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A Self-regulation Perspective on Hidden-profile Problems: If–Then Planning to Review Information Improves Group Decisions

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ABSTRACT

In *hidden-profile* (HP) problems, groups squander their potential to make superior decisions because members fail to capitalize on each other's unique knowledge (*unshared information*). A new self-regulation perspective suggests that hindrances in goal striving (e.g., failing to seize action opportunities) contribute to this problem. *Implementation intentions* (if–then plans) are known to help deal with hindrances in goal striving; therefore, supporting decision goals with if–then plans should improve the impact of unshared information on group decisions. Indeed, in line with past research, control participants in two experiments rarely identified the best alternative despite monetary incentives and setting decision goals. In contrast, simply adding if–then plans to review advantages of the non-preferred alternatives before making the final decision significantly increased solution rates. Process manipulations (Experiment 1) and measures (Experiment 2) indicate that conceptualizing HP problems as a self-regulation challenge provides explanatory power beyond existing accounts. Copyright © 2014 John Wiley & Sons, Ltd.

KEY WORDS decision making; self-regulation; implementation intentions; hidden-profile paradigm; group performance

Suboptimal decisions are costly as they squander performance potential. Improving decision making is thus a key interest to researchers and practitioners (Milkman, Chugh, & Bazerman, 2009). Groups can make more informed decisions than individuals when group members bring their unique knowledge to the table and consider it jointly. However, research from the past 25 years suggests that groups frequently fail to realize this potential (review and meta-analysis by Lu, Yuan, & McLeod, 2012; Stasser & Titus, 2003).

Even when groups are committed to making an informed decision, they consistently focus on what all the group members know (*shared information*) rather than capitalizing on individual, unique knowledge (*unshared information*). When unshared information is necessary to identify the best decision alternative (i.e., in *hidden-profile* [HP] problems, Stasser & Titus, 1985), groups thus squander their potential to make decisions superior to those made by each group member individually (Stasser & Titus, 2003; Wittenbaum & Park, 2001). In the present paper, we focus on the challenges of considering mentioned information and suggest a new self-regulation perspective on HP problems. Despite their commitment to the goal of making an informed decision, group members might fail to act on this goal because of hindrances during goal striving (e.g., missing the opportunity to review relevant information before making the final decision). Forming *implementation intentions* (Gollwitzer, 1999) that plan out in advance when, where, and how to act in an if–then format (e.g., "If situation y occurs, then I will show the goal-directed response z!") is known to facilitate goal attainment (Gollwitzer & Sheeran, 2006), even in the presence of hindrances. Accordingly, we asked whether forming if–then plans to review the advantages of the non-preferred alternatives in support of the goal to make an informed decision helps groups consider unshared information that has already been mentioned and to make more informed decisions.

A self-regulation perspective: challenges to considering unshared information

Groups commonly possess more information than single individuals, and thus, group decisions are highly informed when group members capitalize on their unique knowledge (unshared information; Lu et al., 2012; Mesmer-Magnus & DeChurch, 2009). Unfortunately, research suggests that groups neglect unshared information even when it comes up during the discussion (Gigone & Hastie, 1993, 1997; Mojzisch & Schulz-Hardt, 2010) and instead focus on what everybody already knows (i.e., shared information; Wittenbaum & Park, 2001). This leads to suboptimal decisions when unshared information is key to finding the best alternative (i.e., in HP situations). Indeed, this problem persists even when groups are explicitly told that they have to consider all the available information to find the optimal decision alternative (Stasser, Stewart, & Wittenbaum, 1995; Stasser, Vaughan, & Stewart, 2000) and when group members receive monetary incentives for optimal group decisions and therefore should be highly motivated (Greitemeyer, Schulz-Hardt, Brodbeck, & Frey, 2006; Lightle, Kagel, & Arkes, 2009).

From a rational-economic perspective, it seems counterintuitive that groups fail to solve HP problems even when good decisions are incentivized: Why would one fail to attain a goal one is strongly committed to? Although this question has not been addressed in the context of HP problems, Lewin's psychology of action perspective (Lewin, Dembo, Festinger, & Sears, 1944) suggests that setting strong goals

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is only the first step toward their attainment. The second step is to implement goal-directed actions and responses during goal striving. Thus, humans do not attain goals they are highly committed to when the implementation of goal-directed actions and responses fails. Indeed, meta-analytic findings suggest that a medium-to-large change in the strength of a goal ($d = 0.66$) only leads to a small-to-medium change in the intended behavior ($d = 0.36$, Webb & Sheeran, 2006), and this gap is mainly due to people who have a strong intention but fail to act (Sheeran, 2002).

A common hindrance to implementing goal-directed actions and responses is that people fail to get started with acting toward their goal (Gollwitzer & Sheeran, 2006). Reasons for this failure include having detrimental routines, failing to seize opportunities, and experiencing a high cognitive load. First, behavioral routines are difficult to break when they have been applied repeatedly or have strong intuitive appeal. Although routines are an advantage in stable environments, they become a problem when they cannot be applied to a new problem at hand (Aarts, Dijksterhuis, & Midden, 1999; see Betsch & Haberstroh, 2005, for routines in decision making). Second, many goal-directed behaviors have to be performed within a certain time frame, for instance, when an action opportunity presents itself only for a short period or when one has to wait for it to occur. It is easy to miss such opportunities because one may fail to act in time (Prestwich et al., 2005). Lastly, it is difficult to act when one is "preoccupied with something else" or "distracted" (i.e., one is under a high *cognitive load*). Such a high cognitive load makes it difficult to initiate a goal-directed action deliberately (Brandstätter, Lengfelder, & Gollwitzer, 2001; Cohen & Gollwitzer, 2008).

