Group Decision Making: The Effects of Initial Preferences and Time Pressure

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Triads, working under time pressure or not, participated in a management simulation that asked groups to decide which of two cholesterol-reducing drugs to market. The total distribution of information available to the group always favored the same drug. However, members' initial preferences were manipulated by varying the distribution of shared information (provided to all members) and unshared information (provided to only a single member) supporting each alternative. Thus, each member's fact sheet either (a) favored the correct decision (correct preference condition), (b) mildly favored the incorrect decision (weak incorrect preference condition), or (c) strongly favored the incorrect decision (strong incorrect preference condition). Initial preferences were major determinants of group decisions. Time pressure either enhanced or reduced decision quality depending on the strength of initial preferences and the content of the group interactions. These findings are discussed in light of Karau and Kelly's Attentional Focus Model of group performance.

Many of the world's most important decisions are made in small groups. Government agencies, businesses, research institutions, and a wide variety of other organizations all frequently use small groups to make decisions and solve problems. Given that group decisions can have a lasting impact on both group members and others affected by the decision, it is vital to identify factors that may lead to low quality decisions. One especially pervasive factor may be time pressure. Indeed, time is an integral component of every group task, and decisions are usually made under some type of deadline. But despite the importance of temporal factors, surprisingly few researchers have devoted much theoretical or empirical effort to understanding the effects of time pressure on group performance and decision making. The present research was designed to examine the joint effects of time pressure and strength of members' initial decision preferences on group interaction and decision outcomes.

The Attentional Focus Model

Our research was driven by Karau and Kelly's (1992) Attentional Focus Model (AFM) of group performance. The model represents an integration of prior individual-level research and theory on time pressure and performance with current group-level research on interaction and performance. Although originally developed to account for time pressure effects, the AFM also provides insight on the operation of other individual- and group-level factors that are likely to affect attentional and cognitive processes influencing group process and performance. The model suggests that time pressure serves to narrow group members' focus to the most salient features of the group interaction and task. As time pressure increases, features that appear most central to completing the task are likely to increase in relative salience, whereas features that are less relevant or central to task completion are likely to decrease in salience. These differences in members' attentional focus and interaction objectives are likely to produce related differences in the discussion content and information processing strategies adopted by the group, thereby affecting resulting group performance.

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A central implication of the AFM is that time pressure can either enhance or reduce performance depending on the requirements for successful task performance and the nature of the most salient environmental cues. If time pressure leads groups to focus on an appropriate amount of information that is truly relevant and diagnostic, decisions might actually be improved. However, for many tasks (especially those that are complex and require careful processing of a large amount of information), time pressure is likely to restrict either the amount of information considered or the thoroughness with which information is evaluated beyond functional levels, thereby reducing decision quality.

The AFM also specifies that temporal influences are unlikely to operate in isolation and that a variety of input factors interact to determine group members' attentional focus and information processing objectives. In addition to time pressure, relevant input factors include other situational variables, such as stress, noise, and distraction; group structural variables, such as norms, cohesiveness, and composition; task characteristics, such as complexity and quantity-versus-quality emphasis; and individual difference variables, such as need for cognition or introversion (Karau & Kelly, 1992).

Group members' initial decision preferences are an especially important input factor that can influence both the content and consequences of the group interaction. The logic of the AFM suggests that initial preferences serve as an attentional filter through which new information is considered. Initial preferences, especially when strong and shared with other group members, could lead to the adoption of a hypothesis-confirming search strategy such that individual attention and group discussion focus on supportive information while disregarding or minimizing contradictory information. Indeed, prior research has shown repeatedly that initial preferences are key determinants of final group decisions, especially when those preferences are made known early in the discussion (e.g., Kaplan & Miller, 1987; Stasser, Kerr, & Davis, 1989). Early advocacy of a position also is related to that position's influence on a final group outcome (McGuire, Kiesler, & Siegel, 1987; Weisband, 1992).

Time pressure also might accentuate the effects of initial preferences. Under time pressure, the importance of reaching consensus before a deadline is likely to increase the salience of initial preferences (e.g., Kruglanski & Webster, 1996), whereas time constraints simultaneously reduce the probability that enough arguments will be offered during discussion to create shifts in those preferences (e.g., Anderson & Graesser, 1976; Burnstein & Vinokur, 1977). Time pressure also is likely to enhance consensus pressures that would prevent members from offering information that contradicts an emerging group preference (e.g., Hoffman, 1979; Janis, 1982; Kerr, MacCoun, Hansen, & Hymes, 1987). Regarding decision quality, initial preferences would likely enhance quality when preferences are based on an accurate assessment of information that is diagnostic and reduce it when based on unrepresentative or poorly processed information.

The AFM is consistent with previous research and theory on the effects of time pressure, stress, distraction, and heuristic processing on performance. For example, research at both the individual and group level has found that high levels of time pressure typically lead to increased performance rates (e.g., Kelly, 1988; Kelly, Futoran, & McGrath, 1990; Locke & Latham, 1990), increased focus on features central to completing the task (Karau & Kelly, 1992; Kelly & McGrath, 1985), and decreased performance quality (e.g., Karau & Kelly, 1992; Kelly & McGrath, 1985; Pepinsky, Pepinsky, & Pavlik, 1960). Similarly, a number of theories suggest that arousal or stress leads individuals to focus on an increasingly narrow range of task-relevant cues (e.g., Baron, 1986; Easterbrook, 1959; Kruglanski & Webster, 1996) in a manner that may influence information processing and decision making (e.g., Chaiken, 1980; Cohen, 1978; Craik & Lockhart, 1972; Petty & Cacioppo, 1986). A number of viewpoints suggest that the content of the group interaction process, as influenced by processing objectives, influences group performance (e.g., Hackman & Morris, 1975; Hirokawa, 1988) and that the nature of this influence is dependent on task attributes (e.g., Baron, 1986; Hackman, Brousseau, & Weiss, 1976). The AFM is unique, however, in identifying how specific interactions of time pressure with a range of other input factors contribute to enhanced or reduced performance via group interaction processes that are influenced by individual members' attentional focus and cognitive processes.

