishbein & Ajzen, 1975.) Furthermore, the contribution of recalled information to discussion is probably governed by a norm of advocacy: a social expectation that group members will actively advocate their preferred alternative during debate. At the level of the group, sampling is biased by the number of members who are cognizant of a given piece of information. The more members there are who have been exposed to an item of information, the more likely it is that at least one of them will recall and mention it. If sampling of the content of discussion is biased in these ways, then it is also the case that the amount of discussion favoring an alternative depends on the number of members who prefer that alternative.

Regarding the severely biased pregroup information distribution that is illustrated by Case 4 in Table 1, the biased sampling model predicts that group discussion will be biased in favor of alternative B even though there exists more information, in total, favoring A over B. This bias in discussion is expected for two reasons. First, group members will tend to prefer B initially and, as a result, will be predisposed to argue in favor of B. Second, shared information favors B even though the total set of information favors A. In summary, Case 4 illustrates a situation in which the collective decision of a group could be better (i.e., more consistent with the implications of all the available information) than the decision of any member acting alone. However, the biased sampling model suggests that groups will often fail to realize their potential, especially when pregroup distributions are biased sufficiently to shift initial preferences away from the best alternative, as in Case 4.

The role of initial consensus in determining the outcome of group discussion and decision is emphasized by the biased sampling model. This emphasis is not new in the group decision-making literature (cf. Davis, 1973; Stasser, Kerr, & Davis, 1980) but deserves some elaboration in the context of our study. In

terms of the initial consensus, Case 4 illustrates the worst of all possible cases: Group members possess sets of information that are not only biased against the best alternative but are also consistently biased in favor of another alternative. Thus we expect an initial consensus that favors an alternative other than the best one. Limiting our example to two alternatives precluded illustrating another possibility. If more than two decision alternatives exist, it is possible for pregroup distributions of information to be biased against the best alternative but not consistently, across members, biased in favor of another alternative. In other words, none of the group members may support the best alternative but, at the same time, they may not agree on any one of the remaining alternatives. Such a lack of an initial consensus may avoid discussion that uniformly supports one alternative and promote more extensive and exhaustive sampling of the total available information. In this way, initial disagreement or conflict may actually encourage more effective information exchange. Others have noted the apparent value of conflict in group decision making (e.g., Fisher, 1980; Janis, 1972).

We designed our study to examine two implications of the biased sampling model of group discussion. First, when pregroup distributions of information are severely biased against one alternative, group discussion tends to enhance rather than erode this initial bias. Second, discussion is more likely to counter an initial bias when there is disagreement that is due to conflicting patterns of information across group members than when pregroup information is consistently biased in favor of one alternative. We examined these predictions by comparing the distributions of pregroup preferences with the distributions of group decisions and postgroup individual preferences.

Method

Overview

University students read descriptions of three hypothetical candidates for student body president and then met in 4-person groups to decide which candidate was best suited for the position. The profile of Candidate A contained more positive and fewer neutral attributes than the profiles of Candidates B and C. The valences (positive, neutral, or negative) of profile attributes were determined

via pre-experimental ratings. Thus Candidate A was the best candidate in the sense that his profile contained more of the consensually valued attributes of a student body president. We defined three experimental conditions according to how the information about the candidates was distributed over the 4 group members before discussion. In the *shared* condition, participants read descriptions that contained all of the profile information about each candidate. Two unshared conditions were used; in both, a participant was given only partial information about each candidate. However, the distribution of information across a group's members was designed so that a group, collectively, had all of the information and potentially could recreate the complete candidate profiles during discussion. In the *unshared/consensus* condition, positive information about A and negative information about B were unshared (i.e., given to only one member) before discussion in order to bias initial preferences against A and for B. In the *unshared/conflict* condition, the same strategy for distributing positive information about A was used; however, negative information about both B and C was unshared with the intent of shifting pregroup preferences away from A but, at the same time, avoiding a strong initial consensus for either B or C.

Subjects

Miami University students participated in order to partly fulfill a research experience requirement of introductory psychology courses. Assignment to experimental conditions and to decision-making groups within conditions was random. There were 72 subjects in the shared and unshared/conflict conditions and 84 in the unshared/consensus condition.