Past research suggests that these hindrances to goal striving are present in HP situations. First, research suggests that considering unshared information deviates from groups' decision routine. Gigone and Hastie (1993) manipulated in repeated group decisions whether each quantitative information item about a student (e.g., percentage of attendance and SAT score) was available to everyone before the discussion (shared) or just available to some (unshared) and then assessed the impact that each information item had on the group decisions (i.e., the course grade assigned to each student). Whether information was shared or unshared was highly predictive of group members' initial preferences and the grades groups assigned; however, groups took very little time to discuss each student, and whether information was brought up during the discussion had no impact. Apparently, groups commonly base their decisions on pre-discussion information and preferences (Gigone & Hastie, 1993; Mojzisch & Schulz-Hardt, 2010). Second, unshared information is usually mentioned later in the discussion than shared information (Larson, Christensen, Abbott, & Franz, 1996; Larson, Christensen, Franz, & Abbott, 1998), and one therefore has to wait until it is on the table and then seize the opportunity to consider it before the final decision is made. Thus, merely being committed to considering relevant information might not suffice; one might actually have to plan when to review it. The finding that unshared information has a greater impact when discussions are structured rather than unstructured supports this idea (Mesmer-Magnus & DeChurch, 2009). Third, when group discussions cover a lot of information, they create a high cognitive load, which makes it difficult to pursue the goal of making an informed decision. Stasser and Titus' (1987) observation supports this reasoning. They manipulated the information load: Groups either received 12 (low load) or 24 (high load) different information items on three decision alternatives before their discussion. After the discussion, low-load groups recalled more available information than high-load groups, suggesting that they discussed more information.

In sum, our self-regulation perspective suggests that group members facing HP problems might be highly motivated and have the goal to consider all crucial information but fail to do so because of problems during goal striving: Failing to interrupt routines and to seize opportunities and experiencing a high cognitive load are all known to hinder acting on one's goals even when one is highly committed (Gollwitzer & Sheeran, 2006). In order to improve decisions in HP situations, one therefore has to apply strategies that are known to support goal attainment when such hindrances are present.

Planning to review relevant information

Research from the past 20 years suggests that forming *implementation intentions* (Gollwitzer, 1993, 1999, in press) supports goal attainment. In an implementation intention, one plans out in advance when, where, and how one wants to act on one's goal in an if–then format (e.g., "And if situation Y occurs, then I will show response Z!"). Implementation intentions promote goal attainment by two related processes[1]: First, forming an implementation intention entails selecting a future action opportunity (if-part). The mental representation of this situation becomes highly activated, and one thus easily recognizes it once it presents itself (Achtziger, Bayer, & Gollwitzer, 2012; Parks-Stamm, Gollwitzer, & Oettingen, 2007, Study 1; Wieber & Sassenberg, 2006). Second, implementation intentions create a strong situation–response link: Once the situation specified in the if-part occurs, it triggers the response specified in the then-part immediately and efficiently (Brandstätter et al., 2001; Parks-Stamm et al., 2007, Study 2; Webb & Sheeran, 2007) without requiring further conscious intent (Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009).

Implementation intentions have been shown to help overcome the most common challenges of initiating goal-directed action. First, implementation intentions facilitate interrupting routine behavior in order to achieve one's goal. In one study, Aarts et al. (1999) promised participants a voucher that was to be collected on the way to the cafeteria, which required taking an unusual turn. Some participants furnished this goal with an implementation intention. After a distracting filler task, participants were asked to go to the cafeteria for another study. Whereas only half of the control participants were successful in interrupting this routine walk to obtain the

[1]Implementation intentions do not impact the commitment toward a set goal (motivation) but support goal attainment by these two processes (Gollwitzer & Sheeran, 2006; Webb & Sheeran, 2008).

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voucher, 80% of the implementation intention participants succeeded. Second, implementation intentions promote goal-directed actions when one has to seize a specific opportunity—such as voting on Election Day. Nickerson and Rogers (2010) made different types of phone calls to thousands of potential voters before the 2008 US presidential elections and later checked voter records for actual turnout. Standard "get out the vote" messages did not affect single-household voters' turnout compared with no-call controls; however, implementation intentions planning out when and how to vote led to a significant 4% increase. Third, self-regulation by implementation intentions is efficient such that the goal-directed response is triggered even under a high cognitive load. Cohen and Gollwitzer (2008) had participants quickly decide whether letter strings presented on a computer screen were actual words or not (*lexical decision task*) and measured their response times. To create a high cognitive load, participants in two experimental conditions were additionally instructed to say the word *wrapper* when the word *window* appeared on the screen. Whereas mere goal participants only formed the goal to follow this rule, implementation intention participants added the if–then plan "If I see the word 'window' at any point in the task, then I will say 'wrapper' as fast as possible!" Control participants without a high cognitive load were given no additional instructions. As expected, in subsequent trials, the cognitive load created by performing both tasks simultaneously led mere goal participants to fail frequently to say *wrapper* when *window* appeared and also to make slower lexical decisions than control participants. Implementation intention participants, on the other hand, not only managed to say *wrapper* when *window* appeared more often, but this improvement did not come at the cost of slower lexical decision response times. Indeed, despite a high cognitive load, implementation intention participants responded as quickly as control participants.

In sum, implementation intentions help overcome the three challenges to goal striving that are present in HP problems (i.e., interrupt routine behavior, seize opportunities, and cope with a high cognitive load). Furnishing the goal to make an informed decision with an implementation intention to review the advantages of the non-preferred alternatives should therefore help consider unshared information. Rather than sticking to their routine of making preference-based decisions, missing opportunities to consider new information, or being burdened by a high cognitive load, group members with implementation intentions should wait until the specified opportunity arises and then immediately and efficiently recapitulate the advantages of the non-preferred alternatives, leading them to consider unshared information. Because the optimal decision alternative can only be identified with unshared information in HP problems, this implementation intention should improve HP group decisions.

Of course, the response of reviewing information for an important decision is qualitatively different from more concrete behaviors, such as taking an unusual turn (Aarts et al., 1999), going to vote (Nickerson & Rogers, 2010), or calling out a word (Cohen & Gollwitzer, 2008). One might thus want to argue that simple if–then plans cannot promote a complex response such as considering a host of information. However, recent research by Henderson, Gollwitzer, and Oettingen (2007) suggests that effectively considering multiple sets of performance feedback can also be pre-planned by implementation intentions. Drawing on this research, we predict that implementation intentions should promote considering even complex information, such as the pros of different decision alternatives. Furnishing the goal to make an informed group decision with a simple if–then plan to review the advantages of the non-preferred alternatives should improve decision quality.