The AFM also has received initial support from three recent studies of group process and performance. First, Karau and Kelly (1992) asked triads to work on a planning task under low, moderate, or high levels of time pressure. The groups' written solutions to a common problem were coded on quality, and interactions were videotaped and coded for process features. Consistent with the AFM, time pressure was positively related to an increased focus on activity that directly moved the task forward and inversely related to interpersonal and other activities that did not advance the task. Moderate, but not high, levels of time pressure enhanced the creativity and adequacy of written solutions, presumably by facilitating an optimal level of task focus. Second, Parks and Cowlin (1995) asked groups to make decisions involving either two, three, or four alternatives under low, moderate, or high levels of time pressure. Groups increased their rates of task activity under time pressure and were

less likely to repeat previously mentioned information. These effects were enhanced as the number of decision alternatives increased. Parks and Cowlin argue that these effects are consistent with a narrowed focus of attention on task-completion-focused activities. Third, Kelly, Jackson, and Hutson-Comeaux (1997) asked groups to reach consensus on a ranking task. High time pressure enhanced normative influence processes, suggesting that time pressure focused attention on the salient task-relevant goal of reaching agreement on a common ranking.

Overview and Predictions

Taken as a whole, prior research and theory provides initial support for key tenets of the AFM. The present research was designed to examine two key implications of the AFM for understanding the joint effects of both time pressure and initial decision preferences on information processing and decision making in groups. First, we wanted to validate further the notion that input factors, such as time pressure and initial preferences, constrain both group members' attentional focus and the content of the group interaction. Second, we wanted to test more directly the notion that time pressure would enhance focus on salient, apparently diagnostic, information. We examined this latter issue by providing group members with information about the decision alternatives that varied in relevance and created differences in the strength and direction of members' initial decision preferences through the use of "hidden profiles" (Stasser & Titus, 1985).

Same-sex triads were asked to play the role of managers in a pharmaceutical company that had to decide which of two cholesterol-reducing drugs should be marketed. Participants were given facts about each of the two drugs that contained positive, neutral, and negative information. After individuals studied the information, the group was asked to discuss the problem and make a decision. We manipulated group members' initial decision preferences by varying specific aspects of the information provided. Across all conditions, the total distribution of information available to the group always favored Drug 2. However, in two of the three initial preference conditions, the information sheets were constructed such that some of the facts were shared (provided to all three members) and some were unshared (provided to only one group member). By varying which specific shared and unshared facts supported each decision alternative, we created individual fact sheets with distributions that either mildly (weak incorrect preference condition) or strongly (strong incorrect preference condition) disagreed with the overall distribution of information available to the group. In the third initial preference condition, all of the facts were shared (strong correct preference condition), and thus, members' fact sheets accurately represented the total distribution of information available to the group. Note that the degree to which effective communication and sharing of information was required for making the correct decision varied systematically across these conditions: In the two unshared conditions, discussion of unshared information was either somewhat (weak incorrect preference) or very (strong incorrect preference) important to decision quality because merely relying on the initial individual preferences would lead to an incorrect decision. Careful discussion was less vital to decision quality in the strong correct preference condition, in which all members had immediate access to the entire distribution of information available to the group. Finally, two levels of time pressure also were created via an instructional manipulation. Group interactions were videotaped and coded for which facts were discussed, and individual memory for the drug facts was assessed both before and after the discussion.

Our theoretical analysis led to a number of predictions. First, the AFM predicts that work groups will focus on task completion when working under time pressure. Thus, we expected groups to work at a faster rate, and to focus most directly on discussing information relevant to the decision, when working under time pressure.

Hypothesis 1: Groups will work at a faster rate under time pressure, discussing more facts per unit time.

Second, the AFM predicts that individuals will focus their attention, and groups will focus their discussion efforts, on salient cues. The initial information distributions created two such cues: information relevance and initial decision preferences. Thus, we expected group discussions to focus on information that was most relevant to the decision and that supported initial preferences. Moreover, because the AFM suggests that time pressure enhances reliance on salient cues, we expected time pressure to enhance these tendencies.

Hypothesis 2: Group discussions will focus on information that is most relevant to the decision (i.e., positive and negative facts) to the relative exclusion of other information (i.e., neutral facts).

Hypothesis 3: Time pressure will enhance the tendency for discussions to focus on relevant information.

Hypothesis 4: Group discussions will focus on information that supports members' initial preferences. Thus, discussions will be biased in favor of Drug 1 in the strong incorrect preference condition and in favor of Drug 2 in the correct preference condition. Discussions will be more evenly balanced in the weak incorrect preference condition.

Hypothesis 5: Time pressure will enhance the tendency for discussions to be biased in favor of initial preferences.

Third, because we used hidden profiles to create two salience cues relevant to the AFM, we also were able to examine the pooling of unshared information. Prior research by Stasser and colleagues (e.g., Stasser & Titus, 1985, 1987; Stasser, Taylor, & Hanna, 1989; Stasser & Stewart, 1992; Wittenbaum & Stasser, 1996) has identified conditions under which groups are more or less likely to have a difficult time discussing and pooling their unshared information. Consistent with the logic of the AFM, groups may be more likely to pool unshared information when it is particularly salient or diagnostic. The information sheets in the present study were designed such that the unshared information was more diagnostic than the shared information and was particularly diagnostic in the strong incorrect preference condition. Thus, we expected groups to focus relatively more on unshared information in the strong incorrect preference condition.

