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The Effect of Perceived Competence and Competitive Environment on Team Decision-Making
in the Hidden-Profile Paradigm

Abstract

Complex decision-making in organizations is a process frequently assigned to teams. An expected benefit of utilising teams is that, due to an expanded pool of available information, outcomes may be superior to those of an individual decision-maker. However, research using the Hidden-Profile Paradigm (i.e., a research design where each team member has information that must be shared to arrive at an accurate solution) has consistently shown that team members regularly fail to exploit their unique information to produce accurate decisions. This failure may be due to a combination of social, individual, and contextual factors, information processing inaccuracies, and cognitive biases. The current study sought to determine whether individuals' perception of competence relative to other team members influences information sharing and decision accuracy in hidden-profiles. Further, the interactive effects of competitive versus cooperative environmental factors were examined. Two-person teams were assembled to solve a hidden-profile task. Team members were led to believe that they were either more or less competent than their team-mate, and instructed to either cooperate or compete with one another. Results indicated that teams comprising individuals who perceived themselves as relatively less competent shared more information; however, decision accuracy was found to be better only under a cooperative environment. In addition, intention to strategically withhold information from one's team-mate was found to be higher for teams under a competitive environment. The study has implications for hidden-profile research and for team decision-making in organizations.

Keywords: Teams; Decision-making; Hidden-Profile; Information sharing; Strategic withholding

Introduction

It is often said that “two heads are better than one”. It may be with this intuitive belief in mind that complex decision-making tasks in organizations are increasingly being assigned to teams rather than individuals (Robbins & Judge, 2016). Indeed, one often expected advantage of using teams is to potentially expand the pool of available information, thereby producing outcomes superior to an individual decision-maker (Mesmer-Magnus & DeChurch, 2009). However, this expectation rests upon an assumption that individual team members will exchange their unique, diverse, and relevant information, and that this information will be processed efficiently by the team. Despite this assumption, research using the Hidden-Profile Paradigm (i.e., where information is distributed amongst team members as either shared or exclusive to an individual, and whereby the optimal decision alternative is only available under conditions of full disclosure and integration) has consistently shown that teams fail to exploit their unique and diverse information to produce better quality decisions (Sohrab, Waller, & Kaplan, 2015; Wittenbaum, Hollingshead, & Botero, 2004).

To shed further light on the factors affecting team decision-making, this article considers individual team members’ contributions and the impact of context on team decision-making. The questions posed here are: which two heads are better than one? Does perception of competence relative to one’s team-mate(s) impact decision outcomes? For example, a team of highly competent, knowledgeable individuals may have little motivation to exchange information with one another, consequently producing poorer decisions. On the other hand, a team of less competent individuals, each motivated to increase his/her knowledge, may exchange more information, and consequently produce better decisions. Furthermore, depending on

organizational incentive structures, individuals within teams may, in attending to personal goals, deliberately choose to withhold information, thereby producing poorer team decisions.

The limited effectiveness of collective information sharing and decision-making identified in hidden-profile studies potentially undermines the value of collective decision making in organisations (Bazerman & Chugh, 2006; Wittenbaum et al., 2004). To realise the potential benefits of utilising teams for decision-making, organisations require an understanding of the factors that impact information sharing and processing (Hinsz, Tindale, & Vollrath, 1997; Mesmer-Magnus & DeChurch, 2009).

The Hidden-Profile Paradigm

A hidden-profile exists when individual team members receive information favouring an inferior decision alternative, but only a portion of the information favouring a superior decision alternative (Stasser, 1992). In their seminal study, Stasser and Titus (1985) distributed information using a combination of shared information (i.e., that which was available to all team members) and unshared information (i.e., that which was available to only one team member). Collectively, the team possessed all information required to make the optimal decision, provided that they exchanged unshared information items concerning the superior alternative. Stasser and Titus (1985) found that team members consistently focused on shared information at the expense of unshared information, and that this bias toward shared information produced inferior team decisions. There are a number of proposed explanations for the effects commonly observed in hidden-profile studies.