Materials

The candidate profiles contained 16 items of information about each of the three candidates. This information consisted of biographical data (e.g., extracurricular activities and hobbies, academic classification and major, grade point average) and positions on local and university issues such as dorm policies (e.g., visitation hours, dorm assignments), academic policies (e.g., class evaluations, course scheduling), and student social life (e.g., program board activities, local drinking ordinances). On the basis of an independent sample's pre-experimental ratings of candidate characteristics and policy statements, we constructed the profiles to include a specific number of positive, negative, and neutral items of information. Positive items are those that were rated, on the average, as both desirable and important attributes for a candidate by pretest participants, whereas negative items were rated as both moderately undesirable and important. (In order to avoid unrealistic profiles, extremely undesirable attributes were not used.) Neutral items either were judged unimportant or received neutral desirability ratings. The profile for Candidate A contained eight positive, four neutral, and four negative items, whereas the profiles for Candidates B and C contained four positive, eight neutral, and four negative items.

The descriptions that were read by participants before group discussion were based on the overall profiles and included a summary of biographical information followed

Table 2

Number of Items of Information About Each
Candidate Received by Group Members
Before Discussion

Condition and information valence	Candidate		
	A	B	C
Shared			
Positive	8	4	4
Neutral	4	8	8
Negative	4	4	4
Unshared/consensus			
Positive	2	4	1
Neutral	4	5	8
Negative	4	1	1
Unshared/conflict			
Positive	2	4 [4]	4 [4]
Neutral	4	6 [4]	4 [6]
Negative	4	0 [2]	2 [0]

Note. In the unshared/conflict condition, 2 members of a 4-person group received configurations of information about Candidates B and C given by the numbers without brackets, whereas the other 2 members received configurations given by the numbers in brackets.

by interview excerpts stating the candidate's position on various local issues. In Table 2 we summarize the ways in which positive, neutral, and negative items were distributed in the descriptions read by a group's members. In order to be consistent with our earlier definition, shared information was included in all of the descriptions, whereas unshared information appeared in only one of the members' descriptions.

The scheme for distributing information in the shared condition is straightforward because all information was shared. Every group member received identical descriptions containing all of the information in each candidate profile. In the unshared conditions, only eight items of information about each candidate were shared. For the eight unshared items, the description read by the first group member contained two of the unshared items, the description read by the second member contained another two of the unshared items, and so forth. In other words, each member read a description that contained one fourth of the unshared information. This method of distributing unshared information ensured that every item of information was contained in at least one of the descriptions read by a group's members.

The actual items of information to be unshared were selected to bias individual members' pregroup preferences in the unshared conditions. In the unshared/consensus condition, a given description of Candidate A contained only two of the eight positive items but all four of the negative items. In contrast, a given description of candidate B contained all four of B's positive attributes but only one of his negative attributes. The descriptions of candidate C remained relatively balanced because both positive and negative items about C were unshared. Thus each group member in this condition read descriptions that were biased against A and in favor of B.

A similar effect was obtained in the unshared/conflict condition except that 2 members of a 4-person group read descriptions that were biased in favor of Candidate B over Candidate C (nonbracketed configurations in Table 2) and the other 2 members read descriptions that were biased in favor of Candidate C over Candidate B (bracketed configurations in Table 2). The intent was to split pregroup support between B and C.

We emphasize that even though the descriptions read by participants were biased in the unshared conditions, the total pool of information received by a group's members still favored Candidate A. For example, if each member of a group were to mention his or her two items of positive information about A during discussion, then all the members of the group would be informed of all eight pro-A items.

Procedures

The procedures for all experimental conditions were identical except for the aforementioned differences in the descriptions that were read by participants before group discussion. Participants met in a classroom at the beginning of an experimental session and were seated at random in locations that determined their experimental condition and discussion group assignment. Exceptions to random assignment were made in order to obtain the maximum number of 4-person groups, given the number of participants attending any one session. Participants remaining after the maximum number of groups were formed were given a different experimental task, and their data are excluded from this report.

Preliminary instructions stated that the research was concerned with group decision making and briefly described the role of a caucus in political elections. Participants were told that they would be reading descriptions of three hypothetical candidates for student body president and then meeting as a "political caucus" to decide which candidate was best suited for the position. We noted that members of a real political caucus rarely have identical information about candidates and, therefore, the information given to each member before discussion might not be entirely identical to the information received by their fellow group members. Thus in this study, participants in all conditions were alerted to the possibility that the descriptions might not be complete and their fellow group members might have information of which they were unaware.