Hypothesis 6: Group discussions will be less likely to focus on shared information in the strong incorrect preference condition than in the weak incorrect preference condition.

Fourth, the AFM specifies that final decisions should be related to discussion content. Thus, the attentional focus produced by initial preferences and enhanced by time pressure will affect decision quality to the extent that such preferences favor either the correct or incorrect decision alternative.

Hypothesis 7: Groups will be most likely to make the correct decision (i.e., to select Drug 2) in the correct preference condition, least likely to make the correct decision in the strong incorrect preference condition, and decision quality in the weak incorrect preference condition will fall in between.

Hypothesis 8: Time pressure will enhance decision quality in the correct preference condition but will reduce it in the two unshared conditions (with the largest reduction of quality in the strong incorrect preference condition).

Finally, the AFM suggests that decisions should be related to the interaction processes engaged in by groups. Thus, we expected final decision quality to be strongly related to the degree to which discussions focused on information supporting the correct decision alternative.

Hypothesis 9: The discussion of information favoring Drug 2 will be strongly related to final selection of Drug 2.

METHOD

Participants and Design

Participants were 213 introductory psychology students at Purdue University (105 women and 108 men) who partially fulfilled a course requirement by participating. The study employed a $3 \times 2 \times 2$ between-groups design. Three initial preference conditions (correct, weak incorrect, strong incorrect), two levels of time pressure (time pressure vs. no time pressure), and two gender compositions (groups of 3 women or 3 men) were used.

Initial Preference Manipulation

Three levels of initial decision preferences were manipulated by varying the lists of facts about the two drugs that were provided to group members. The goal was to vary the strength and direction of members' initial preferences, either toward the correct drug or toward the incorrect drug, while holding the overall distribution of information available to the group constant across conditions. In the correct preference condition, all of the facts about the two drugs were provided to each of the 3 group members. In the strong incorrect and weak incorrect preference conditions, however, half of the information was provided to all 3 members (shared) and half of the information was provided to only 1 member (unshared).

The initial preferences, relative to the overall distribution of facts available to the group, can be viewed in the context of manifest and "hidden profiles" (Stasser, 1988). The manifest profile refers to the information that each individual group member has immediate access to, whereas the hidden profile refers to the information that is potentially available to the group if each member were to contribute all of his or her information. When shared information favors a different alternative than unshared information, manifest and hidden profiles can be in conflict. In the current research, information sheets were constructed such that the manifest profile favored the less desirable (incorrect) decision alternative, whereas the hidden profile favored the more desirable (correct) alternative.

In all three conditions, the total distribution of positive, neutral, and negative information about each drug that was available to the group was identical. As can be seen in Table 1, there were 9 positive, 9 neutral, and 12 negative facts about Drug 1, whereas there were 12 positive, 9 neutral, and 9 negative facts about Drug 2. Thus, the total distribution of information available to the group moderately favored Drug 2, thereby making Drug 2 the "correct" choice. Because all of the facts were provided to each group member in the correct preference condition, there was no hidden profile and the manifest profile favored Drug 2. In the two incorrect preference conditions, however, the manifest profile favored Drug 1 either strongly (strong incorrect preferencecondition) or mildly (weak incorrect preference condition), whereas the hidden profile favored Drug 2. Therefore,

although the total information potentially available to the group always favored Drug 2, the information provided to each group member strongly favored Drug 1 in the strong incorrect condition, mildly favored Drug 1 in the weak incorrect preference condition, and strongly favored Drug 2 in the correct preference condition. Moreover, in the two unshared conditions, communication of unshared information was necessary if groups were to uncover the hidden profile and make the correct decision.

Examining both correct and incorrect preference conditions while holding constant the distribution of information available to the group necessarily creates a higher individual memory load in the correct condition (60 vs. 40 facts). Although this lighter memory load provides a potential communication advantage to the two incorrect conditions, prior research has consistently found that this advantage is rarely used in practice (e.g., Stasser & Titus, 1985; Stasser, Taylor, & Hanna, 1989). Such a communication advantage, if operative, also would work against our decision quality hypotheses.

The 30 facts about each drug were selected from a larger pool of facts (total $N = 108$) during pretesting. Some of the facts were based on information about actual drugs that were meant to reduce cholesterol and some were created specifically for this study. A separate sample of 15 participants (8 women and 7 men) rated each fact (using 100-point scales) on how positive or negative it was and on how important the fact would be to them if they had to make a decision about the drug. The criteria for selecting positive and negative facts were that (a) they were rated as moderately positive ($M = 76.69$) or moderately negative ($M = 26.68$) and (b) they were rated as moderately important (positive facts $M = 67.27$, negative facts $M = 63.10$). Facts that were rated as especially positive or negative or that were rated as especially important were avoided in an attempt to maintain relatively equal weighting of the facts. The criteria for selecting neutral facts were that (a) they were rated near the midpoint on positivity-negativity ($M = 53.01$) and (b) they were rated moderately low on importance ($M = 38.81$).

An example of a positive fact is "A 3-month study of 22 human patients showed that total cholesterol levels decreased by 10% and HDL levels increased by 32%." An example of a neutral fact is "Drug 1 would most likely be produced in the form of gel caplets." An example of a negative fact is "Drug 2 is expensive for patients to buy and is likely to be associated with increased insurance rates." The positive, negative, and neutral facts about each drug were presented in one of two random orders that were equivalent across conditions (except for removal of appropriate unshared facts from individual fact sheets in the two unshared conditions). The order of positive, negative, and neutral items, as well as shared and unshared items, was relatively evenly distributed across sheets within both random orders. The specific items that were unshared also were counterbalanced in the two unshared conditions.