Prominent existing accounts and self-regulation

Existing theories explain groups' difficulties to solve HP problems without referring to self-regulation. One account that has frequently been used focuses on groups' problems in mentioning unshared information during the discussion (Larson, Foster-Fishman, & Keys, 1994; Stasser, Taylor, & Hanna, 1989; Stasser & Titus, 1987). If one assumes that each information item has an equal probability of being remembered and mentioned by a group member who has it, those items that more than one group member has (i.e., which are shared) have a greater chance of being mentioned. Consequently, unshared information is less likely to be mentioned and therefore cannot influence the group decision. More recently, Lightle et al. (2009) argued that in addition to problems in recalling unshared information altogether, errors in recalling unshared information also make solving HP problems difficult. Whereas other group members can correct errors in recalling shared information, errors in recalling unshared information cannot be corrected (because no other group member has this information). Consequently, Lightle and colleagues argue convincingly, a group correction factor may account for groups' failures to solve HP problems.

Our new self-regulation perspective complements rather than contradicts these existing accounts. It is theoretically possible that besides hindrances in information exchange, goal-striving challenges in considering crucial information also impede solving HP problems. However, in order to contribute to the better understanding of HP problems, our perspective should provide explanatory power beyond these existing accounts. That is, even if information exchange is held constant, groups with implementation intentions to review important information should solve more HP problems.

THE PRESENT RESEARCH

Two experiments tested whether implementation intentions can help consider key unshared information in decisions. In both experiments, participants first formed the goal to choose the optimal decision alternative (e.g., the optimal of three job applicants), learned that all group members' information was necessary to find this optimal alternative, and were told that they would be paid for each correct decision. To test whether forming respective if–then plans facilitates achieving this

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incentivized goal, half of the participants were asked to add an implementation intention specifying an if (situation)–then (response) link that spelled out when and how the participants were to act on this goal (i.e., review the advantages of the non-preferred alternatives before making the decision). The other half of the participants received identical task information on how to act on the goal (i.e., review the advantages of the non-preferred alternatives) but did not specify a triggering situation. Thus, the if (situation)–then (response) link created by the implementation intention was the only difference between the two established experimental conditions.

Before the group discussion, each participant received partial information favoring a suboptimal decision alternative; thus, crucial information items (e.g., qualifications of the optimal candidate) were unshared. However, a subsequent pre-scripted, computer-animated discussion (Experiment 1) or an actual group discussion (Experiment 2) allowed access to complete information clearly favoring the optimal alternative (materials adapted from Greitemeyer et al., 2006). The dependent measure was whether the optimal alternative was ultimately chosen and marked on a decision sheet. We expected that furnishing the goal to make an informed decision with an implementation intention would facilitate this choice. In order to test whether our self-regulation perspective provides explanatory power beyond existing information-sharing accounts, we ensured (Experiment 1) and measured (Experiment 2) information exchange.

EXPERIMENT 1: CONSIDERING UNSHARED INFORMATION IN DECISIONS

Experiment 1 sought to establish maximal experimental control to test whether implementation intentions promote considering unshared information under conditions of complete information recall during the group discussion. First, all participants learned that they had to consider all group members' information and formed the goal to find the best alternative. To test whether implementation intentions support this goal, half of the participants added an if–then plan. For the decision case, participants then received a subsample of information on three job applicants that pointed to a suboptimal applicant (HP problem). As ensuring complete information recall in actual group discussions can be difficult (Mojzisch & Schulz-Hardt, 2010), we developed a procedure with a computer-animated group discussion. During the discussion, all participants were exposed to complete and correct information. Participants then chose the supposedly best applicant. We predicted that implementation intention participants would choose the optimal applicant more often than control participants.

Method

Design and participants

Fifty-one university students (29 women) with a mean age of 21.90 years ($SD = 2.88$) were recruited through a €4 compensation or course credit; they were promised an extra €2.50 for choosing the optimal applicant. We offered this additional monetary incentive to ensure that the decision was important to the participants. Participants were randomly assigned to either a control condition or an implementation intention condition.

Procedure

Upon arrival, participants were told that the study was on group decisions and were seated in front of a PC. Participants read that they were to assume the role of a panel member. They would view a discussion of the panel and then pick one of three job applicants they believed the panel should select. As in the real world, group members might have different bits of information, but no false information existed. On the basis of all the available information, one of the applicants was optimal for the job. These instructions sought to ensure that all participants were aware of the importance of the other group members' information in order to find the best alternative. Participants then received written instructions to form the goal "I want to find the optimal decision alternative." Implementation intention participants furnished this goal with an if (situation)–then (response) plan: "And when we finally take the decision sheet to note our preferred alternative, then we will go over the advantages of the non-preferred alternatives again." To ensure that control participants also knew about the strategy to go over the non-preferred alternatives' advantages and felt the same experimenter demand, they were asked to add: "We will go over the advantages of the non-preferred alternatives again." Even though participants had to review the information independently, the implementation intention and control instruction referred to the group (*we*) to further emphasize the importance of the information the other panel members mentioned during the animated discussion. Participants in both conditions envisioned the given instructions (implementation intention or control) and wrote them down twice; all participants did so correctly. Thus, we only varied the format of the manipulation (implementation intention or not) to ensure that the expected differences between the conditions would solely be due to the if–then link formed by implementation intention participants.

To create an HP problem, participants then received a written subsample of the information on the three job applicants (27 out of 45 items overall and three out of nine advantages of the optimal applicant, Table 1), studied it, and indicated their (pre-discussion) decision preference. As most of the crucial information items (i.e., advantages of the optimal applicant) were not available to the participants at this point (unshared information, see later in the text), this pre-discussion information pointed to a suboptimal applicant. A computer-animated group discussion followed, providing full information that clearly favored the optimal job applicant (see later discussion). Thus, our procedure resembled an ideal group discussion where group members recall and mention all information correctly. Participants finally noted their decision on which applicant to hire, were thanked, compensated, and debriefed.

