Hidden Profiles and Concealed Information: Strategic Information Sharing and Use in Group Decision Making

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Hidden Profiles and Concealed Information: Strategic Information Sharing and Use in Group Decision Making

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Two experiments investigated the differential impact of cooperation and competition on strategic information sharing and use in a three-person group decision-making task. Information was distributed in order to create a hidden profile so that disconfirmation of group members' initial preferences was required to solve the task. Experiment 1 revealed that competition, compared to cooperation, led group members to withhold unshared information, a difference that was not significant for shared information. In competition, compared to cooperation, group members were also more reluctant to disconfirm their initial preferences. Decision quality was lower in competition than in cooperation, this effect being mediated by disconfirmation use and not by information sharing. Experiment 2 replicated these findings and revealed the role of mistrust in predicting strategic information sharing and use in competition. These results support a motivated information processing approach of group decision making.

Keywords: *cooperation; competition; information sharing; disconfirmation; group decision making*

Pressure to compete with others is commonplace in organizational, educational, and political settings where groups are often required to make decisions. Although group decision making requires cooperation and information sharing, the reality of most decision-making groups is different (Wittenbaum, Hollinghshead, & Botero, 2004). The strategic sharing of information and information withholding, now a widely known phenomenon in organizations (Mitusch, 2006), stands on the idea that often group members have competitive incentives when making decisions. Thus, if both cooperative and competitive motives occur during group decision making, how do these motives differentially impact the processing of information needed to reach an optimal decision? The present research experimentally contrasts cooperation and competition and studies their differential impact on information processing (information sharing and use) and its consequences on decision quality.

The important point here is that much of our knowledge on information sharing and group decision making comes from classic research on the so-called hidden profile situations (Stasser & Titus, 1985, 1987), which

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implicitly assumed that group members work cooperatively when making decisions (Wittenbaum et al., 2004). These past studies overlooked that in decision-making groups individuals face a mixture of cooperative incentives to reach high-quality group decisions and competitive incentives to do well personally (Davis, Laughlin, & Komorita, 1976). Worded differently, although early studies assumed cooperation, their findings may reflect mixed-motives situations rather than purely cooperative situations, as suggested by more recent research on group decision making (De Dreu, Nijstad, & van Knippenberg, 2008).

We claim that the contrast between cooperation and competition is critically important in hidden profiles and that both information sharing and use should be considered as motivated processes directed toward group members' goal attainment. Thus, we hypothesize that competition leads group members to engage in strategic behavior more than cooperation and that this should be reflected in the withholding of information and the unwillingness to put into question initial solutions, with the result of reducing the quality of group decisions. We first present the theoretical model that framed our studies and then we discuss the impact of goal interdependence on information sharing and use in hidden profiles.

MOTIVATED INFORMATION PROCESSING IN GROUP DECISION MAKING

Recently, De Dreu et al. (2008) proposed a model of motivated information processing in groups (MIP-G) that expands the view of groups as information processors (Hinsz, Tindale, & Vollrath, 1997) and emphasizes the role of social motivation: "Group decision-making research and theory can be enriched by systematically considering the mixture of cooperative and competitive incentives people have when working in groups" (p. 24). The authors pointed out that the assumption of purely cooperative incentives in group decision-making research is inconsistent with work on coalition formation (e.g., Komorita & Parks, 1995) and negotiation in small groups (e.g., Pruitt, 1998), in which quite the reverse assumption was made. Various competitive goals (desire to attain a high status, proving competence, taking credit for group success) are indeed present in groups and dyads, and they affect strategic choices and processing activities (Darnon, Butera, & Harackiewicz, 2007; Darnon, Harackiewicz, Butera, Mugny, & Quiamzade, 2007; De Dreu, Beersma, Stroebe, & Euwema, 2006; De Dreu & Carnevale, 2003; Steinel & De Dreu, 2004).

The concept of mixed-motive interdependence, believed to underlie most of group decision tasks, is central to the MIP-G model. In interdependence situations, group members are faced with a conflicting choice between collective and self-interests (Kelley & Thibaut, 1978). For example, one group member may be driven by cooperation and act in the interest of the group, while another group member may be driven by competition, his or her acts being guided by self-interest. Social motives are related to individual differences like social value orientation (McClintock, 1977) or—more importantly for our present contention—may be induced by situational cues like positive or negative goal interdependence (Deutsch, 1973; see also Johnson & Johnson, 1989). Information processing and strategic decisions are influenced by social motives: When motivated by competition, negotiators have been found to reach agreements of lower joint gain (De Dreu, Weingart, & Kwon, 2000), and decision makers exchanged less accurate information and strategically misrepresented their preferences (Murnighan, Babcock, Thompson, & Pillutla, 1999; Steinel & De Dreu, 2004). Therefore, it seems wise to believe that in group decision making, competition, more than cooperation, leads to deception under the form of strategic information sharing.

COOPERATION AND COMPETITION IN INFORMATION SHARING

The so-called hidden profiles (Stasser & Titus, 1985, 1987) are the prototype of decision situations in which group members could experience mixed-motive interdependence. In hidden profiles, group members are interdependent with regard to the optimal decision: They need to decide among a series of alternatives (e.g., suspects in a murder), but they have only part of the information available about each alternative. The optimal decision is hidden by the information distribution in that the key pieces of information are distributed to different group members (unshared information) while other pieces of information are known to all group members (shared information). Thus, by processing unshared information, groups have the possibility of making decisions of superior quality (Stasser & Titus, 2003). However, the majority of this research suggests that group members ignore unshared information, keeping the decision quality low (e.g., Larson, Christensen, Abbott, & Franz, 1996; Stasser & Stewart, 1992; Stasser & Titus, 2003; Stewart & Stasser, 1998).

We propose that this unshared information neglect may be understood by taking into account the cooperative and competitive goals underlying this task. Only because hidden profiles imply positive (cooperative) interdependence does not mean that group members always acted cooperatively (Wittenbaum et al., 2004). Studies in which participants were assumed to cooperate because

instructed to reach unanimous consensual decisions have shown that groups tended to pool more shared than unshared information and failed to make optimal decisions (e.g., Larson, Foster-Fishman, & Keys, 1994; Stasser & Titus, 1985, 1987). Put differently, research has shown that groups may fail to work cooperatively in a task that strongly requires cooperation (Tindale & Sheffey, 2002).