Participants studied the candidate descriptions and then indicated their initial preferences on a private questionnaire. After collection of the candidate descriptions, participants completed a free recall task by listing as much information as they could remember about each candidate. Our intent for this task was to assess the salient information that participants retained before group discussion.

Participants then adjourned to nearby "caucus" rooms to, as a group, discuss the candidates and decide which one was the best candidate for student body president. After reaching a decision, group members privately completed a final questionnaire. In addition to assessing their postdiscussion preferences, this questionnaire repeated the free recall task.

Results

Pre- and Postgroup Individual Preferences

The distributions of pregroup preferences, given in Table 3, are significantly different among the experimental conditions, $\chi^2(4, N = 228) = 51.44, p < .001$. In the shared condition, Candidate A was the popular choice as expected. By comparison, Candidate A was significantly less popular in the unshared conditions, $\chi^2(1, N = 228) = 51.63, p < .001$, and Candidate B was more popular, $\chi^2(1, N = 228) = 27.95, p < .001$. Thus the method of distributing unshared information had the intended effect of reducing pregroup support for A and increasing support for B. Furthermore, Candidate C was more popular in the unshared/conflict condition than in the unshared/consensus condition, $\chi^2(1, N =156) = 7.91, p < .005$. In summary, pregroup support shifted from A to B in the unshared/consensus condition, whereas in the unshared/conflict condition, both B and C gained support at the expense of A.

One can assess the effects of group discussion on individual preferences by comparing pregroup with postgroup preference distributions. The biased sampling model suggests that candidates having the predominance of support before discussion will maintain or even gain support during discussion. This expectation follows because the content of discussion is presumed to reflect the initial allegiances of group members. If, however, groups do effectively pool members' information, group discussion should substantially increase support for Candidate A in the unshared conditions.

The distributions of postgroup preferences, given in Table 3, are consistent with the biased sampling model predictions. The differences among the experimental conditions observed in the pregroup preferences are enhanced rather than mitigated in the postgroup preferences. For example, in the shared condition, the proportion of participants preferring A increased from .67 to .85, and in the unshared/consensus condition the proportion preferring B increased from .61 to .75. Overall, the distributions of postgroup preferences are significantly different, $\chi^2(4, N = 227) = 122.00, p < .001$. Again, A was chosen more frequently in the shared condi-

Table 3

Relative Frequencies of Pregroup and Postgroup Preferences and Group Decisions

| Condition | Candidate | | | |
	A	B	C	*n*
Pregroup preferences				
Shared info.	.67	.17	.17	72
Unshared info./				
consensus	.25	.61	.14	84
Unshared info./				
conflict	.21	.46	.33	72
Postgroup preferences				
Shared info.	.85	.11	.04	72
Unshared info./				
consensus	.20	.75	.05	83[a]
Unshared info./				
conflict	.17	.47	.36	72
Group decisions				
Shared info.	.83	.11	.06	18
Unshared info./				
consensus	.24	.71	.05	21
Unshared info./				
conflict	.12	.53	.35	17[b]

[a] One participant failed to report a postgroup preference.
[b] One group failed to reach a decision.

tion than in the unshared conditions, $\chi^2(1, N = 227) = 89.51, p < .001$, and B was chosen more frequently in the unshared conditions than in the shared conditions, $\chi^2(1, N = 227) = 51.17, p < .001$. Finally, C was more popular in the unshared/conflict condition than in the unshared/consensus condition, $\chi^2(1, N = 155) = 24.17, p < .001$.

In sum, the patterns of differences obtained for pregroup preferences tend to be exaggerated in the postgroup data. Our expectation was that conflicting patterns of pregroup information would increase the likelihood of discussion shifting preferences toward A when information was unshared; this expectation was not supported. The postgroup support for A is not significantly different between the unshared/consensus and unshared/conflict conditions.

Group Decisions

The distributions of group decisions in Table 3 parallel closely the distributions of postgroup preferences. Overall, the distributions of decisions are significantly different

among the experimental conditions, $\chi^2(4, N = 56) = 28.81$, $p < .001$. In the shared condition, 83% of the 18 groups chose Candidate A whereas only 18% of the 38 groups in the unshared conditions chose A, $\chi^2(1, N = 56) = 21.59$, $p < .001$. Candidate B was chosen more often in both of the unshared conditions than in the shared condition, $\chi^2(1, N = 56) = 13.31$, $p < .001$, and Candidate C was chosen more often in the unshared/conflict condition than in the unshared/consensus condition, $\chi^2(1, N = 38) = 5.83$, $p < .025$. Again, there was no support for the notion that conflicting patterns of pregroup information would increase the likelihood that sentiment would shift toward Candidate A during discussion when pro-A information was unshared. In fact, groups in the unshared/conflict condition tended to choose A less frequently than did groups in the unshared/consensus condition; however, this difference is not significant.