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Table 1. Information distribution prior to the discussion in hidden profiles (unshared information is crucial, Experiments 1 and 2) and manifest profiles (unshared information is trivial, Experiment 2)

Type of information	Best	Alternative Second	Third
Hidden-profile cases (Experiments 1 and 2)			
Shared information			
Positive	0	3	6
Neutral	3	0	0
Negative	3	3	0
Unshared information			
Positive	9	3	0
Neutral	0	6	3
Negative	0	0	6
Total pre-discussion information per participant			
Positive	3	4	6
Neutral	3	2	1
Negative	3	3	2
Manifest profile case (Experiment 2)			
Shared information			
Positive	6	3	0
Neutral	0	0	3
Negative	0	3	3
Unshared information			
Positive	3	3	6
Neutral	3	6	0
Negative	3	0	3
Total pre-discussion information per participant			
Positive	7	4	2
Neutral	1	2	3
Negative	1	3	4

Note. Shared information items are given to each group member prior to the discussion; unshared information items are just given to one group member prior to the discussion. Thus, the total pre-discussion information per participant equals all shared information items plus one third of the unshared information items.

Decision

The pre-scripted, computer-animated discussion started after participants had finished studying their pre-discussion information. A graphic depicting three group members labeled "You," "Christian," and "Katharina" appeared on the screen (Figure 1). The pre-discussion information of all three participants was provided one item at a time. Each information item was linked to one of the three group members by including the information in a speech balloon that pointed to the depiction of the respective participant (You, Christian, or Katharina). Only information items and no preferences for any of the candidates came up during the discussion. In this respect, the procedure resembled an ideal group discussion where all information is mentioned correctly and in an unbiased fashion. However, as in actual group discussions, the other group members agreed on familiar, shared items (e.g., "Yes!," "Exactly!," or "That is correct.") but did not comment on new, previously unshared items (i.e., shared information was socially validated). Participants commenced to the next information item by pressing the space bar whenever they were ready, and the time that participants spent on each discussion screen was unobtrusively recorded. Participants could thus not comment on or influence the mentioned information but determined the pace of the discussion. All information items appeared once and in a fully randomized order that was different for each participant. After participants had read the last statement, computer instructions prompted them to take the decision sheet listing the available applicants and think about the last few minutes of the discussion and their group decision. Participants therefore had the chance to go over the advantages of the non-preferred alternative, albeit independently. Finally, participants individually marked the presumed best applicant.

Results and discussion

Pre-discussion preferences

As expected, the majority of the participants preferred a suboptimal decision alternative after studying the case material (73%, 37 out of 51; 16 out of 22 in the control condition), and there were no differences between the implementation intention condition and the control condition, $\chi^2(1) < 0.01$, $p = .98$.

Attending to information provided

Although we ensured complete and correct information exchange, one might argue that participants have attended to the information differently. We therefore analyzed the time participants spent with the pre-scripted statements in the animated group discussion. Implementation intention participants took the same time ($M_{ii} = 3.99$ min, $SD_{ii} = 1.53$) as control participants ($M_c = 3.65$ min, $SD_c = 1.13$), $t(48) = 0.91$, $p = .37$, to read all the statements presented. The reading time for the advantages of the optimal applicant did not differ between conditions either ($M_c = 0.74$ min, $SD_c = 0.37$; $M_{ii} = 0.73$ min, $SD_{ii} = 0.28$), $t(48) = 0.17$, $p = .87$. This suggests that control and implementation intention participants had the same information—including the advantages of the optimal applicant—on which to base their decisions and had the same chance of discovering the optimal applicant.

Dependent variable: decision quality

Whereas control participants rarely chose the optimal applicant (18%, 4 out of 22, Table 2),[2] implementation intention participants had a success rate of 48% (14 out of 29), $\chi^2(1) = 4.96$, $p = .03$, $\phi = 0.31$. During the discussion, all participants equally received the unshared information necessary to identify the optimal applicant. Thus, the higher solution rate by implementation intention participants

[2]For this first study, we repeated the analysis with logistic regression. As expected, condition was a significant predictor for making the best decision, $B = 1.44$, $Wald = 4.64$, $p = .03$. Three participants in the control condition and two participants in the implementation intention condition deteriorated in their decision (i.e., chose the best applicant prior to the discussion but a suboptimal applicant afterwards). We suspect that this attests to some random error in participants' decisions (e.g., Stasser & Titus, 1985). In line with this assumption, the number of participants who deteriorated did not differ between conditions, $\chi^2(1) = 0.64$, $p = .42$, but more implementation intention participants than control participants improved their decision, $\chi^2(1) = 4.57$, $p = .03$.

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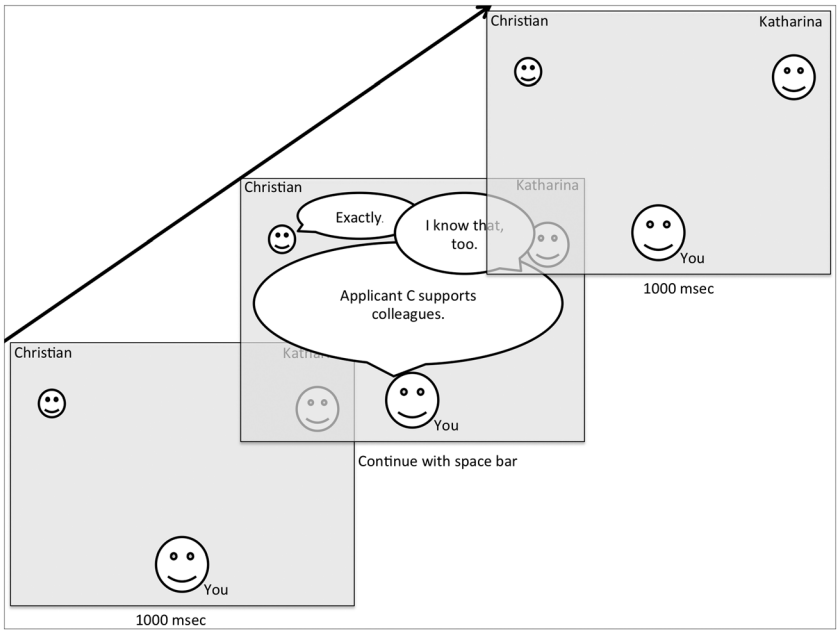