TABLE 1: Distributions of Facts Provided in Each Initial Preference Condition

Correct Preference Condition and Overall Distribution

Item Valence	*Drug 1*	*Drug 2*
Positive	9	12
Neutral	9	9
Negative	12	9

Weak and Strong Incorrect Preference Conditions

	Weak Incorrect Preference		*Strong Incorrect Preference*	
Item Type and Valence	*Drug 1*	*Drug 2*	*Drug 1*	*Drug 2*
Shared items				
Positive	6	3	6	0
Neutral	6	6	9	9
Negative	3	6	0	6
Unshared items (for each member)				
Positive	1	3	1	4
Neutral	1	1	0	0
Negative	3	1	4	1
Manifest profile				
Positive	7	6	7	4
Neutral	7	7	9	9
Negative	6	7	4	7

Time Pressure Manipulation

The time pressure manipulation was developed based on extensive pretesting. This pretesting revealed that a relatively strong manipulation was necessary because participants tended to disregard more subtle time pressure procedures. Therefore, groups in the time pressure condition were told the following:

> During your discussion, we would like to simulate the pressures and stress often experienced by everyday business decision-making teams. Therefore, we would like you to imagine that the president of your company has called a surprise meeting and has demanded that your group report its final decision about what drug to market at this meeting. For this reason, it is very important for your group to come to a decision as quickly as possible.

Groups also were told that "the quality of your decision will be judged both on its correctness and on how quickly the decision was made." In addition, a volunteer from the group was asked to time the session using a stopwatch. Groups in the no time pressure condition

were told to "take as much time as you need to come to a decision that you are comfortable with and that you all are confident is correct."

Procedure

Participants volunteered for a study titled "Drug Marketing Simulation," which was described as a study in which groups would decide which of two drugs to market. Participants reported to the lab area in same-sex groups of 7 or 8. Six of these participants were randomly assigned to one of two triads to participate in the group discussions. The additional participants (when present) were assigned to an alternate experiment. Groups were randomly assigned to conditions and each participant was randomly assigned to a seat. The two group sessions were conducted in separate rooms by different experimenters. Each session was videotaped from behind a one-way mirror. Group members sat at one of three sides of a table, with the fourth side flush against the mirror.

Once seated, participants read an introduction sheet that described the videotaping procedure and explained that they would be participating in a role-playing simulation of managers in a pharmaceutical company trying to decide which of two drugs to market. They were told that both drugs were meant to reduce cholesterol levels and that each drug had certain benefits and certain risks. To reduce the chances of participants rushing through the materials or the interaction in hope of early dismissal, groups were told that the session would take the full 1½ hours but that no one would be asked to stay longer than that time. (Sessions typically lasted about 1 hour and 20 minutes.)

Participants were then given a booklet containing some factual, background information on cholesterol, drugs meant to reduce cholesterol, and the drug marketing process. To increase the participants' involvement in the task, the booklet also contained information about their pharmaceutical company, revealing that the company was in financial trouble and that their marketing decision was therefore especially important. Participants were given about 10 minutes to read through this information.

Each participant was then provided with information sheets about the two drugs that contained lists of positive, neutral, and negative facts. Participants were asked to familiarize themselves with the information about the two drugs. Barriers were placed on the table between participants so that items could not be shared prior to the group discussion. Participants were told that because individuals in everyday decision-making groups rarely have identical knowledge about any particular issue, the information they were given was not necessarily the same as the information that other group members received. However, participants were told that all of the information was accurate. Furthermore, they were told that they would be asked to recall the information about the two drugs later in the experiment. Participants were given 10 minutes to study the information sheets.

Prior to the group discussion, the fact sheets were collected and participants were asked to recall as many of the facts about each drug as they could. They were told that if they could only remember the general idea of a fact they should go ahead and write it down but that they should try to remember each fact as accurately as possible. Participants were allowed as much time as necessary to complete the recall task.

Following the recall task, the barriers were removed and the groups were asked to discuss the problem and come to a group consensus about which drug to market. They were told that it was very important to consider as much information as possible and to evaluate carefully the benefits and problems associated with each drug. The groups were then given one of the two time pressure manipulation instructions. The experimenter demonstrated how to use the intercom and told the group to signal over the intercom when it reached the final decision. The experimenter then left the room, started the videotape camera, and started the session over the intercom.

After the group reached its final decision, barriers were placed between group members and they were asked to once again recall the original facts about the two drugs. Finally, participants were asked to complete a questionnaire that included a number of manipulation and process checks and items assessing perceptions of the interaction, as well as individual and group drug preferences. Participants were then debriefed and dismissed.

Videotape Coding

The videotapes were coded for information communicated during discussion. Each fact about a drug that was mentioned during the interaction was transcribed. Coders then located the fact on a master coding sheet that told them whether the fact was positive, neutral, or negative and whether the fact was shared or unshared for any given condition.[1] Eight judges were used so that coding could be completed within a single semester. Judges were blind to the experimental conditions and hypotheses. Reliability was estimated by having all eight judges code a 15-minute sample tape consisting of 3-minute segments taken from each of five randomly selected pretest groups. Because coding took place over the course of a semester, reliability was assessed at three times during the coding period using three different tapes (prior to any coding, halfway through the coding, and after all coding had been completed). Given the relatively objective nature of the coding, it is not surprising that reliabil-

ity was high. Mean agreement was 95% among all possible pairs of coders, with no outliers.

RESULTS

Group and individual decision data (Drug 1 or Drug 2) were analyzed using a hierarchical log-linear procedure. Other outcome measures were analyzed by univariate analyses of variance (ANOVAs). All questionnaire data were analyzed at the group level.[2] Finally, gender composition of groups had no significant influence on any of the findings relevant to our hypotheses. Therefore, this factor was excluded from final analyses. After presenting information pertaining to the manipulations, we organized the presentation of findings around our central hypotheses.