It seems then that group members might be motivated also by competition. But why? French and Raven suggested in 1959 that by controlling the access to valuable information, one may get or maintain a superior status within the group. Competitive motives underlie the desire to attain a high status, to impress others (Stroebe, Diehl, & Abakoumkin, 1992), and this seems to affect the exchange of unshared information. Some studies, indeed, suggest that group members already possessing high status mention more unshared information than low-status members (Larson et al., 1994; Larson, Foster-Fishman, & Franz, 1998). Although these studies focus on information sharing at the individual level, one may wonder whether the same holds true at the group level. Therefore, in line with the MIP-G model (De Dreu et al., 2008), we expect that group members' goals influence the pooling of unshared information during discussion. Cooperation should lead group members to primarily exchange the information-facilitating group goals, namely, the unshared information, as compared to competition where group members could be motivated to restrict the access to their unshared information. In other words, we expect that the propensity to withhold unshared information is more likely to appear in competition than in cooperation.

COOPERATION AND COMPETITION IN INFORMATION USE

In addition to the impact of goals on information sharing, it is also important to consider their impact on information use. The fact that some information is pooled during group discussion does not mean that groups use this information to reach their decisions (Stasser & Titus, 2003). *Information use* refers to the processing of the relevant and available information by groups (Hinsz et al., 1997) and specifically here to the disconfirmation of members' initial preferences. Disconfirmation is a very interesting indicator of information use in hidden profiles. Whenever group members put into question their own or others' initial preferences, they need to use unshared information in order to confirm or disconfirm their positions. Therefore, disconfirmation of both one's own and others' initial preferences are useful to solve hidden profiles. As for disconfirmation of one's own positions in particular, Greitemeyer and Schulz-Hardt (2003) have shown that groups' failure to solve hidden profiles stems from individual members' inability to disconfirm their own initial erroneous preferences during discussion. In line with this idea, Gigone and Hastie (1993) provided evidence that group decisions generally reflected participants' initial preferences more than information exchanged during discussion. These studies suggest that even when all information is available, group members need to use their unshared information to disconfirm members' erroneous initial preferences.

However, as hidden profiles imply mixed motives, it is unclear from these studies whether the reluctance to disconfirm members' initial preferences is more likely to occur under competition than under cooperation. We suggest here that competition should motivate group members to avoid disconfirming both their own and others' initial preferences. Two reasons could be evoked. On one hand, growing evidence indicates that people instantly develop ownership of their ideas and prefer information consistent with their ideas or preferences (for a review, see Frey & Schulz-Hardt, 2001). Moreover, some studies suggest that people may react defensively when their own preferences are questioned, especially if they are motivated by competition (Darnon, Muller, Schrager, Pannuzzo, & Butera, 2006; De Dreu & Van Knippenberg, 2005). Under competition, confirmation of one's own initial preference may serve a protection function (Butera & Mugny, 1995, 2001), being motivated by a fear of being exploited by the competitors (Leyens, Dardenne, Yzerbyt, Scaillet, & Snyder, 1999). On the other hand, under competition group members could also act strategically to impede other group members to find the correct decision. Therefore, they might be motivated to avoid disconfirming other members' erroneous preferences so as to keep the competitive advantage. In sum, we expect that competition, compared to cooperation, should lead group members to decrease the use of disconfirmation.

OVERVIEW AND HYPOTHESES

We report two experiments designed to test the general hypothesis that competition induces strategic information sharing and use, such that competition, more than cooperation, leads group members to withhold unshared information and to decrease the use of disconfirmation. Experiment 2 is aimed to replicate Experiment 1 and to test the role of mistrust in explaining strategic information sharing and use. In both experiments, cooperation and competition were manipulated by providing participants with positive or negative goal interdependence instructions. Several specific hypotheses are tested.

First, as mentioned earlier, members' goals should influence the type of information shared during discussion

(De Dreu et al., 2008), and we expect that groups should withhold more information in competition than in cooperation, moreso the unshared than the shared information (Hypothesis 1). Second, members' goals should affect members' inability to disconfirm their initial preferences, and we expect that competition, compared to cooperation, should lead groups to use disconfirmation to a lesser extent (Hypothesis 2). Because we predicted that groups in competition will perform poorly on both information sharing and use of disconfirmation, we also expect that competition should lead to less correct decisions than cooperation (Hypothesis 3). Logically, Hypothesis 3 suggests that information sharing and use of disconfirmation should mediate the effect of goal interdependence on decision quality. However, still little is known about the relative contribution of information sharing and disconfirmation in explaining decision quality. Initially, studies focused on information sharing (Stasser & Titus, 1987; Stasser & Stewart, 1992), but more recently Scholten, Van Knippenberg, Nijstad, and De Dreu (2007) showed that information use is at least as important as information sharing. Making optimal decisions is not simply a matter of promoting information, but also of integrating others' information and preferences (De Dreu & Carnevale, 2003; Stasser & Titus, 2003). However, these studies tested either the mediation by information sharing (Winquist & Larson, 1998), or by information use (Scholten et al., 2007), but none of them pitted one mechanism against the other in the same study. We therefore tested the joint mediation of information sharing and disconfirmation in a multiple mediation model and we suggest here that the use of disconfirmation is more important than the sharing of information for making optimal decisions in hidden profiles. Greitemeyer and Schulz-Hardt (2003) provide support to this hypothesis as they have shown that even when all information is available, group members still have difficulties in making correct decisions if they inefficiently disconfirm initial preferences. We hypothesize that disconfirmation and not unshared information should mediate the effect of goal interdependence on decision quality (Hypothesis 4).

EXPERIMENT 1

Method

Participants

In all, 90 psychology students (80 women and 10 men, $M = 20.65$ years, $SD = 2.63$) from a large French university participated in this study in return for course credit. The participants were randomly assigned to 30 3-person groups, 15 groups in cooperation and 15 groups in competition. Preliminary analyses revealed that mixed-sex groups did not behave differently from same-sex groups, and therefore this variable has not been included in the final analyses; this remark also applies to Experiment 2.

Task and Pilot Work

A task dealing with a road accident investigation was created (see appendix). Four persons are potential suspects in this accident, but three of them could be exonerated (Mr. X, Mrs. Y, and Mr. Z) and the fourth (Mr. X's son) incriminated based on a critical set of 9 clues. The entire set of information contained 28 items: 19 shared and 9 critical unshared items. A hidden profile was created by distributing 3 different critical items to each one of the 3 group members. The 19 shared items described the accident's circumstances and suspects' characteristics (descriptive information). It should be noted that only 1 item referred to Mr. X's son, making him a less salient suspect. The 9 unshared items allowed for the identification of Mr. X's son as the guilty person (identification information). This task is similar to Stasser and Stewart's (1992) homicide task, but differs in two important ways.