Figure 1. Example of a shared information item in the computer-animated group discussion: A pre-scripted statement of an argument that the participant received prior the group discussion (i.e., applicant C supports colleagues) is displayed and socially validated by the other two group members (Experiment 1)

Table 2. Decision quality in hidden profiles (unshared information is crucial) and manifest profiles (unshared information is trivial) and unshared information recapitulated by condition

	Condition				
Decision quality	Control	Implementation intention	χ^2	p	φ
Experiment 1: Decisions after pre-scripted discussions ($N = 51$ individuals)					
Number of optimal decisions: hidden profile	4 out of 22 (18%)	14 out of 29 (48%)	4.96	.03	0.31
Experiment 2: Decisions in interactive group discussions ($N = 28$ triads)					
Number of optimal decisions: in three hidden profiles	0 out of 42 (0%)	5 out of 42 (12%)	5.32	.02	0.25
Percentage of mentioned, previously unshared advantages of the best alternative reviewed	20% ($SD = 27\%$)	31% ($SD = 34\%$)	4.31	.04	—
Number of optimal decisions: manifest profile	13 out of 14 (93%)	14 out of 14 (100%)	1.04	.31	—

suggests that they made better use of this provided unshared information than control participants.

Experiment 1 demonstrates that implementation intentions increase the impact of unshared information in a highly controlled setting: All participants were exposed to full and correct information on which to base their decision and even attended to it for the same amount of time. However, we wondered whether implementation intentions also facilitate considering unshared information in interacting groups. Interacting groups have to rely on their members to remember and mention unshared information correctly, and both incomplete and false recall have been shown to contribute to low solution rates in HP problems (Larson et al., 1994; Lightle et al., 2009; Stasser & Titus, 1987; Stasser et al., 1989). If our self-regulation perspective provided explanatory power beyond these approaches, we should observe an effect of the implementation intention to review the advantages of the non-preferred alternatives even when complete and correct information recall is not ensured—that is, in freely interacting groups.

EXPERIMENT 2: CONSIDERING UNSHARED INFORMATION IN INTERACTING GROUPS

Real group discussions require listening to each other and taking turns, which makes it difficult to keep the goal of making an informed decision in one's mind and recognizing an opportune situation. Moreover, even if one spots an opportunity, one might be reluctant to act when it comes to reviewing initially unshared information. This is because other group members cannot confirm unshared information when it is mentioned, and one might be burdened by worries pertaining to other group members' disapproval (Wittenbaum & Park, 2001). The question for the current research then is whether implementation intentions lead to more informed decisions despite these additional challenges. Implementation intentions have not been applied to interacting groups yet but are known to facilitate recognizing the opportune situation specified in the if-part (Wieber & Sassenberg, 2006), even while doing something else (Cohen & Gollwitzer, 2008). Moreover, implementation intentions

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promote goal-directed responses even when there is an initial reluctance to act (Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2010; Thürmer, McCrea, & Gollwitzer, 2013; Wieber & Gollwitzer, 2010). The implementation intention to review the advantages of the non-preferred alternative should thus help interacting groups to master these challenges to consider unshared information and in turn improve their decisions.

We tested this prediction by asking triads to work on three consecutive HP problems. All groups learned that they had to consider all group members' information to identify the best alternative. Each group member received partial information favoring a suboptimal decision alternative. A subsequent group discussion gave access to full information favoring the optimal alternative. As a dependent measure, we assessed whether groups finally chose the best alternative; we also recorded and coded the group discussions to test whether implementation intention triads actually recapitulated more initially unshared advantages of the best alternative and whether errors in recall could explain our expected results. Finally, we tested whether implementation intentions actually lead to considering information or just trigger changing one's initial preference regardless of the available information. To this end, we added one control decision for which information favoring the optimal alternative was provided to each group member prior to the discussion (i.e., most advantages of the optimal alternative were shared; *manifest profile*). Thus, changing one's optimal initial preference without considering available information would lead to a suboptimal decision for this manifest profile.

Method

Participants and design

Eighty-four university students (49 women) with a mean age of 22.68 years ($SD = 4.20$) were recruited through a €12 compensation or course credit; they were promised an extra €2.50 for each correct group decision (i.e., up to €10 extra per participant). Participants were invited in triads, and groups were randomly assigned to either an implementation intention or control condition.

Procedure

Groups learned that they were supposed to make four different decisions (see next section). For each decision, each group member would receive different (but no false) information on three alternatives. Based on complete information, one alternative was optimal, and the group's task was to find it. We thus emphasized that groups had to exchange their information in order to ensure choosing the best alternative. Participants of a given group then received either implementation intention or control instructions as in Experiment 1: All participants formed the goal to find the best decision alternative. Whereas implementation intention participants furnished this goal with the plan "And when we finally take the decision sheet to note our preferred alternative, then we will go over the advantages of the non-preferred alternatives again," control participants added, "We will go over the advantages of the non-preferred alternatives again." Participants in both conditions individually envisioned the given instructions (implementation intention or control) and wrote them down twice; all participants did so correctly. Thus, an if (situation)–then (response) link created by implementation intention participants was the only difference to control participants. Then, groups made four decisions (see next section). After the fourth decision, all participants provided demographic information, were debriefed, thanked, and compensated.

Decisions

All groups were asked to make the following four decisions, presented in a fully randomized order that was different for each group: rent an apartment, hire an applicant, appoint a professor, and pick a shop location. In a pilot test of the four cases ($N = 75$), groups of three participants received full information on one case, discussed it, and made a group decision. Eighty percent of the groups (20 out of 25) chose the supposed best alternative. This result is in line with the Greitemeyer et al.'s (2006) individual-level pre-test findings and the assumption that the cases have indeed one best solution. In the first three decisions (the material varied according to randomization), HP problems were created as in Experiment 1: The advantages of the optimal alternative were *un*shared (nine out of nine, Table 1) as only one group member received a respective item. Therefore, only the group discussion could reveal the optimal alternative (*HP*). In the fourth decision, most advantages of the optimal alternative were shared (six out of nine, Table 1), and each individual could identify this optimal alternative independently before the discussion (*manifest profile*). As the order of the decision materials was randomized, an HP and a manifest profile were created for each decision. The pre-discussion information distribution (HP vs. manifest profile) was the only difference between the first three decisions and the fourth decision.