Manipulation Checks

Time pressure. All questionnaire items were assessed on 9-point scales. Participants were asked to report how much time pressure they felt from 1 (*none*) to 9 (*extreme*). As expected, participants in the time pressure condition reported significantly more time pressure (M = 3.54) than did participants in the no time pressure condition (M = 2.63), $F(1, 65) = 10.93$, $p < .01$.

Participants also were asked to report, again on a 9-point scale, whether they felt they had enough time to make a decision and the degree to which their group focused on completing the task quickly. Consistent with the AFM, group members in the time pressure condition felt that they had less time to make a decision (M = 6.86) than did group members in the no time pressure condition (M = 7.71), $F(1, 65) = 13.73$, $p < .001$. Group members in the time pressure conditions also were more likely to focus on task completion (M = 5.33) than were group members in the no time pressure condition (M = 3.99), $F(1, 65) = 28.31$, $p < .001$.

Participants also were asked to assess the amount of stress they felt and to identify the source of their stress. Although no significant effects were found for amount of stress (all Fs < 1), participants in the time pressure condition specified time pressure as the cause of stress more frequently (16 out of 81) than did participants in the no time pressure condition (0 out of 88), $\chi^2(1, N = 169) = 19.20$, $p < .001$.

Finally, groups in the no time pressure condition took marginally longer to come to a decision (M = 7.67 minutes) than did groups in the time pressure condition (M = 5.52 minutes), $F(1, 68) = 2.79$, $p < .10$. Therefore, group members who were given the time pressure instructions reported that they experienced more time pressure, focused more on completing the task quickly, felt they had less time to make a decision, and took a marginally shorter amount of time to come to a group decision. Thus, it appears that the time pressure manipulation was successful in creating differential perceptions of time pressure. However, given that mean scores on the primary manipulation check item for both high and low time pressure conditions are below the midpoint of the scale, the amount of time pressure experienced in the high time pressure condition was modest.

Initial preferences. Group members were asked, after the discussion, to recall their prediscussion drug preferences. Recall that individual manifest profiles were constructed such that correct preference condition members should prefer Drug 2, strong incorrect preference members should strongly prefer Drug 1, and weak incorrect preference members should mildly prefer Drug 1. Indeed, the initial preference manipulation strongly influenced members' prediscussion drug preferences, $\chi^2(1, N = 201) = 41.42$, $p < .001$. Participants were more likely to favor Drug 2 in the correct preference condition (78%) than in the weak incorrect preference condition (46%) or the strong incorrect preference condition (25%).

Interaction Data

Because the AFM specifies that decision outcomes are reliant on discussion content, we present interaction process results prior to decision outcomes. Our theoretical analysis led to several interaction process predictions. Results relevant to each hypothesis will be presented separately.

Rate. A rate index was calculated by dividing the total number of facts discussed by the number of minutes in the group interaction.

Hypothesis 1: Groups will work at a faster rate under time pressure, discussing more facts per unit time.

As predicted, time pressure groups worked at a faster rate, discussing more facts per minute (M = 5.13) than no time pressure groups (M = 3.97), $F(1, 63) = 5.55$, $p < .03$. Discussion rate was not influenced by initial preferences.

Focus on diagnostic information. Hypotheses relevant to diagnosticity were examined using a 3 (initial preference) × 2 (time pressure) × 3 (fact valence: positive, neutral, or negative) × 2 (Drug 1 or Drug 2 facts) mixed ANOVA, with initial preference and time pressure being between-groups factors and item valence and drug being within-groups factors. To account for differences in the number of positive, neutral, and negative facts about each drug available for discussion, proportion indices (representing the proportion of available facts of a given type that were offered during discussion) were used.

Hypothesis 2: Group discussions will focus on information that is most relevant to the decision (i.e., positive and

negative facts) to the relative exclusion of other information (i.e., neutral facts).

Hypothesis 3: Time pressure will enhance the tendency for discussions to focus on relevant information.

The data offered strong support for Hypothesis 2 and did not support Hypothesis 3. Specifically, a strong main effect was found for item valence, $F(2, 126) = 112.84$, $p < .001$. Overall, groups were more likely to discuss positive ($M = .37$) and negative ($M = .52$) facts than neutral facts ($M = .20$). However, this tendency to focus on relevant information was not enhanced by time pressure ($F < 1$ for Time Pressure × Fact Valence interaction).[3] A significant main effect of drug also was found, $F(1, 63) = 19.30$, $p < .001$) such that groups were more likely to discuss Drug 1 facts ($M = .39$) than Drug 2 facts ($M = .33$). Finally, a significant Valence × Initial Preference interaction was found, $F(4, 126) = 2.44$, $p < .05$. Discussion patterns for valenced information appeared to be similar in the correct preference (positive facts $M = .38$, neutral $M = .16$, negative $M = .53$) and weak incorrect preference conditions (positive $M = .27$, neutral $M = .20$, negative $M = .54$), whereas groups in the strong incorrect preference condition appeared to discuss relatively fewer negative facts and relatively more neutral facts (positive $M = .37$, neutral $M = .27$, negative $M = .48$).

Biasing of discussions in favor of initial preferences. A bias index was created to assess the degree to which group discussions focused on information that was favorable to one decision alternative rather than the other. Specifically, the number of facts discussed that supported Drug 2 (positive facts about Drug 2 and negative facts about Drug 1) was divided by the total number of positive and negative facts discussed. The resulting index has a possible range of 0 to 1, with values greater than .50 indicating a discussion that was biased in favor of Drug 2 (the correct decision alternative) and values less than .50 indicating a discussion that was biased in favor of Drug 1. The bias index was examined using a 3 (initial preference) × 2 (time pressure) between-groups ANOVA.