First, the task is transparent in that participants knew what items were shared and what items were unshared. This is important because such explicit knowledge allows participants to deliberately withhold or disseminate unshared information. One pilot study with 66 French psychology students tested whether participants were indeed able to distinguish shared from unshared information. Participants, seated as groups, were informed that shared (vs. unshared) information was presented on the top (vs. on the bottom) of the page. Participants were allowed to keep the information sheets in front on them and instructed to write down all their unshared information. Out of 66 participants, 46 correctly identified all items of their unshared information, $\chi^2(1, N = 66) = 10.24$, $p < .001$, regardless of its location. A second pilot study with 31 French psychology students tested whether participants recognized the superior value of unshared information for the task. Participants, provided with all the information, were asked to evaluate, on a 9-point scale, to what extent each item of information was important for an optimal decision. They were not informed about the location of information, but they were told that not all information is equally important for the task. They were also asked to classify each item as descriptive or identification information. Participants evaluated unshared information as being more important ($M = 6.88$, $SD = 1.38$) than shared information ($M = 5.50$, $SD = 1.20$), $t(30) = 7.26$, $p < .001$. The majority of the participants classified shared information as descriptive

(15 out of 19 shared items, for all χ^2s, $p < .05$) and unshared information as identification (seven out of nine unshared items, for all χ^2s, $p < .05$).

Second, this task requires the use of unshared information under the form of initial preferences disconfirmation. In Stasser and Stewart's (1992) task, group members had to discover the hidden profile by adding and subtracting exonerating and incriminating information. Here, each group member was oriented to a different initial preference and he or she had the opportunity to use his or her unshared information to disconfirm another member's initial preference. For example, the member oriented to Mr. X received the information "the guilty person is a man," which allows disconfirming the initial preference of another member, namely, Mrs. Y. Three additional pilot studies showed that participants can be oriented toward three different suboptimal initial solutions, and a fourth pilot study proved that possessing all the information allows finding the correct solution (see appendix). Thus, in contrast with previous "hidden profile" research, our task allowed (a) participants to identify shared and (their own) unshared information prior to the group discussion and (b) each group member to disconfirm another group member's initial but erroneous preference.

Procedure

Upon arrival at the laboratory, participants were told that the research was designed to find out how groups make decisions. Participants were then invited to study the road accident case individually and to identify the guilty person. They were provided with the 19 shared items along with 3 unshared items devised to orient them toward specific suspects. In order to increase the likelihood of choosing the induced solutions, participants were given 3 minutes to find a solution. Next, they were invited to take seats at a round discussion table. Seating positions were perfectly symmetric so that no participant had a dominant seat. The participants' agreement to allow video recording was obtained at that point. Participants were instructed to discuss the road accident case for 15 minutes maximum. The discussion was not memory dependent as participants were allowed to keep their sheets during discussion. Similar to the pilot studies, participants were informed about the location of shared and unshared information.

Participants in cooperation were then told that their goal was to jointly decide about the best solution regarding the guilty person in the accident. Participants in competition were told that although in group decision situations generally members make a joint decision, it is often important to be the first in the group to propose a solution. Thus, their goal was to outperform the others by being the first in the group to offer the best solution. All participants were told that making the best decision was of the utmost importance to meet the experiment's purpose. No material reward was offered for correct decisions and no punishment was administered for wrong decisions. The discussion was interrupted when the group (in cooperation) or a group member (in competition) announced a decision. The group discussion ended no matter what the decision was, and participants were unaware if their decision was correct or not. In competition, the participant who first wanted to give her or his decision was not allowed to announce it to the other group members. He or she was invited to write it on a piece of paper that the other group members were unable to see and give it to the experimenter. When the discussion was interrupted, all group members, in both conditions, were asked to provide their individual decisions and to fill out a postdiscussion questionnaire. Finally, the experimenter debriefed the participants and gave them the credit course certificates. The entire experiment lasted about 1 hour.

Dependent Measures

Information sharing and use. Each group discussion was videotaped and transcribed. All the transcriptions were analyzed by two independent coders, who were blind to the hypotheses and received extensive training in the procedure. The dependent measures were derived from the coded group discussion. The measures of information sharing consisted of the proportions of unshared and shared information, computed, respectively, by dividing the number of mentioned unshared items by the total number of unshared items available (9) and by dividing the number of mentioned shared items by the total number of shared items available (19), as it is common practice in the literature on hidden profiles (Scholten et al., 2007). However, because it is not at all sure that the participants respect base rates (Tversky & Kahneman, 1974), a second measure of the proportions of unshared and shared information, closer to the participants' actual behavior, was calculated by dividing the amount of mentioned shared and unshared information (counted separately) by the total amount of information actually mentioned by each group.

The measure of information use consisted of the number of disconfirmations, that is, the number of statements in which a member ruled out any initial preference (his or her own or that of another member); for example, "It can't be Mrs. Y because I know that the guilty person is a man." Because each discussion was coded by two coders, we averaged all the measures in the analyses and estimated reliability with intraclass correlation. The estimated reliabilities for the averaged

measures varied between 0.84 and 0.90. Discussion time was also recorded.

Decision quality measures. Decision quality was a dichotomous measure expressing whether groups found the correct decision (coded 1) or not (coded 0). Because group members reported their decisions individually, two indicators of decision quality were computed. We considered a group as successful only if all group members indicated the correct decision or if at least one group member indicated the correct decision. Both measures were used in the analyses.

Postdiscussion measures. Six questions concerned with perception of cooperation and competition were answered on a 9-point scale ranging from 1 (*not at all*) to 9 (*yes, definitely*). Three questions referring to cooperation ("How important was it to discuss/to share information/to work as a group ?") were combined into a single mean score ($\alpha = .96$). Three questions referring to competition ("How tense was the climate?" "Did you find other members were your opponents/were trying to withhold information?") were combined into a single mean score ($\alpha = .78$).

Results

Manipulation Checks

The perceived cooperation score was higher in cooperation ($M = 8.52$, $SD = 0.44$) than in competition ($M = 6.60$, $SD = 2.32$), $t(26) = 3.03$, $p < .01$. Conversely, the perceived competition score was higher in competition ($M = 1.99$, $SD = 0.98$) than in cooperation ($M = 1.19$, $SD = 0.22$), $t(26) = 2.98$, $p < .05$. It should be noted that the homogeneity of variance assumption was not met for both variables and that the Welch separate-variance version of the t test was used (Zimmerman, 1998). These results indicated that the goal interdependence manipulation was successful, notwithstanding a normative preference for cooperation.