Recent reviews (e.g., Brodbeck et al., 2007; Lu, Yuan, & McLeod, 2012) have consistently revealed a tendency for groups to fail in hidden profile tasks. In their review of 25 years of hidden profile research, Schulz-Hardt et al. (2012) propose a model of group decision

making that highlights the parameters that must be optimized to ensure synergy in hidden-profile problems. According to their model, a failure to solve hidden profile decisions is based on the group's failure to discuss decision relevant information among the group (i.e., all such information is mentioned in the presence of all group members), in conjunction with a failure among individual group members to adequately process (i.e., encode, store, interpret, and evaluate) the information. Further, the authors purport that such discussion and processing must be engaged with a sufficient degree of intensity (i.e., there must be a level of discussion to facilitates the realisation of the implications of relevant information), as well as an absence of biases that may constrain the discussion of certain information, or result in members evaluating information in an overly negative manner (Schulz-Hardt et al., 2012).

Factors affecting information sharing in the Hidden-Profile Paradigm may be themed around *group factors* (e.g., information load, group size), *individual factors* (e.g., expertise, competence, status, experience), and *environmental factors* (e.g., incentive structures that promote competition or cooperation).

Group factors in Hidden-Profiles. Performance in hidden-profile tasks is impacted by various team-level factors. A high information load exacerbates a Common Knowledge Effect, suggesting that unshared information has a greater chance of being recalled when team members have less information to process (Stasser & Titus, 1987). Klocke (2007) found that training interventions to overcome the discussion and preference biases improved information exchange but not decision accuracy. This finding suggests that, even with awareness of the tendencies, training to mitigate the effects, and behavioral change during the decision-making process, the biases persist on some level. Finally, larger teams show a greater discussion bias and higher failure rates than smaller teams (Sohrab et al., 2015), and time pressure hinders a team's decision

accuracy (Bowman, & Wittenbaum, 2012). These findings suggest that smaller teams that are not operating under time constraints may be better at overcoming the discussion bias and making superior decisions.

In recognition of the fact that individuals are nested within teams (Sohrab et al., 2015), further studies have experimentally induced factors such as member characteristics and team composition to examine ways in which the discussion bias towards shared information can be attenuated (Wittenbaum et al., 2004). Such individual-level inputs include task-related expertise, competence, status, and experience.

Individual factors in Hidden-Profiles. Studies on task-related expertise provide information on how different levels of competence within teams influence information sharing behaviors. In these studies, expertise is operationalised as superior or additional knowledge in relation to the task. Research has found that teams are more likely to discuss unshared information and produce superior decisions when information is held by an expert, but that the expert's information is only valued when both the expert and other team members are made aware of the presence of expertise (e.g., Emich, 2012; Stasser, Stewart, & Wittenbaum, 1995). When only the expert is informed of his/her expertise, dissemination of information uniquely held by the expert was not increased (Baumann & Bonner, 2013). These findings suggest that, for an individual's expertise to be recognised and leveraged during team discussion, the majority of team members should be aware of the presence of an expert on the team.

Stasser et al. (1995) suggest that teams require coordinated information processing based on mutual recognition of each other's responsibility for specific domains of information in order to benefit from expertise. This suggests that the key mechanism that permits leveraging of

expertise is not the expert's information itself, but rather non-experts' awareness of the presence of expertise, or perception of greater task-related competence of his/her team-mate.

Adopting a rationale that experts may be drawing information from non-experts through information seeking behaviors, Franz and Larson (2002) found that while experts contributed more information to team discussions, they were not found to increase other members' contributions through the use of probes. Further, teams containing an expert were no more accurate than teams that did not contain an expert. The authors suggest that the reason experts did not facilitate information sharing and increase decision accuracy may be that, due to their expertise, they felt that they already possessed all the necessary information, and therefore did not need to search for further relevant information from non-experts (Franz & Larson, 2002). That is, the experts may have experienced an overconfidence bias that prevented them from seeking further information required to make an accurate judgement (Robbins & Judge, 2016). Alternatively, the experts may have acted as leaders and, through strategic repetition of information, may have advocated for their own suboptimal pre-discussion preference (Franz & Larson, 2002). These findings suggest that the presence of expertise, or individuals who perceive themselves as having greater task-related competence, may hinder information sharing, information seeking, and decision accuracy when critical information is distributed amongst experts and non-experts.