For each of the four decisions, participants received a written subsample of information to be studied independently (Table 1) and indicated their individual, pre-discussion preference. Then, a decision sheet was placed on the group table, and the group members engaged in a discussion (up to 6 min) to come to a consensus. At the end of each discussion, groups marked their decision on a decision sheet. Participants were unaware of the different information distributions; whether their decision was optimal was only announced during the final debriefing.

Results and discussion

Pre-discussion preferences

In HP cases (Cases 1–3), the pre-discussion information pointed to a suboptimal alternative, and group members should thus not be able to identify the best alternative independently. Indeed, the pre-discussion preferences showed that the optimal alternative was only chosen in 15 out of 252 (6%) pre-discussion decisions. No participant preferred

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the best alternative prior to the discussion in more than one of the three HP cases. To investigate the group preference prior to discussion, the sum of correct decisions across group members and trials was calculated for each group: Eleven groups had a correct member in one of the three trials (seven in the implementation intention condition), two groups had a correct member in two of the three trials (two in the implementation intention condition), and no group had a correct member in all of the three trials. A chi-square test indicated that there was no significant difference in number of group members with the correct preference before the discussion (0–2) across trials between the implementation intention condition and the control condition, $\chi^2(2) = 4.49$, $p = .11$.

For the fourth decision, pre-discussion information already pointed to the optimal decision alternative (*manifest profile*), allowing each group member to identify the optimal alternative individually. In line with this assumption, the optimal alternative was chosen by 39 out of 84 (46%) participants before the discussion, up to three participants in each group preferred the best alternative, and there was no difference in group preferences between the implementation intention condition and the control condition, $\chi^2(3) = 0.40$, $p = .94$. Lastly, as expected, optimal pre-discussion preferences were more common in the manifest profile than in the HPs, $\chi^2(3) = 45.85$, $p < .01$.

Manifest profile decision quality

We assumed that finding the best alternative in the manifest profile decision case should be easy for groups as crucial information was available to every group member prior to the discussion. In support of this assumption, 93% of the control groups (13 out of 14) and 100% of the implementation intention groups (14 out of 14) chose the optimal alternative after the discussion of the manifest profile (Table 2), $\chi^2(1) = 1.04$, $p = .31$, indicating that it was possible to identify the optimal decision alternative if sufficient information was taken into consideration. This is in line with Greitemeyer et al.'s (2006) observation that their decision cases (which we adapted for our studies) imply one best decision alternative when all information is considered. Furthermore, the high solution rates observed in the manifest profile in our study suggest that implementation intentions did not lead to changing one's initial preference without considering the available information.

Mentioning information provided

The HP discussions were audio recorded and coded to check whether groups across conditions exchanged available information equally well. Two independent coders blind to condition counted the total number of items and the advantages of the optimal alternative that were correctly mentioned at least once during each discussion (95% inter-coder agreement). The number of arguments mentioned represent count data (Wright, 1997), which should be analyzed with negative binomial regression for small group sizes (Hox, 2010). We therefore conducted a generalized linear model analysis assuming a negative binomial distribution. We included HP round as a repeated factor, implementation intention (yes vs. no) as a predictor and number of information items mentioned as a dependent measure. The implementation intention used in the present study was geared toward recapitulating already mentioned information and thus should not necessarily increase the number of information items brought up during the discussion. Indeed, implementation intention groups and control groups mentioned the same number of information items overall, $M_c = 20.33$, $SD_c = 4.86$; $M_{ii} = 21.90$, $SD_{ii} = 7.00$, Wald $\chi^2(1) = 0.82$, $p = .37$, and advantages of the optimal alternative, $M_c = 2.71$, $SD_c = 1.70$; $M_{ii} = 2.67$, $SD_{ii} = 2.72$, Wald $\chi^2(1) = 0.02$, $p = .89$. We further replicated the classic discussion bias (Stasser & Titus, 1985, 1987): Unshared information, $M_c = 8.86$, $SD_c = 3.00$; $M_{ii} = 9.17$, $SD_{ii} = 4.07$, was less likely to be mentioned than shared information, $M_c = 11.48$, $SD_c = 2.55$; $M_{ii} = 12.74$, $SD_{ii} = 3.38$, Wald $\chi^2(1) = 88.47$, $p < .01$, and this was true across conditions $ps < .01$.

Lightle et al. (2009) recently suggested that unshared information is not only less likely to be brought up during the discussion but also more likely to enter the discussion incorrectly as other group members cannot correct errors in recall. We therefore also coded the number of recall errors and corrections during the group discussions. Both errors in recall, $M = 0.70$, $SD = 0.80$, and corrections, $M = 0.23$, $SD = 0.55$, occurred infrequently in the present sample. To test for differences between conditions, we used negative binomial regression with HP round as a repeated factor and implementation intention (yes vs. no) as a predictor. As the number of corrections in each discussion is limited by the number of errors made and the number of errors varied, we included the number of errors as an offset variable for this analysis. Neither the number of errors $M_c = 0.71$, $SD_c = 0.86$; $M_{ii} = 0.69$, $SD_{ii} = 0.75$, Wald $\chi^2(1) = 0.01$, $p = .92$, nor the number of corrections, $M_c = 0.29$, $SD_c = 0.64$; $M_{ii} = 0.19$, $SD_{ii} = 0.51$, Wald $\chi^2(1) = 0.59$, $p = .44$, differed significantly between conditions. Although known to be powerful predictors for solving HP problems (Lightle et al., 2009; Stasser et al., 1989), failure to share information, errors in recall, and lack of corrections of these errors can therefore not account for the expected differences in HP solution rates between conditions in the present experiment.

Dependent variable: hidden-profile decision quality

We argued that meeting the goal of making an informed group decision would be an enormous challenge. Indeed, none of the groups solved more than one of the three presented HPs. Looking at the differences between the control and implementation intention conditions, however, we observed that control groups did not solve any HPs (0%, 0 out of 42), whereas implementation intention groups solved 12% of the HP problems (5 out of 42, Table 2). Available repeated-measures analyses (e.g., hierarchical linear modeling or repeated logistic regression) require within-group variance for parameter estimates. Therefore, the zero value in the control condition (none of the control groups solved any HPs) rendered these analyses impossible. Consequently, we performed non-parametric cross tabulation with a chi-square test. The Pearson chi-square test revealed that the difference between conditions was significant, $\chi^2(1) = 5.32$, $p = .02$, $\phi = 0.25$.