Davis (1973) suggested that group process can be represented as a rule (social decision scheme) relating the group decisions to the configuration of members' preferences at the onset of discussion. In Table 4, we represent the initial preference configuration of a group by (r_1, r_2, r_3), whereby r_i is the number of members in a fraction such that $r_1 > r_2 > r_3$, and $r_1 + r_2 + r_3 = r$, group size. In the present case, $r = 4$, and the possible initial configurations of preference are as follows: $(4, 0, 0)$ = initial unanimity; $(3, 1, 0)$ = initial majority; $(2, 1, 1)$ = initial plurality; and $(2, 2, 0)$ = initial nonplurality. In Table 4, the decision of a group is classified as the candidate initially supported by the largest faction (plurality supported), by a minority faction (minority supported), or by no members of the group (unsupported). Note that for some initial configurations, one of the classifications for decisions does not exist. In particular, the distinction between plurality supported and minority supported does not exist for the $(2, 2, 0)$ case. Thus for the $(2, 2, 0)$ configuration, decisions are simply tabulated as unsupported or plurality supported.

Candidates with initial unanimity or majority support won with one exception: the unsupported candidate chosen by a group with an initial $(3, 1, 0)$ configuration. Candidates with only plurality support in the

Table 4
Group Decisions as a Function of Initial Support Within the Group

Initial consensus	Supported		Unsupported
	By plurality	By minority	
(4, 0, 0)	6	—	0
(3, 1, 0)	24	0	1
(2, 1, 1)	13	3	—
(2, 2, 0)	9	—	0

Note. Dashes indicate outcomes that are not defined for an initial consensus configuration.

$(2, 1, 1)$ configuration won very frequently (81%) over the minority-supported candidates. Given the nonplurality configuration $(2, 2, 0)$, one of the two supported candidates always won over the unsupported candidate. Thus a "plurality-supported wins" rule accounts for most of the group decisions; that is, a candidate with at least a plurality of initial support was likely to be the group's decision. Such a process suggests that discussion rarely erodes even a minimal consensus. This finding is consistent with Laughlin and Earley's (1982) conclusion that groups deciding issues of judgment or social preference seem to follow a majority rules process. However, the dominance of the initial plurality in our groups is particularly noteworthy because the distributions of unshared information provided ample opportunity for discussion to counter the initial consensus in the unshared conditions.

Furthermore, it is worth noting that the seven groups that chose Candidate A in the unshared conditions were, by chance, assigned at least two members who favored A at the onset of discussion. Thus it was not the lack of a consensus for B or C that resulted in groups' discovering the merits of A (the intended effect in the unshared/conflict condition); rather, it was the presence of at least two members who supported A.

Information Recall

Even though group discussion may often fail to correct the bias in information that members bring to the group, the biased sampling model suggests that the content of discussion is nonetheless instrumental in pro-

ducing shifts of preference. The point is that shifts of preference occur in the direction of the initial consensus because members tend to recall and contribute arguments and facts that support their existent preferences. The content of discussion serves not only to give members new information but also to change the salience of old information. If shifts of preference and the emergence of a group decision are dependent on the content of discussion, there should be a concomitant increase in the salience of information that supports the winning candidate from pre- to postdiscussion. Thus information that supports the winning candidate should be more likely to be recalled after than before discussion.

The numbers of positive and negative items recalled before and after discussion were tabulated separately for the winning and losing candidates. Because Candidate A had more positive attributes than B and C, and because there was always more total information about the two losing candidates than about the one winning candidate, we analyzed the percentage of information recalled rather than the absolute frequency. Also, because of a possible dependency of postdiscussion recall among a group's members, we averaged the recall scores of the four members of each group and conducted an analysis of variance (ANOVA), using these group means (following a method of analysis suggested by Myers, DiCecco, & Lorch, 1981).