Hypothesis 4: Group discussions will focus on information that supports members' initial preferences. Thus, discussions will be biased in favor of Drug 1 in the strong incorrect preference condition and in favor of Drug 2 in the correct preference condition. Discussions will be more evenly balanced in the weak incorrect preference condition.

Hypothesis 5: Time pressure will enhance the tendency for discussions to be biased in favor of initial preferences.

The data provided strong support for Hypothesis 4 and did not support Hypothesis 5. Specifically, a strong main effect was found for initial preferences, $F(2, 63) = 12.84$, $p < .001$. Discussions were most biased in favor of Drug 2 in the correct preference condition ($M = .66$) and were least biased toward Drug 2 in the strong incorrect preference condition ($M = .50$), with the bias index falling between these two values in the weak incorrect preference condition ($M = .55$).[4] The emergence of this predicted pattern of means suggests that discussion content was indeed strongly influenced by initial preferences, although it is interesting to note that the discussions in both of the unshared conditions were relatively evenly balanced. However, contrary to prediction, time pressure did not enhance the tendency for discussions to focus on information congruent with initial preferences ($p > .20$ for Time Pressure × Initial Preference interaction).

Focus on shared and unshared information. Because we used hidden profiles to create our initial preference manipulation, we also were able to examine the pooling of unshared information. The proportion of facts discussed was analyzed by a 2 (initial preference) × 2 (time pressure) × 2 (shared or unshared facts) ANOVA. Note that the correct preference conditions were not included in these analyses because they do not contain unshared information. Although previous research has found that groups tend to focus their discussions on shared information, we predicted that this tendency would be reduced in the current study because the unshared information was relevant and diagnostic. We expected this reduction in the sharing bias to be especially strong in the strong incorrect preference condition, in which all of the unshared information was diagnostic.

Hypothesis 6: Group discussions will be less likely to focus on shared information in the strong incorrect preference condition (in which the unshared information is highly relevant and diagnostic) than in the weak incorrect preference condition.

The data provided strong support for Hypothesis 6. Overall, groups were more likely to discuss shared facts ($M = .40$) than unshared facts ($M = .36$), $F(1, 43) = 5.33$, $p < .03$. However, this main effect must be interpreted in light of the predicted Initial Preference × Shared/Unshared interaction, $F(1, 43) = 7.90$, $p < .01$. Groups in the weak incorrect preference condition focused more on shared facts ($M = .43$) rather than on unshared facts ($M = .33$), $F(1, 43) = 11.50$, $p < .01$. However, this tendency was eliminated in the strong incorrect preference condition (shared facts $M = .37$, unshared facts $M = .38$), $F < 1$. No other main effects or interactions were significant.

If the elimination of the bias toward shared information found in the strong incorrect preference condition

was indeed due to a focus on diagnostic information, we would expect the bias to return when item valence is controlled. Stated differently, the tendency for groups to focus on positive and negative information could lead them to avoid contributing shared, neutral facts, leaving no option but to discuss the more relevant, unshared facts. To test this idea, we excluded the neutral information and re-analyzed the shared and unshared facts data. When this step was taken, the Initial Preference × Shared/Unshared interaction was no longer significant ($F < 1$) and the shared/unshared main effect became much stronger, $F(1, 43) = 53.56$, $p < .001$. Groups were more likely to discuss valenced, shared facts ($M = .54$) than they were to discuss valenced, unshared facts ($M = .38$), and this effect was robust across both incorrect preference conditions. Taken as a whole, these findings suggest that the typical tendency for groups to focus on shared information can be reduced or eliminated when the unshared information is especially salient due to its diagnosticity or relevance to the decision, a conclusion consistent with the results of Stasser's (1988) computer simulations of the information sharing model.

Group Decisions and Individual Preferences

The AFM specifies that final decisions are likely to reflect the content of group discussions, as influenced by members' initial preferences and other input variables affecting attention and information salience. The model also states that time pressure should enhance attention to salient information. Based on the distributions of information in the manifest profiles provided before discussion, we made the following predictions:

Hypothesis 7: Groups will be most likely to make the correct decision (i.e., to select Drug 2) in the correct preference condition, least likely to make the correct decision in the strong incorrect preference condition, and decision quality in the weak incorrect preference condition will fall in between.

Hypothesis 8: Time pressure will enhance decision quality in the correct preference condition but will reduce it in the two unshared conditions (with the largest reduction of quality in the strong incorrect preference condition).

These hypotheses received mixed support. As predicted, initial preferences had a strong effect on both group, $\chi^2(2, N = 71) = 18.24$, $p < .001$, and individual post-discussion drug choices, $\chi^2(2, N = 213) = 43.09$, $p < .001$. Both groups and individuals were more likely to prefer Drug 2, the correct drug, in the correct preference information condition, were least likely to prefer Drug 2 in the strong incorrect preference condition, with preferences in the weak incorrect preference condition falling in between (see Table 2).

TABLE 2: Proportion of Groups and Post-Discussion Individuals Choosing the Correct Drug (Drug 2)

	Time Pressure	
Condition	*Low*	*High*
Group decisions		
Correct preference	.75 (9/12)	.92 (11/12)
Weak incorrect preference	.50 (6/12)	.36 (4/11)
Strong incorrect preference	.15 (2/13)	.36 (4/11)
Individual preferences		
Correct preference	.75 (27/36)	.89 (32/36)
Weak incorrect preference	.47 (17/36)	.42 (13/33)
Strong incorrect preference	.18 (7/39)	.45 (15/33)

Although the time pressure main effect for group choices did not reach significance, a significant main effect for time pressure was found for individual post-discussion preferences, $\chi^2(1, N = 213) = 4.06$, $p < .05$. Overall, a higher proportion of individuals chose the correct drug under time pressure. This effect, however, was qualified by a marginally significant Initial Preference × Time Pressure interaction, $\chi^2(2, N = 213) = 4.92$, $p < .10$. Time pressure improved selection of the correct drug in the correct preference condition and worsened selection of the correct drug in the weak incorrect preference conditions. However, contrary to predictions, time pressure also improved selection of the correct drug in the strong incorrect preference condition.