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Process variable: recapitulating mentioned information

We also tested whether implementation intentions lead groups to review more of the mentioned, initially unshared advantages of the best alternative prior to making their final decision. We expected that groups would generally be reluctant to review this crucial information but that implementation intentions should help master this challenge. To test this prediction, coders counted the number of advantages of the best alternative that groups reviewed prior to their group decision (94% inter-coder agreement). We then computed a negative binomial regression (see previous discussion); because only already mentioned items can be reviewed, we included the number of advantages of the best alternative mentioned as an offset variable. Percentages are reported for ease of interpretation. Indeed, control groups recapitulated only 20% ($SD_c = 27\%$), whereas implementation intention groups recapitulated 31% ($SD_{ii} = 34\%$) of the unshared information items that came up during the discussion, *Wald* $\chi^2(1) = 4.31$, $p = .04$.

In sum, groups with the implementation intention to review the advantages of the non-preferred alternatives reviewed more initially unshared, crucial information and also made superior decisions in comparison with control groups. This is remarkable for at least two reasons. First, little time was available to make the decision. The improved HP solution rates in the implementation intention condition therefore suggest that these groups used their time efficiently. This assumption is in line with implementation intention research demonstrating that if–then planners respond swiftly in the pre-planned manner once the specified situation presents itself (Brandstätter et al., 2001; Parks-Stamm et al., 2007, Study 2). However, because the response of reviewing crucial information requires effortful thought (Henderson et al., 2007), additional time might further increase the solution rates. Second, group members in our study had to indicate their preference prior to the group discussion. Although this is common practice in HP studies and allowed us to check that participants actually preferred a suboptimal alternative prior to HP discussions, recent research has found that providing pre-discussion preferences can have a detrimental effect on the decision quality (Reimer, Reimer, & Hinsz, 2010). In the present research, implementation intention groups managed to solve HP problems despite indicating their pre-discussion preferences. Still, implementation intention groups who do not disclose a pre-discussion preference might further improve their decision quality. Future research should test whether additional time and not indicating pre-discussion preferences further improve HP solution rates in groups with implementation intentions.

GENERAL DISCUSSION

When it comes to unshared information, the goal to make an informed group decision is challenging for at least three reasons: It requires interrupting routine behavior, seizing opportunities to act, and overcoming cognitive load. We hypothesized that the powerful if (situation)–then (response) link created by implementation intentions helps master these challenges and thus boosts the impact of unshared information. In line with this prediction, if–then plans to review the advantages of the non-preferred alternatives led to significantly more optimal decisions in HPs across two experiments.

Experiment 1 used a highly controlled laboratory setting that ensured complete information exchange. Our finding that implementation intention participants made more optimal decisions thus suggests that these participants considered crucial, unshared information more successfully than did control participants. Experiment 2 used interacting small groups, a setting that resembles real-world group decision making. Again, groups who furnished their decision goal with an implementation intention to review the advantages of the non-preferred alternatives made superior decisions to control groups. Importantly, control groups received the same strategy to review the advantages of the non-preferred alternatives but without an implementation intention, and mere differences in task knowledge can therefore not account for the observed differences between the two established experimental conditions. Jointly, both studies suggest that implementation intentions can improve decisions by promoting the consideration of unshared information, even in the challenging context of an actual group discussion.

In both studies, the implementation intention included the strategy to review the advantages of the non-preferred alternatives. At least two other strategies to make more informed HP decisions come to mind. First, an alternative strategy would be to review the disadvantages of the preferred alternative instead of the advantages of the non-preferred alternatives. Although apparently similar, both strategies could lead to different outcomes because positive and negative information impact evaluations differently. Indeed, research suggests that negative information influences evaluations more strongly than positive information (Ito, Larsen, Smith, & Cacioppo, 1998). This might indicate that it is easier to take negative information into consideration as compared with positive information. Research on implementation intentions has demonstrated that easy goals (e.g., when pursued under favorable environmental conditions) profit less from if–then plans than difficult goals (e.g., when pursued under unfavorable environmental conditions, Hall, Zehr, Ng, & Zanna, 2012; also Gollwitzer & Brandstätter, 1997). Future research should therefore test whether implementation intentions are also needed to increase the impact of negative information or if a mere goal suffices. Second, an additional strategy to make more informed HP decisions would be to increase the amount of information mentioned during the discussion (e.g., Greitemeyer et al., 2006). Although Greitemeyer and colleagues' findings suggest that increased information exchange in itself does not always improve decisions, adding a strategy that increases information exchange to an implementation intention that increases information consideration could further increase HP solution rates.

Value added? Prominent existing accounts to hidden-profile problems and self-regulation

Two prominent existing accounts explain difficulties in solving HP problems with incomplete or false recall of unshared

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information. One focuses on groups' problems in bringing up unshared information during the discussion (Larson et al., 1994; Stasser & Titus, 1987; Stasser et al., 1989), because only one group member can mention it (in contrast to shared information that all members can mention). Indeed, this problem of bringing up unshared information also evinced in our second experiment where only about half the information available was discussed and crucial unshared information was less likely to enter the discussion than already shared information. However, even though implementation intention groups and control groups equally faced this problem, implementation intention groups solved some HP problems, whereas control groups did not solve any of them. Moreover, in Experiment 1, we controlled the information exchange to ensure that all information was brought up. Even under these conditions, if–then planners capitalized on all available information more successfully and made better decisions.

A second, more recent account (Lightle et al., 2009) argues that errors in recalling unshared information impede solving HP problems because they cannot be corrected (because no other group member holds this information). Although we agree that errors in recall play an important role, this explanation cannot fully account for our findings: In Experiment 1, errors in recall were ruled out through the standardized discussion. Although no errors in recall were present, implementation intention participants solved more HP problems. Moreover, when coding for errors in recall and corrections during group discussions in Experiment 2, we did not find any differences between conditions on these variables. In sum, the observed higher solution rates by implementation intention participants support the idea that our self-regulation perspective increases explanatory power beyond incomplete or false recall of unshared information.