Information Sharing

Proportions of information relative to the available amount of information were analyzed with a 2 (goal interdependence: cooperation, competition) × 2 (information type: shared, unshared) mixed-model ANOVA with repeated measures on the second factor. This analysis revealed a main effect of information type: More unshared ($M = 1.82$, $SD = 1.13$) than shared information ($M = 0.76$, $SD = 0.57$) was exchanged, $F(1, 28) = 42.87$, $p < .001$, $\eta^2 = .60$. This main effect was qualified by a significant interaction between goal interdependence and information type, $F(1, 28) = 16.03$, $p < .001$, $\eta^2 = .36$, as expected in Hypothesis 1. Simple effect analyses showed that groups in competition exchanged significantly less unshared information ($M = 1.27$, $SD = 0.92$) than groups in cooperation ($M = 2.38$, $SD = 1.08$), $F(1, 28) = 9.03$, $p < .01$, $\eta^2 = .24$, while the difference between competition ($M = 0.86$, $SD = 0.56$) and cooperation ($M = 0.67$, $SD = 0.59$) was not significant for shared information, $F < 1$ (see Figure 1). The main effect of goal interdependence was marginally significant, $F(1, 28) = 3.29$, $p = .08$. Groups in competition ($M = 1.06$, $SD = 0.60$) tended to exchange less information than groups in cooperation ($M = 1.52$, $SD = 0.76$).

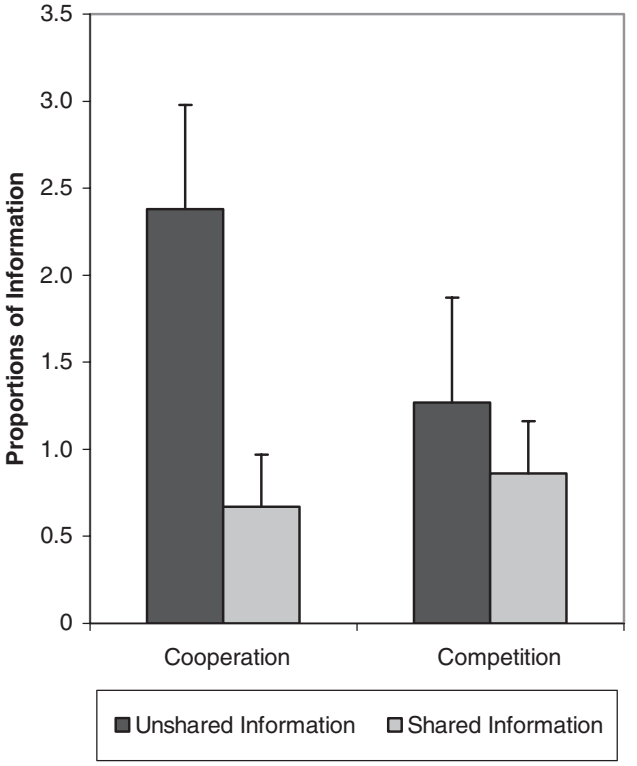


Figure 1 Pooling of unshared and shared information as a function of goal interdependence (Experiment 1).

However, consistent with Tversky and Kahneman's (1974) work, our participants clearly ignored base rates. Indeed, of the 19 shared and 9 unshared items, participants mentioned 8.23 ($SD = 4.68$) shared and 6.83 ($SD = 2.92$) unshared items. Thus, information sharing was also analyzed with proportions of unshared and shared information relative to the total amount of information actually mentioned by each group. Because the two scores were perfectly negatively correlated, only proportions of unshared information were analyzed. Groups in competition exchanged significantly less

unshared information ($M = 0.38$, $SD = 0.21$) than groups in cooperation[1] ($M = 0.65$, $SD = 0.15$), $F(1, 28) = 16.04$, $p < .001$, $\eta^2 = .36$.

Information Use: Disconfirmation

In line with Hypothesis 2, groups in competition disconfirmed their initial preferences less ($M = 1.60$, $SD = 2.06$) than groups in cooperation ($M = 4.20$, $SD = 3.27$), $F(1, 28) = 6.76$, $p < .05$, $\eta^2 = .19$.

Decision Quality

With regard to decision quality, results for the first score (all members succeed) indicated that in cooperation more groups succeeded (93%) than failed (7%), whereas in competition more groups failed (66%) than succeeded (33%), $\chi^2(1, N = 30) = 15.00$, $p < .001$. Results for the second score (at least one member succeeded) indicated that in cooperation more groups succeeded (93%) than failed (7%), whereas in competition 40% of groups failed and 60% of groups succeeded, $\chi^2(1, N = 30) = 4.66$, $p < .05$. In conclusion, both indicators of decision quality supported Hypothesis 3.[2]

Mediational Role of Disconfirmation and Unshared Information

We studied whether disconfirmation rather than unshared information[3] mediated the effect of goal interdependence on decision quality (Hypothesis 4). The correlation between disconfirmation and unshared information was $r = .36$. We used a multiple mediator model (Preacher & Hayes, 2008), but because the dependent variable was dichotomous both logistic and linear regression analyses were used.

Goal interdependence significantly predicted decision quality, $B = 1.66$, $SE = 0.58$, Wald $\chi^2(1, N = 30) = 8.09$, $p < .01$; disconfirmation, $B = 1.30$, $SE = 0.50$, $t(28) = 2.60$, $p < .05$; and unshared information, $B = 0.13$, $SE = 0.03$, $t(28) = 4.00$, $p < .001$. Both disconfirmation, $B = 1.66$, $SE = 0.74$, Wald $\chi^2(1, N = 30) = 4.97$, $p < .05$, and unshared information, $B = 8.95$, $SE = 4.35$, Wald $\chi^2(1, N = 30) = 4.24$, $p < .05$, predicted decision quality. When goal interdependence and the two mediators were used to predict decision quality, disconfirmation appeared to be a significant predictor of decision quality, $B = 1.50$, $SE = 0.73$, Wald $\chi^2(1, N = 30) = 4.22$, $p < .05$, whereas unshared information and goal interdependence were no more significant predictors, respectively, $B = 8.43$, $SE = 7.55$, Wald $\chi^2(1, N = 30) = 1.25$, $p = .26$ and $B = .13$, $SE = 1.21$, Wald $\chi^2(1, N = 30) = .01$, $p = .92$; the reduction for goal interdependence was marginally significant, $z = 1.66$, $p = .09$.