Perception of expertise is a critical factor to consider, as it appears to have a substantial behavioral impact. To create a perception of expertise in the absence of actual expertise, Thomas-Hunt, Ogden, and Neale (2003) recruited business and engineering students, informing all participants that business students typically significantly outperform engineering students on the task. Similar to the aforementioned studies in which the authors created *actual* expertise

(e.g., Baumann & Bonner's, 2013; Franz & Larson, 2002), the authors found that team members who perceived themselves as experts participated more in team discussion, but did not differ from perceived non-experts with respect to sharing their own unique knowledge. Again, the authors suggest that the increased participation of experts may reflect an increase in their repetition of others' unique knowledge. Furthermore, the authors suggest that perceived experts were actually assuming responsibility for managing the information of the team and focusing on aggregating information, and, as such, felt that they had no need to contribute information of which they were already aware (Thomas-Hunt et al., 2003). The study by Thomas-Hunt et al. (2003) demonstrates that expertise does not need to be real to influence team interaction, suggesting that an essential factor at play relates to the perception of relative competence amongst team-mates. It seems pertinent to consider the influence of team members who perceive themselves as relatively less competent, and how perceptions of relative competence influence information sharing.

Studies on social status and status by virtue of prior task experience of individual members within teams provide further insight into the influence of perception of different levels of competence amongst team members on information sharing. Hollingshead (1996) compared the information sharing behaviors of equal status teams comprised of three university juniors with mixed status teams comprised of two university seniors and one university junior. Equal status teams were found to solve a hidden-profile task better than mixed status teams, as critical information possessed by low-status members (i.e., the one university junior) received less attention and was less likely to be discussed. Further, information-poor high-status members exerted a greater influence on the final team decision than information-rich low-status members (Hollingshead, 1996). That is, the information held by the low-status member was not leveraged

by the team. This finding suggests that perceived status acts in a similar way to perceived expertise, hindering information sharing and decision accuracy when critical information is distributed amongst low and high-status individuals.

Another way to establish status is through task-relevant experience. In Wittenbaum's (1998) study, low-status team members were found to mention more shared than unshared information and had to contribute more information to have a persuasive effect on the team than high-status team members (Wittenbaum, 1998). Wittenbaum (2000) suggests that unshared information held by experienced team members is more likely to be mentioned because the experienced member is perceived as more competent, resulting in a higher evaluation and reception of his/her comments by other members. In contrast, Kim (1997) found that teams containing members who had previously worked together on similar tasks discussed less unshared information and performed worse than teams containing members with no prior experience. These findings suggest that perception of competence and experience plays a critical role in sharing information, and in turn producing more accurate decisions.

Kim (2003) investigated the effect of beliefs about co-worker task competence on information sharing and decision accuracy by providing false feedback to participants regarding their team-mate's performance on a pre-experiment task. The author found that perception of higher co-worker motivation (but not perception of higher co-worker competence) lowered information sharing and decision accuracy (Kim, 2003). The author suggests that further examination of the influence of different co-worker perceptions may help to explain the discrepancies between studies that have examined the effects of experience on collective information sharing and decision accuracy (Kim, 2003).

Taken together, the findings on expertise, competence, status, and experience are difficult to reconcile. On one hand, it appears that experts may be mistaking their expertise for leadership and assuming responsibility for coordination of information, thereby enabling the team to uncover the superior decision. On the other hand, expertise and experience may be associated with high status and a stronger belief in co-worker competence, thereby resulting in the team evaluating the expert's comments more highly. The latter suggests a need to examine the factors associated with perception of relative competence. The key questions are: what information sharing behaviors are being adopted by individuals within teams when they perceive their teammates as more competent? Are they seeking information from those they perceive as more competent, and withholding their own unshared information? Or are they sharing their information in an attempt to have it validated by the more competent members?