What might be the advantage of our self-regulation perspective on HP decisions? Forming implementation intentions left groups intact and did not change the information distribution or increase the decision incentives. We thus speculate that implementation intentions can be applied to actual decision-making groups, such as selection panels in organizations (also Latham & Pinder, 2005). In such decision-making groups, suboptimal decisions can have severe consequences (Milkman et al., 2009). Equipping these groups with simple if–then plans could be a feasible and highly cost-efficient strategy to improve their decisions, thus realizing their performance potential (Thürmer, Wieber, & Gollwitzer, in press; Wieber, Thürmer, & Gollwitzer, 2012, 2013). The idea that implementation intentions can improve real-world decision making receives support from research demonstrating that implementation intentions are surprisingly effective in various applied settings (e.g., fighting snacking habits, Adriaanse et al., 2010, and voter mobilization, Nickerson & Rogers, 2010).

Our research moreover complements other approaches to improve group decisions. For instance, assignment of expert roles (Stasser et al., 2000), creation of task conflict (Boyle, Hanlon, & Russo, 2012), and a group-level counterfactual mindset (Liljenquist, Galinsky, & Kray, 2004) all have been shown to increase the impact of unshared information. These interventions, although effective by themselves, could be enhanced by adding implementation intentions. Research findings showing that implementation intentions can enhance other effective behavior change interventions (e.g., mental contrasting, Adriaanse et al., 2010, and voter mobilization calls, Nickerson & Rogers, 2010) are in line with this idea.

Moreover, Lightle et al. (2009) pointed out that group members in HP situations often face a conflict of interest between sharing information and keeping it to themselves. However, even when an incentive structure was established, HP solution rates were low. This is in line with our finding that control groups quite infrequently solved HP problems despite the monetary incentive we offered. Furthermore, one underlying assumption of our research is that group members want to cooperate in order to solve an HP problem, and we show that if–then planning can support such cooperation. Recent research suggests that this assumption of group cooperation does not always have to be met. Specifically, Maciejovsky and Budescu (2013) showed that fostering competition by establishing market-like incentives to share crucial, unshared information can enable groups to solve HP problems despite such conflicts of interest. Indeed, this line of research (Maciejovsky & Budescu, 2007, 2013; Maciejovsky, Sutter, Budescu, & Bernau, 2013) suggests that a range of group performances do not have to rely on cooperation but may also evince in market-like structures with competitive incentives. As the effect of implementation intentions is well documented for individual goals (Gollwitzer & Sheeran, 2006), including competitive goals (e.g., Achtziger, Gollwitzer, & Sheeran, 2008, Study 2), if–then planning might also increase information usage in markets and auctions. Future research should test this assumption.

Lastly, existing research has discussed the role on implementation intentions for decision implementation (Bagozzi, Dholakia, & Basuroy, 2003; Dholakia & Bagozzi, 2002; Dholakia, Bagozzi, & Gopinath, 2007). The present research extends this view as it conceptualizes the decision process itself as goal striving and shows that implementation intentions help in making better decisions. Better decisions can be expected to yield better outcomes when implemented successfully, and therefore combining implementation intentions for decision making and for decision implementation might lead to further performance improvements.

Goal setting and hidden-profile problems

Another underlying assumption of our research is that group members are motivated to make good decisions. We sought to ensure this by choosing engaging tasks and offering a monetary incentive. But what if groups are not motivated in this way (e.g., De Dreu, Nijstad, & van Knippenberg, 2008; Levine & Smith, 2013)? Goal setting theory (reviews by Locke & Latham, 1990, 2006, 2013) maintains that challenging and specific goals can help to increase motivation and lead to better performance than easy or unspecific goals. Arguably, if–then planning also adds specificity to one's goal. However, both kinds of specificity differ: Whereas goal

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setting specifies a high outcome, if–then planning specifies when, where, and how to perform actions to achieve an already set goal. As a consequence, both self-regulation strategies also rely on different mechanisms (Locke & Latham, 2013; Oettingen, Wittchen, & Gollwitzer, 2013): Whereas goal setting increases commitment, if–then planning increases the accessibility of the specified situation and triggers the pre-planned response in an automatic fashion. Therefore, when group members are not sufficiently committed to perform well in decision tasks, setting such high and specific goals and adding implementation intentions could be a most powerful combined intervention. Moreover, certain types of goals might be particularly beneficial to improve decision quality: *learning goals*[3] (Payne, Youngcourt, & Beaubien, 2007; Pintrich, 2000). Rather than focusing on the mere performance outcome, learning goals focus on improving skill and mastering the task at hand. As knowledge acquisition is key to solving HP problems, such learning goals might be well suited to improve decision quality (e.g., Seijts & Latham, 2006). But again, adding implementation intentions to learning goals should make these goals particularly effective as acting on these goals will be enhanced.

In sum, the present research demonstrates that group decision making can benefit from enhanced self-regulation of goal striving. Group members who equip their goals to make informed decisions with implementation intentions, which specify when and how to act toward this goal can successfully increase the impact of unshared information. Groups can thus emancipate themselves from their initial preferences, capitalize on their unique knowledge to optimize their decisions, and perform to their full potential.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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Peter M. Gollwitzer is Professor of Psychology at the University of Konstanz and New York University. His research focuses on the willful pursuit of goals. He is a Fellow of the Association of Psychological Science, the American Psychological Association, and the Academia Europaea; he received the Max Planck Research Award (1990) and the TRANSCOOP Award (1994) for international collaboration. He has co-edited three volumes on action control: *The psychology of action: Linking cognition and motivation to behavior* (Gollwitzer & Bargh, 1996), *Oxford Handbook of human action* (Morsella, Bargh, & Gollwitzer, 2009), and *Acting intentionally and its limits: Individuals, groups, institutions. Interdisciplinary approaches* (Seebaß, Schmitz, & Gollwitzer, 2013). He regularly publishes his work in high-ranking journals in social psychology and related fields such as education, health psychology, cognitive psychology, and economics.

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