Supplementary Analysis

One could argue that superior decision quality in cooperation, compared to competition, is due to discussion time. Competition implied some temporal pressure that might have affected decision quality (Kelly & Karau, 1999). Indeed, groups in cooperation discussed more ($M = 215.86$ seconds, $SD = 77.77$) than groups in competition ($M = 131.07$, $SD = 55.70$), $F(1, 26) = 10.99$, $p < .01$, $\eta^2 = .30$. However, it is possible that whereas in competition participants were implicitly incited to make rapid decisions, individual members in cooperation were as fast as those in competition to propose a decision. We therefore measured the time necessary for a member in cooperation or in competition to announce a decision. This new analysis revealed that groups in cooperation were not different ($M = 130.86$, $SD = 46.46$) from groups in competition ($M = 131.07$, $SD = 55.70$), $F(1, 26) < 1$, $p = .99$. Thus, groups in the two experimental conditions took equal time to make the decision to be announced; because groups in cooperation found more correct decisions than groups in competition, we can conclude that they performed better.

Discussion

The results strongly supported our hypotheses, as the goal interdependence manipulation significantly impacted unshared information pooling and use of disconfirmation. Compared to groups in cooperation, groups in competition pooled less unshared information, while the difference was not significant for shared information (Hypothesis 1). This suggests that the withholding of unshared information is a motivated process more likely to occur in competition than in cooperation. Pilot studies indicated that participants are aware of the diagnostic value of unshared information and they are able to identify it. Therefore, pooling less unshared information in competition than in cooperation suggests that group members, for strategic reasons, were not willing to pool this information. Moreover, members in competition and in cooperation pooled comparable proportions of shared information, showing that members in competition do not display a generic bias toward withholding information: They share—as much as the members in cooperation—shared information, probably in a tactical attempt to show that they do share some information, even if not diagnostic (Steinel & De Dreu, 2004).

Previous studies have shown that the dominance of shared over unshared information is a robust phenomenon (Wittenbaum & Stasser, 1996). Our results did not fit this picture, as quite the reverse effect was obtained.

We believe that our task is mainly responsible for this main effect. In such a transparent task, group members had no difficulty in pooling their unshared information, and especially so when working cooperatively. This is consistent with studies showing that unshared information increases if participants are given clues to distinguish shared from unshared information (Parks, 1992; Schittekatte, 1996).

Reliable and sizable differences between competition and cooperation were also found for disconfirmation. Groups in competition disconfirmed their initial suboptimal preferences less than groups in cooperation (Hypothesis 2). This is consistent with previous research showing that competition reduced the use of disconfirmation because it induces more protection and inflexibility regarding one's initial position (Butera & Mugny, 1995, 2001; De Dreu & Van Knippenberg, 2005). In cooperation members were probably more open to others' preference and more inclined to endorse critical thinking (Postmes, Spears, & Cihangir, 2001).

Finally, group decision quality was strongly influenced by goal interdependence as more groups in cooperation than in competition succeeded in making the optimal decision (Hypothesis 3), whatever the conception of success. Moreover, results suggested that disconfirmation and not unshared information underlies groups' ability to reach the correct decision (Hypothesis 4). This is consistent with Greitemeyer and Schulz-Hardt's (2003) work suggesting that decision quality is dependent on members' use of the exchanged information. Clearly, groups in competition were less successful in using disconfirmation, so they failed. It should also be noted that the superiority of decision quality in cooperation is not attributable to differences in discussion time: Individual members in cooperation did not spend more time than members in competition before they mentioned the decision that was finally delivered by the group. Their additional time seemed to be dedicated to clarifications.

EXPERIMENT 2

Because Experiment 1 is the first study testing the moderating role of goal interdependence in hidden profiles, we sought a replication in a second experiment, using a different sample than psychology students. Moreover, although the results of Experiment 1 showed that group members are likely to strategically share and use their information when instructed to compete with their fellow members, it remains unclear why. Mistrust has long been discussed in connection with competition (see Deutsch, 1962). Defined as the unwillingness to risk vulnerability to a person whose behavior is beyond one's control (Zand, 1972), mistrust might be an important reason to engage in deceptive behavior in competition. First, mistrust could be responsible for information withholding in competition (Butler, 1999). Zand's (1972) dynamic model of trust specifies a causal link between mistrust and decrease in information sharing. Research in negotiation supported this idea and found negative effects of mistrust on information exchange and negotiation effectiveness (Kemp & Smith, 1994; Thompson & Hastie, 1990). In the domain of social decision making, Steinel and De Dreu (2004) also found that the fear of being exploited is a reason to withhold accurate information. Second, mistrust could be responsible for the unwillingness to disconfirm initial preferences in competition. As mentioned earlier, the confirmation of one's initial preference may serve a protection function (Butera & Mugny, 2001) and could reflect the fear of being exploited by competitors (Leyens et al., 1999). Because under competition group members are motivated by personal achievement but experience a high level of mistrust (De Dreu & Carnevale, 2003; Pruitt, 1998), preserving one's initial preference might seem a wise strategy in this situation. Therefore, in Experiment 2 we test the explanatory hypothesis that mistrust is responsible for the effects of goal interdependence on strategic information sharing and disconfirmation.

Method

Participants

In all, 84 students of a large French university (50 women and 34 men, $M = 20.61$ years, $SD = 2.12$) with different academic backgrounds volunteered for this study. They were recruited on the campus mainly in libraries and cafeterias. From these participants, 28 groups were created, 14 groups in cooperation and 14 groups in competition.

Procedure

Procedure and materials were identical to those of Experiment 1. The same dependent measures were used. Mistrust ("Were you suspicious about other group members?" "Were you hesitant in communicating information?" "Were you concerned about others acting unfairly?") was assessed on a 9-point scale (1 = *not at all*, 9 = *yes, definitely*). These items were combined into a single score ($\alpha = .90$).

Results

Manipulation Checks

The combined scores for cooperation and competition showed good internal consistency ($\alpha = .77$ and $\alpha = .91$). Group interaction was perceived as more

cooperative in cooperation ($M = 8.72$, $SD = 0.31$) than in competition ($M = 7.25$, $SD = 1.15$), $t(26) = 4.64$, $p < .001$, and more competitive in competition ($M = 3.22$, $SD = 1.68$) than in cooperation ($M = 1.21$, $SD = 0.32$), $t(26) = 4.40$, $p < .001$. These results indicated that again, the goal interdependence manipulation was successful.