Figure 1 contains the average pre- and postdiscussion recall of positive and negative information about the winning and losing candidates for each experimental condition. Although we are primarily interested in the changes of recall from pre- to postdiscussion, it is important to note that the prediscussion recall of positive attributes of the winning candidate is noticeably higher in the unshared conditions than in the shared condition. This inflated recall reflects the biasedness of the sets of information given to members before discussion in the unshared conditions; that is, the percentage of unshared information recalled before discussion in the unshared conditions is necessarily low because each member received only one fourth of the unshared information. The winning candidate in these conditions was typically (except for

the few groups who chose A) the one for whom members were given all of the positive information before discussion. Unshared information, in these conditions, was typically (a) negative information about the winning candidate and (b) positive and negative information about one or both of the losing candidates. Thus if group discussion had corrected the bias introduced by the patterns of shared and unshared information in the unshared conditions, this disproportionate recall of positive-winning information should have been reduced in postdiscussion recall. However, visual inspection of Figures 1c and 1e suggests that this bias in recall increased from pre- to postdiscussion.

A 3 × 2 × 2 × 2 (Experimental Condition × Winning vs. Losing Candidate × Positive vs. Negative Valence × Prediscussion vs. Postdiscussion) ANOVA of the recall scores
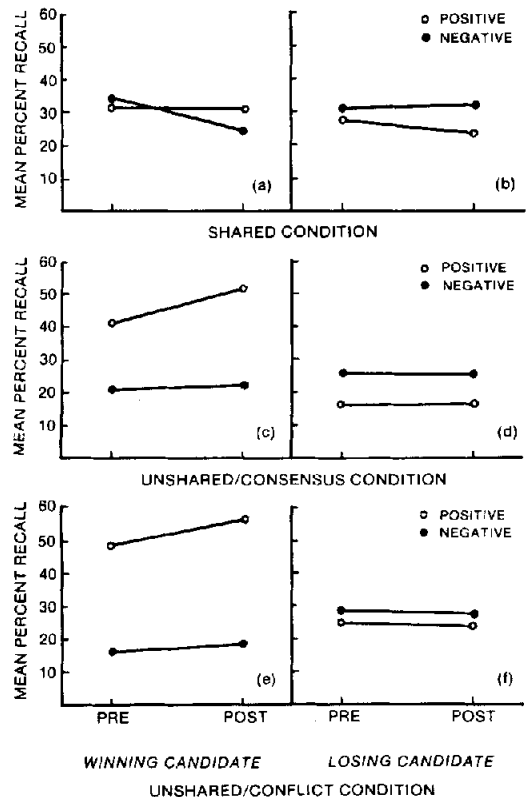

Figure 1. Mean percentage of pre- and postdiscussion recall of positive and negative information about the winning and losing candidate for each of the experimental conditions.

was conducted. Two three-way interactions are of primary interest: the Condition $\times$ Candidate $\times$ Time interaction, $F(1, 53) = 5.43$, $p < .01$, and the Candidate $\times$ Information Valence $\times$ Time interaction, $F(1, 53) = 8.98$, $p < .01$. Post hoc analyses suggested that both of these three-way interactions are due primarily to three simple main effects of time. In the shared condition there is a significant decrease in the recall of negative information about the winning candidate, $F(1, 53) = 12.05$, $p < .01$ (see Figure 1a). In contrast, there is a significant increase in the recall of positive information about the winning candidate in both the unshared/consensus and the unshared/conflict conditions, $F(1, 53) = 16.38$, $p < .01$, and $F(1, 53) = 8.43$, $p < .01$, respectively (see Figure 1c and 1e). All other simple main effects of time are not significant.

Thus the results for the unshared conditions support the predictions of the biased sampling model. Effective information exchange during discussion should have resulted in a substantial gain of negative information about the winning candidate in these conditions because group members could give each other new information that opposed the winning candidate. Clearly, discussion did not serve this corrective function but tended to increase the salience of information supporting the winning candidate even though members of most groups had been exposed to this information before discussion.

The results for the shared condition are somewhat more puzzling although they are not necessarily inconsistent with the biased sampling model. It seems that when group members had received all of the information before discussion, the discussion maintained the salience of information favoring the initially preferred (and ultimately winning) candidate, whereas information opposing this candidate was less likely to be recalled after discussion. One interpretation of this finding is that giving members all of the information before discussion resulted in information overload. Discussion then served to reduce this overload by focusing on information that supported the initially popular candidate and ignoring other information. The net effect of this focus, coupled with information overload, would be to reduce the recall of nonsupporting information.