Interaction-Decision Relationships

A central tenet of the AFM is that group decisions are strongly influenced by group interaction process. Thus, a major purpose of the current study was to examine the link between interaction process and decision quality.

Hypothesis 9: The discussion of information favoring Drug 2 will be strongly related to final selection of Drug 2.

The data provided strong support for Hypothesis 9. The proportion of positive and negative facts discussed by the group that favored Drug 2 was significantly correlated with final choice of Drug 2, $r(69) = .52$, $p < .001$.

DISCUSSION

This study clearly demonstrates that both initial preferences and communication features of group interaction influence the quality of group decisions, and it provides moderate support for the AFM. On one hand, support was found for a number of important hypotheses central to the model. Initial preferences dramatically influenced both group interaction processes and final

group decisions. Discussions were biased in favor of initial preferences, and those biased discussions led to final decisions that also were largely congruent with initial preferences. Discussion content also was strongly related to final group decisions. These findings provide strong support for the process-performance and information salience facets of the AFM. Finally, the tendency for groups to focus on shared information was eliminated in the strong incorrect preference condition, perhaps because the unshared information in that condition was particularly diagnostic, another result consistent with the salience facet of the AFM.

On the other hand, results for time pressure were inconsistent and provided only mixed support for the model. Consistent with the AFM, time pressure led to a faster work rate and also led group members to report that their attention was more focused on task completion. Time pressure also tended to enhance the impact of initial preferences on final group decisions but only in the correct and weak incorrect preference conditions. However, time pressure did not enhance the tendency for groups to focus on diagnostic information nor did it enhance the tendency for discussions to be biased in favor of initial preferences as the model predicts.

As these findings illustrate, the present study is somewhat unique in providing a detailed analysis of interaction process and its relationship with decision making and can be contrasted with much of the prior literature that either fails to consider group interaction processes or infers process differences merely from decision outcomes. These findings and their implications will now be discussed within the context of the AFM.

Content of the Group Interaction

Most groups centered their discussions around diagnostic information—positive or negative information that was most important to reaching an accurate decision. This is an important finding considering that some models of effective group decision making (e.g., Hirokawa, 1988) suggest that identifying important information is essential for optimal decision making.

The content of group discussions also revealed strong biases that were associated with members' initial decision preferences. Groups that were given initial information that was biased in favor of one of the drugs showed strong tendencies to focus their discussions on this preferred information. Thus, groups that began a discussion with a preferred alternative were less likely to discuss information about the drugs in an optimal manner. In relation to the AFM, initial preferences focus group members' attention on information that is consistent with their initial decision preferences.

The tendency for groups to focus on shared, rather than unshared, information often found in prior research (e.g., Stasser & Titus, 1987) was reduced in the present study and was actually eliminated in the strong incorrect preference condition. This finding is probably attributable to the greater relevance and diagnosticity of unshared information in the strong incorrect preference condition given that the tendency to focus on shared information was intact when neutral facts were excluded from analysis. Therefore, consistent with the AFM, the tendency for groups to focus on diagnostic information may have counterbalanced their tendency to focus on shared information. Consistent with this reasoning, Stasser (1988) presented computer simulation data showing that a biased focus on shared information should be reduced in the presence of highly salient unshared facts. It is also interesting in this regard that time pressure had no effect on information sharing. In general, one might expect time pressure to exacerbate the inability of group members to contribute unshared information. Indeed, Larson, Foster-Fishman, and Keys (1994) found that groups tended to discuss unshared information relatively late in their discussions, suggesting the time pressure would enhance biased discussion of shared information. However, the AFM suggests that time pressure can enhance a focus on unshared information when unshared facts are diagnostic. It is possible, then, that the structural impediments to discussing unshared information under time pressure may have been counterbalanced by the salience of that information in our study.

In addition, triads were used in the present study, and a focus on shared information has been previously shown to be weaker in small, rather than large, groups (Stasser, Taylor, & Hanna, 1989). A focus on shared information also was present in weak incorrect preference groups. This focus might have been eliminated in strong incorrect preference groups because members were more attentive to information that would support or contradict their somewhat strong initial preferences, possibly making the unshared information more salient. Finally, the current study used two decision alternatives, whereas prior research has used more than two. Discussing two alternatives might facilitate direct comparisons in a way that would heighten attention to unshared information. These possibilities could be directly compared in future research assessing the relative salience of shared and unshared information across various group sizes, number of alternatives, and levels of consensus. Future research also might test the intriguing idea that time pressure can either reduce or enhance biased discussion, depending on both the relative salience of the

shared and unshared information and the communication constraints imposed by time limits.

Relationships Between Interaction Process and Group Decisions

Different patterns of discussion either facilitate or debilitate decision making, depending on whether members' initial preferences are in accord with the actual attributes of the decision alternatives. In fact, group decisions were strongly influenced by interaction differences. Groups in the correct preference condition focused on diagnostic information in general and specifically on positive aspects of the correct drug and negative aspects of the incorrect drug. Accordingly, these groups were exceedingly good at coming to a correct decision. Time pressure facilitated these effects somewhat such that groups in the correct preference condition working under time pressure were better able to reach the correct decision. Weak incorrect preference groups also tended to discuss more shared information, especially under time pressure. Because the shared information supported the less adequate drug overall, weak incorrect preference groups tended to make the incorrect decision. Strong incorrect preference groups focused somewhat equally on shared and unshared information but still tended to make the incorrect decision. It is possible that their more even discussion of information was counterbalanced by the sheer strength of the initial preferences, making discussion unlikely to sway initial opinions.