Information Sharing

When analyzing proportions relative to the available amount of information, two main effects were found. More unshared ($M = 1.81$, $SD = 1.40$) than shared information ($M = 0.71$, $SD = 0.48$) was exchanged, $F(1, 26) = 35.57$, $p < .001$, $\eta^2 = .57$; more information was exchanged in cooperation ($M = 1.82$, $SD = 0.74$) than in competition ($M = 0.70$, $SD = 0.44$), $F(1, 26) = 23.32$, $p < .001$, $\eta^2 = .47$. These main effects were qualified by a significant interaction between goal interdependence and information type, $F(1, 26) = 20.52$, $p < .001$, $\eta^2 = .44$, which again supports Hypothesis 1. Simple effect analyses showed once again that groups in competition exchanged significantly less unshared information ($M = 0.84$, $SD = 0.74$) than groups in cooperation ($M = 2.79$, $SD = 1.21$), $F(1, 26) = 26.56$, $p < .001$, $\eta^2 = .50$, while the difference between competition ($M = 0.57$, $SD = 0.43$) and cooperation ($M = 0.85$, $SD = 0.50$) was not significant for shared information, $F(1, 26) = 2.42$, $p = .13$ (see Figure 2).

Again participants ignored base rates. Indeed, of the 19 shared and 9 unshared items, participants mentioned 9.77 ($SD = 5.53$) shared and 6.75 ($SD = 3.06$) unshared items. When analyzing proportions relative to the total amount of mentioned information, we found once again that groups in competition exchanged significantly less unshared information ($M = 0.34$, $SD = 0.23$) than groups in cooperation ($M = 0.62$, $SD = 0.13$), $F(1, 26) = 15.35$, $p < .001$, $\eta^2 = .37$.

Information Use: Disconfirmation

As in the previous experiment, groups in competition disconfirmed their initial preferences less ($M = 1.43$, $SD = 2.23$), compared to groups in cooperation ($M = 4.64$, $SD = 2.52$), $F(1, 26) = 12.74$, $p < .001$, $\eta^2 = .33$.

Mediational Role of Mistrust

We followed Baron and Kenny's (1986) causal step procedure. Goal interdependence influenced unshared information, $B = 0.14$, $SE = .04$, $t(26) = -3.91$, $p < .001$; disconfirmation, $B = 1.60$, $SE = .45$, $t(26) = 3.56$, $p < .01$; and mistrust, $B = -0.90$, $SE = .16$, $t(26) = -5.58$, $p < .001$. When goal interdependence and mistrust were simultaneously used to predict unshared information, the relation between mistrust and unshared information was reliable, $B = -0.09$, $SE = .04$, $t(25) = -2.27$, $p < .05$, whereas the impact of goal interdependence was no more reliable, $B = 0.06$, $SE = .05$, $t(25) = 1.16$, $p = .25$, Sobel test, $z = 2.09$, $p < .05$. When goal interdependence and mistrust were simultaneously used to predict disconfirmation, the relation between mistrust and disconfirmation was reliable, $B = -1.22$, $SE = .50$, $t(25) = -2.43$, $p < .05$, whereas the impact of goal interdependence was no more reliable, $B = 0.50$, $SE = .61$, $t < 1.16$, Sobel test, $z = 2.24$, $p < .05$.

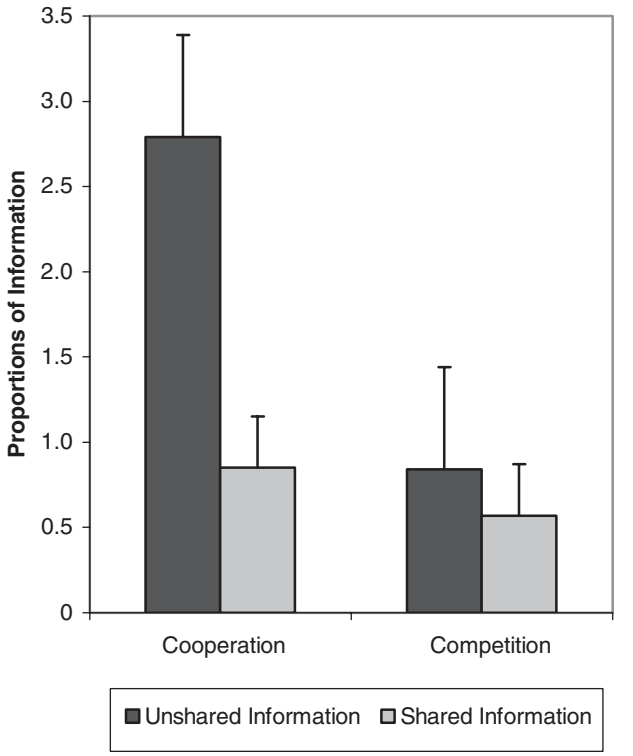


Figure 2 Pooling of unshared and shared information as a function of goal interdependence (Experiment 2).

Decision Quality

For the first indicator (all members succeeded), we found again that in cooperation, more groups succeeded (85%) than failed (15%), whereas in competition, more groups failed (78%) than succeeded (22%), $\chi^2(1, N = 28) = 11.63$, $p < .001$. For the second indicator (at least one member succeeded), the effect of goal interdependence was also significant, $\chi^2(1, N = 28) = 6.30$, $p < .05$. In cooperation, more groups succeeded (85%) than failed (15%), whereas

in competition, 50% of groups failed and 50% of groups succeeded.

Mediational Role of Disconfirmation and Unshared Information

Again, we tested whether disconfirmation rather than unshared information mediates the effect of goal interdependence on decision quality. The correlation between the two mediators was $r = .53$. Goal interdependence predicted decision quality, $B = 1.35$, $SE = 0.48$, Wald $\chi^2(1, N = 28) = 7.86$, $p < .01$; disconfirmation, $B = 1.35$, $SE = 0.28$, $t(26) = 4.71$, $p < .001$; and unshared information, $B = 0.14$, $SE = 0.04$, $t(26) = 3.91$, $p < .001$. Both disconfirmation, $B = 0.87$, $SE = 0.37$, Wald $\chi^2(1, N = 28) = 5.34$, $p < .05$, and unshared information $B = 5.36$, $SE = 3.04$, Wald $\chi^2(1, N = 28) = 3.09$, $p = .07$, predicted decision quality. When both goal interdependence and the two mediators were used to predict decision quality, disconfirmation appeared to be a significant predictor of decision quality, $B = 0.91$, $SE = 0.43$, Wald $\chi^2(1, N = 28) = 4.47$, $p < .05$, whereas unshared information and goal interdependence were no more significant predictors, respectively, $B = 5.76$, $SE = 3.51$, Wald $\chi^2(1, N = 28) = 2.69$, $p = .10$ and $B = 0.19$, $SE = 0.84$, Wald $\chi^2(1, N = 28) = 0.05$, $p = .81$; the reduction for goal interdependence was significant, $z = 1.92$, $p < .05$.