Discussion

Several theoretical perspectives emphasize the role of information exchange in guiding the emergence of a consensus and modifying members' preferences during group discussion (e.g., Anderson & Graesser, 1976; Hoffman & Maier, 1964; Kaplan, 1977; Stasser & Davis, 1981). Burnstein and Vinokur's (1977) persuasive arguments theory suggests that shifts of preference are due to the number of persuasive and unique arguments that are introduced into discussion. Unique arguments are considered particularly instrumental in producing preference shifts. Viewed in this way, information that is unshared before discussion should be more likely than shared information to affect members' preferences during discussion. However, Burnstein and Vinokur (1977) are primarily concerned with the group polarization phenomenon, and in their analysis they assumed that the preponderance of unshared arguments tends to favor the initially most popular position for tasks used in this research tradition. They thus concluded that unique arguments exchanged during discussion tend to bolster the initially popular sentiment within a group.

We are primarily concerned with a situation in which the balance of unshared information opposes the initially most popular position. In this case, according to the biased sampling model, the unshared information will tend to be omitted from discussion and, therefore, will have little effect on members' preferences during group discussion. Our results confirm this notion. Group decisions and postgroup preferences reflected the initial preferences of group members even when the exchange of unshared information should have resulted in substantial shifts of opinion. Furthermore, discussion did not increase the recall of unshared information. On the contrary, discussion tended to increase the recall of information that supported the initially most popular (and ultimately winning) candidate even though this information was primarily shared before discussion.

The unshared conditions in this study simulated a situation in which the quality of the group's decision was potentially better than the quality of its members' pregroup choices. The pregroup choices were based on biased sets of information, but if members had

effectively exchanged information during discussion, the collective choice would have been based on less biased information.

Extending Steiner's (1972) process-loss model of group productivity, Shiflett (1979) proposed a general model that analyzes group performance in terms of resources, transformers, and outputs. *Resources* include knowledge and abilities that are relevant to performing a task. *Transformers* are variables that mediate the ways in which member resources are combined or weighted to yield the group *output* (e.g., a solution to a problem, a judgment, or a decision). For our decision-making groups, the information in the candidate profiles can be viewed as resources, and the collective choice of the best-qualified candidate as the group output. Transformers would include variables that affect the likelihood that information is introduced into discussion and thus is reflected in a group's decision. Shiflett (1979) also distinguished unique resources (resources held by one member) from redundant resources (resources held by all members). In our case, unique resources are items of information unshared before discussion, and shared information constitutes redundant resources. We suggest that one criterion of group productivity in a judgmental task could be the extent to which unique resources are considered in a group's final judgment. Viewed in this way, the decisions of groups in the shared conditions are a standard against which to judge the decisions of groups in the unshared conditions. If unique and redundant informational resources were weighted equally, there should be no difference in the distributions of group decisions between the shared and unshared conditions. However, our results suggest that unique or unshared information had little impact on groups' decisions.

The biased sampling model of group discussion identifies several possible mechanisms that may result in commonly held information receiving more weight than uniquely held information in a group's decision. One possibility follows directly from Shiflett's (1979) distinction between unique and redundant resources: The more members there are who are exposed to an item of information, the more likely it is that at least one of them will recall and mention it during discussion. In Shiflett's (1979) words, "The fact that two or more individuals possess the same resource does not increase the total set of available resources but does increase the probability of that resource being used" (p. 72). Furthermore, according to the biased sampling model, members' initial preferences are a transformer variable in Shiflett's formulation. Initial preferences may mediate the contribution of information to discussion in either of two ways. First, members' recall may be biased because preference-consistent information is more salient than preference-inconsistent information. Second, members may tend to advocate or defend their initial preference and thus bias their contributions to discussion even if their recall is not biased. In sum, initial preferences may act as transformer variables by introducing selective recall or selective contribution of information during discussion.

In many contexts, a desirable goal may be to increase the weight of uniquely held information in the determination of a group's judgment. One suspects that unshared information may often be just as important, or even more important, than commonly held information in arriving at a collective choice. For example, if a group is composed of members who have differing areas of expertise, consideration of unshared information may be very critical to the quality of the group's final decision. Similarly, groups whose members represent disparate points of view or special-interest populations may err by focusing on their shared perspectives and thereby negating any advantage that accrues from multiple sources of diverse input. Our results suggest that unstructured discussion in the face of a consensus requirement may often fail as a means of combining unique informational resources. Ironically, our analysis also suggests that this failure to consider unique information is most likely when the unique information counters the prevailing sentiment in the group and could change its final decision.

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