Overall, discussion content was strongly related to final decisions. Thus, a tendency to focus on information that supported the correct decision led to a greater tendency to actually make that decision. The strength of this relationship was impressive given that other researchers have sometimes had difficulty documenting process-performance relationships (Hackman & Morris, 1975). This finding also provides additional support for the notion that information that is discussed and focused on by group members can be a very important determinant of final performance outcomes, as specified by the AFM.

As predicted, time pressure enhanced the impact of members' drug preferences in two of the three initial preference conditions. Groups in the correct preference condition were more likely to choose the correct drug when working under time pressure, whereas groups in the weak incorrect preference condition were less likely to choose the correct drug when working under time pressure. However, contrary to predictions, time pressure seemed to facilitate correct drug choice in the strong incorrect preference condition.

There are several possible explanations for this latter finding. The interaction data suggest that strong incorrect preference groups focused, to a greater extent than shared and weak incorrect preference groups, on (unshared) information supportive of Drug 2, a pattern that should facilitate decision quality. It is possible that members of strong incorrect preference groups expected that information presented in the discussion would support their initial preferences, and time pressure made this expectation particularly salient. If so, then members may have assigned additional weight to information that ran counter to their preferences early in the interaction, leading them to process additional information about the two drugs more carefully. Indeed, examination of the transcripts of groups that made the correct decision in the strong incorrect preference condition under time pressure showed that these groups all discussed expectation-incongruent information early in the interaction. Consistent with this interpretation, Maheswaran and Chaiken (1991) found that individuals processed a persuasive message systematically rather than heuristically when the provided heuristic cue was incongruent with the content of the persuasive message. Thus, the presence of incongruent information induced systematic processing under conditions in which heuristic processing would ordinarily be predicted. Applied to the current study, when discrepant information was offered early in the discussion in the strong incorrect preference/time pressure condition, this information may have led group members to systematically process the remaining information about the drugs, facilitating correct decisions.

Following the tradition of Anderson and Graesser (1976), Burnstein and Vinokur (1977), and others, this study demonstrates that decision outcome is highly reliant on the content of group interaction. It also shows that initial preferences for a particular decision outcome can be strong determinants of interaction content. In addition, time pressure seems to highlight the importance of both initial preferences and interaction content, at least under certain conditions. That is, biased discussion congruent with members' initial preferences seems to be accentuated under conditions of time pressure, unless a highly discrepant piece of information is encountered early in the interaction. In this latter situation, time pressure may enhance the group's tendency to systematically process information to resolve the discrepancy.

Limitations and Future Directions

Although our study provides valuable information about the joint operation of initial preferences and time pressure on both interaction process and performance and documents a number of useful findings, it also has a number of limitations that should be addressed in future research. One especially important need is to submit the time pressure predictions to a more powerful test. The

instructional manipulation used in the present study was effective in producing reliably distinct levels of time pressure but probably did not produce especially high levels in the time pressure condition. Both the high and low time pressure groups reported levels of time pressure that were below the midpoint of the scale. Future studies might invoke an objective manipulation by using specific time limits, although such a manipulation could be problematic in terms of restricting information search in an artificial manner. Future studies also might employ a paradigm that is less reliant on memory processes. It is possible that some of the biases observed in the content of group interaction, such as the tendency to focus on shared information, might be reduced or eliminated if participants have access to all of the information (e.g., in the form of transcripts) during discussion.

Future studies also could be designed to examine heuristic information processing and the narrowing of attention under time pressure in a more direct manner. In our study, narrowing of attention was inferred both from discussion content and self-reports of attention. Other strategies, such as thought listing procedures or information search assessments, might be used to measure more directly into thought patterns and focal attention.

In addition, the possibility that time pressure can actually improve decisions in some situations could be explored further. The AFM suggests that when decisions are simple, time pressure and the concomitant restricted communication and increased consensus pressure may actually facilitate efforts to make decisions efficiently. On more complex decisions, however, time pressure might lead to a focus on too few cues or on cues that are not necessarily diagnostic, leading to poorer decisions. Given the widespread use of groups for making decisions and solving problems, a greater knowledge of the joint impact of time pressure and initial preferences on decision making seems essential. The AFM provides a potent conceptual framework for generating testable hypotheses central to these temporal and situational issues.

NOTES

1. Statements that did not involve contributing facts were coded into one of several additional categories, including consensus-seeking statements ("Let's see if we all agree"), information-seeking statements ("What information did you have?"), time statements ("We have to do this quickly"), and errors in recall of the facts. Due to the low frequency of statements in these categories (less than 5%), they were excluded from final analyses.

2. Degrees of freedom vary slightly across analyses due to missing data. For questionnaire items, data for the group were considered missing if there were any missing data for any individual member. Interaction data were not available for two groups due to experimenter errors.

3. An index of proportion of discussed facts that were repeated during the interaction produced a similar pattern of results: Groups were more likely to repeat positive (M = .14) and negative (M = .24) facts rather than neutral facts (M = .05), $F(2, 126) = 61.73$, $p < .001$, and this tendency was not significantly enhanced by time pressure ($F < 1$).

4. An index of proportion of facts repeated during discussion produced a similar pattern of results. Repeated information was most biased in favor of Drug 2 in the correct preference condition (M = .74) and was least biased in favor of Drug 2 in the strong incorrect preference condition (M = .45), with the proportion falling in between in the weak incorrect preference condition (M = .52), $F(2, 60) = 11.13$, $p < .001$. This tendency for repeated information to be congruent with initial preferences was not enhanced by time pressure ($F < 1$).

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