Discussion

Results of this experiment replicated those of Experiment 1, again with large effect sizes. Indeed, groups in competition were more strategic than groups in cooperation when sharing information as they mentioned less unshared information, but not less shared information (Hypothesis 1). We also replicated the main effect of type of information found in Experiment 1, thus suggesting that our task is responsible for the increased exchange of unshared information. With regard to information use, groups in competition were also defective because they disconfirmed their initial preferences less than groups in cooperation (Hypothesis 2). As a consequence, group decision quality was inferior in competition than in cooperation (Hypothesis 3), an effect mediated by disconfirmation use and not by unshared information pooling (Hypothesis 4). Consistent with the specific hypothesis of Experiment 2, group members in competition were especially reluctant to exchange unshared information and to disconfirm their preferences when they mistrusted their partners. Indeed, the impact of goal interdependence on both unshared information and disconfirmation was mediated by mistrust.

GENERAL DISCUSSION

For a long time, research on hidden profiles has assumed that group members work cooperatively and exchange information in an objective manner (Wittenbaum et al., 2004). However, a great deal of research rather suggests that groups fail to work cooperatively (Tindale & Sheffey, 2002) because their members fail to pool unshared information (Larson et al., 1994; Stasser & Titus, 2003) and are reluctant to disconfirm initial preferences (Greitemeyer & Schulz-Hardt, 2003). In the present article, we took the perspective of more recent research pointing out that hidden profile groups may involve mixed motives rather than cooperative motives only (De Dreu et al., 2008). We therefore directly contrasted cooperative and competitive goals in group decision making and studied their impact on information sharing and use of disconfirmation.

Indeed, both the motivated information processing in groups model (De Dreu et al., 2008) and interdependence theory (Kelley & Thibault, 1978) suggest that most decision-making situations are characterized by mixed motives and that group members could be motivated to reach high-quality group decisions but also to outperform others (Davis et al., 1976). Although the hidden profile task induces positive resource interdependence, group members may perceive positive and negative goal interdependence (Deutsch, 1973). Our key prediction was therefore that competition leads group members to engage in strategic behavior more than cooperation, and this should be reflected in the withholding of unshared information and the unwillingness to use disconfirmation. The results from both our experiments are consistent with this prediction. In competition more than in cooperation, groups used deceptive behavior when sharing information because they withheld unshared information to a greater extent, a difference that was not significant for shared information. Consistent with the information dilemma effect found in negotiation settings (Murnighan et al., 1999), group members in competition tried to preserve individual advantage by withholding unshared information. Moreover, they pooled shared information as much as the group members in cooperation, perhaps in an attempt to trigger others' cooperation and unshared information. This is in line with social exchange and reciprocity theories (Blau, 1964) suggesting that pooling shared but not unshared information reflects subtle forms of deception that masks the opportunistic characteristics of competitive situations (Wong, Tjosvold, & Yu, 2005).

Also based upon the assumption of mixed motives underlying hidden profiles, we proposed that the

unwillingness to disconfirm initial preferences (Gigone & Hastie, 1993; Greitemeyer & Schulz-Hardt, 2003) would be more pronounced under competition than cooperation. And indeed, results of both experiments supported this prediction and patterned the results on information sharing. This suggests that both information sharing and disconfirmation reflect motivated processes directed toward group members' goal attainment (De Dreu et al., 2008; Wittenbaum et al., 2004).

Consistent with this analysis, we obtained strong evidence that strategic information sharing and use in competition is motivated by mistrust. Indeed, the results obtained in Experiment 2 showed that mistrust accounts for the reduction in the use of disconfirmation and unshared information exchange. This may indicate that fear of exploitation activates avoidance strategies, like protection of one's own initial preferences in competition (Butera & Mugny, 2001; Leyens et al., 1999) and withholding of accurate information (Steinel & De Dreu, 2004). Future research should examine if other motivations (e.g., greed) could explain approach strategies such as pooling shared information and disconfirming others' initial preferences.

Group Decision Quality and Information Use

With regard to decision quality, previous studies on group decision making constantly demonstrated groups' failure to discover hidden profiles (e.g., Larson et al., 1994; Stasser & Stewart, 1992). The present research moderates this effect and shows that failure to discover the hidden profile was more frequent in competition than in cooperation. Importantly, we ruled out that time pressure (e.g., Kelly & Karau, 1999) was responsible for poorer decision quality in competition, which was only affected by the discussion content.

Indeed, we succeeded in showing that lower group decision quality in competition, compared to cooperation, was due to insufficient use of disconfirmation. Unshared information pooling did not appear to be a mediator of the reduction in decision quality under competition. This is in line with Greitemeyer and Schulz-Hardt's (2003) study suggesting that groups not only need to pool information to reach high-quality decisions, but they especially need to use such information to inform their decisions. It is also in line with studies in which the manipulated willingness to engage in information processing gave rise to better decisions (Postmes et al., 2001; Scholten et al., 2007). However, unlike previous research that examined either the mediating role of information sharing (Winquist & Larson, 1998) or of information use (Scholten et al., 2007), the current study allowed us to concurrently examine the two mediators. An important contribution of the present research is that it provides evidence that information use, more than information sharing, predicts decision quality in hidden profiles.

Social Value of Shared and Unshared Information

Previous studies pointed out that the dominance of shared information in hidden profiles is a robust effect (Wittenbaum & Stasser, 1996), being often explained by the superior value of shared information in the group. Indeed, research showed that shared information allows the social validation of members' positions (Wittenbaum & Bowman, 2004) and group members were considered more capable when pooling shared rather than unshared information (Wittenbaum, Hubbell, & Zuckerman, 1999). Unshared information, in return, was considered a threat to group consensus, thus having low social value in groups.

In the present research, we extend this view by suggesting that the social value of information depends on mixed motives. As Dennis (1996) pointed out, in deciding to contribute information, participants assess the relevance of information and the social implication of contributing it. Therefore, both shared and unshared information could be socially valuable if group members' goals are taken into account. Shared information might be socially valuable in cooperation by allowing social validation, but also in competition when strategically used to trigger others' cooperation. Unshared information may possess significant social value in cooperation by allowing group success, but also in competition when strategically withheld to preserve individual advantage. In other words, the dominance of shared information in hidden profile may also stem from a motivation to withhold the valuable unshared information in competition.

Limitations and Conclusions

Our contention about mixed interdependence and strategic information processing in hidden profiles raised several interrogations with regard to the task characteristics and information sharing. In order to allow testing of our predictions in terms of strategic information sharing and use, we needed to devise a hidden profile with specific characteristics. The task used was transparent in that it was possible to recognize the location and the value of information (cf. pilot studies). One may wonder if these characteristics are responsible for the increased pooling of unshared information. We believe they are, which would be consistent with studies of Parks (1992) and Schittekatte (1996) that equally manipulated task characteristics. However, what is important for the present contention is that the increase in pooling unshared information occurred especially in

cooperation, more than in competition. Future research should directly manipulate task transparency in order to replicate the classic "more shared than unshared information" found in previous studies. Second, one could argue that the transparency of the task allowed participants to guess the hypotheses and to conform to the experimenter's expectations. Although the task's characteristics may partly explain the withholding of unshared information under competition, it is unlikely that it also explains the reduced use of disconfirmation, which proved to be more important for decision quality than unshared information. To overcome this limitation, further research may look for more subtle manipulations of cooperation and competition, like priming or evaluative pressure.

This work did not address other possible motivations underlying strategic information sharing and use. It might be that pro-self and pro-social motives of group members interacted with the goal interdependence manipulation in producing the effects found in this study. Moreover, as epistemic motivation does not necessarily covary with social motivation (De Dreu et al., 2008), future research should investigate whether both high and low levels of epistemic motivations underlie cooperation and competition and how this impacts strategic information processing in hidden profiles.

Notwithstanding these limitations, three main conclusions can be drawn. First, competition, more than cooperation, implied strategic behaviors under the form of information withholding and reluctance to disconfirmation, two effects mediated by mistrust. Second, information use and not information sharing was responsible for poor decision quality in competition. And finally, this research suggests that in hidden profiles both information sharing and disconfirmation reflect motivated processes, thus bringing support to a motivated information processing approach in group decision making.

APPENDIX
THE HIDDEN PROFILE TASK

Shared Information

The collision takes place at the St. Georges intersection, on Monday at 7 p.m. The road is narrow and poorly lit. Two cars and one motorcycle are involved. In the first car, Mr. X—who is 53 years old and has held a driving license for 30 years—and his 17-year-old son[4] return home. The father had just drunk several glasses of spirits during a dinner with his friends. In the second car, Mrs. Y, 27 years old and having held a driving license for only 1 year, is going shopping. Her car's lights are damaged. On the motorcycle, Mr. Z, 28 years old, who has held a driving license for 5 years, is going to meet his sick father who asked him to come rapidly. He is speeding on the N13 road.

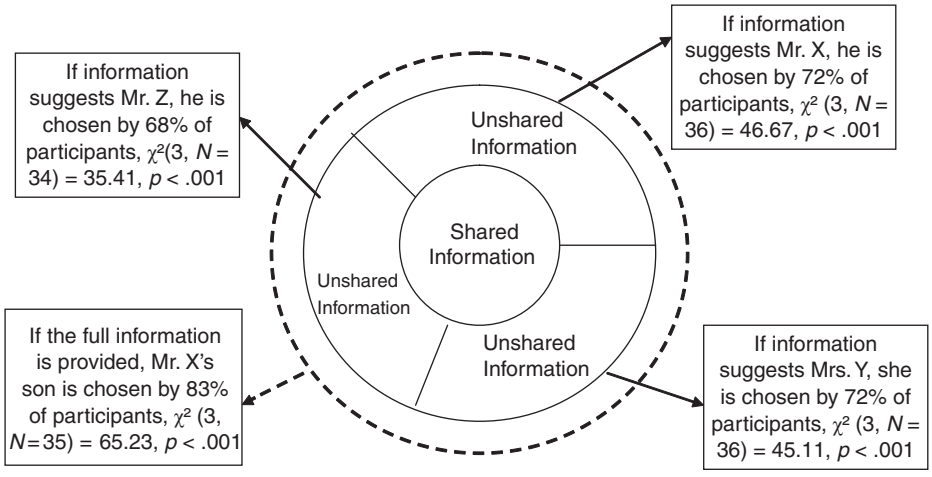
Unshared Information

To member 1, suggesting that the guilty person is Mr. X. The guilty person is driving a car. During police inspection, the guilty car owner was discovered to have a 1.5 level of alcohol. The guilty person admits that he was inattentive at the time of the collision.

To member 2, suggesting that the guilty person is Mrs. Y. The guilty person is less than 30 years old. Due to inexperience, the guilty person wasn't able to avoid the collision. The guilty person claims that he or she did not see others approaching the intersection.

To member 3, suggesting that the guilty person is Mr. Z. The guilty person is a man. His father is indirectly responsible for the accident. The guilty person was driving at 110 km/h.[5]

Four pilot studies showed that the aforementioned orienting information can lead to different suspects (Pilots 1 to 3) and that participants were able to identify the correct decision when provided with the full information (Pilot 4).



NOTES

1. As it is common practice in this literature (e.g., Stasser & Stewart, 1992), we also computed repetition rates by dividing the amount of shared and unshared information repeated by the number of shared and unshared items mentioned at least once. A mixed-model ANOVA revealed a significant interaction between goal interdependence and information type, $F(1, 28) = 39.83$, $p < .001$, $\eta^2 = .58$. This also applies to Experiment 2, $F(1, 26) = 48.41$, $p < .001$, $\eta^2 = .65$.

2. The same results were obtained when controlling for groups with the optimal decision as one of the initial preferences. Although the pilot studies indicated that participants start discussion with an "XYZ" configuration, the likelihood of obtaining it was quite low (35%). In fact, 12 groups started the discussion with the intended configuration, 10 groups contained the optimal solution as one of initial preferences, and 8 groups had a different configuration, $\chi^2 < 1$. This pattern did not differ between experimental conditions, $\chi^2(1, N = 30) = 2.23$, $p = .33$. This is also the case for Experiment 2.

3. Proportion of unshared information relative to the total amount of information was used. The same results were obtained when using the proportion relative to the amount of unshared information available.

4. One must be 18 years old to drive in France.

5. The speed limit on "national roads" (like the N13) in France is 90 km/h.

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