Environmental factors in Hidden-Profiles. Recent attention on information sharing and decision-making in teams has turned to the role of contextual factors, intervening motivational mechanisms, and their influence on information sharing and decision accuracy. Wittenbaum et al. (2004) argue that previous hidden-profile studies assumed a cooperation amongst team members that does not accurately reflect the organizational environment, and therefore these studies lack ecological validity. Specifically, individuals in organizations are subject to incentive structures that may conflict with team goals and influence information sharing. For example, members may be rewarded if their team performs well, but may also attain or anticipate personal reward if the team selects a particular alternative (Wittenbaum et al., 2004). Amason (1996) refers to the presence of conflicting goals as a paradox, as conflict is both a hindrance and an impediment to consensus and decision quality.

De Dreu (2007) suggests that a motivated information processing perspective should be adopted, recognising that effective team information processing is influenced by two types of motivation: epistemic (i.e., individual team members' willingness to expend effort to actively and systematically process and develop an accurate understanding of the decision task) and social (i.e., individual team members' preferences for outcomes, ranging from pro-self to pro-social). A study by Scholten, Van Knippenberg, Nijstad, and De Dreu (2007) found that epistemic motivation can be increased through greater process accountability, which in turn increases pooling of unshared information and produces better decision accuracy. Social motivation relates more directly to individual disposition and situational influences (De Dreu, 2007), with pro-social motivations positively impacting team processes and effectiveness (Hu & Liden, 2015).

As information sharing is a motivated process, team members deliberately select what, how, and to whom information is mentioned in order to satisfy goals evoked by the context (Wittenbaum et al., 2004). Where the incentive structure rewards individual performance, thereby promoting competition rather than cooperation, individuals develop pro-self motivations that result in withholding important information and decreasing decision quality (Steinel, Utz, & Koning, 2010). According to Rosenbaum et al. (1980), "even a modicum of competitive reward" (p. 626) leads to lowered efficiency and productivity in teams.

A number of studies have examined the effects of the pursuit of individual performance goals on information sharing and decision accuracy. De Dreu (2007) presented findings from a field study that suggest the more team members perceived cooperative outcome interdependence, the better they shared information and produced effective, quality decisions. A hidden-profile study on motivational preconditions demonstrated that pursuing individual likeability goals led

to less information sharing and lower decision accuracy than pursuing the goal to perform well as a team (Sassenberg, Landkammer, & Jacoby, 2014). This finding was further supported by Hayek, Toma, Oberlé, and Butera (2015), who found that individual grading during a hidden-profile task led to less pooling of relevant, unshared information and more pooling of shared information. These findings suggest that the perception and presence of alternative individual performance goals negatively influences information sharing.

Individual incentives such as financial rewards have also been shown to impact information sharing and decision accuracy. Super, Li, Ishqaidef, and Guthrie (2016) compared the effects of participants expecting monetary reward based on team performance and participants receiving a fixed amount. The authors found that participants expecting a reward based on team performance shared more information and produced more accurate decisions than participants receiving a fixed amount (Super et al., 2016). Similarly, Budescu, and Maciejovsky (2016) found that financial incentive and competition reduced performance in diverse teams by leading individuals to abandon the notion of shared team goals in favor of individual benefits. These findings suggest that the perception, presence, and structure of incentives influence information sharing.

The presence of individual goals has also been shown to interact with the presence of expertise. Toma, Vasiljevic, Oberlé, and Butera (2013) examined the effects of expertise in cooperative and competitive environments. In cooperative conditions, participants were informed that their goal was to make a joint decision, whilst participants in competitive conditions were additionally informed that it was also important to be the first in the team to propose a solution. The authors found that the presence of expertise decreased information sharing in competitive environments, whilst increasing information sharing in cooperative

environments. Further, they found that a self-other difference in perceived competence mediated this effect, and suggest that this might be due to team members with assigned expertise striving to maintain the difference in competence with others (Toma et al., 2013). These findings further the view that information processing is a motivated process that is dependent on contextual factors. It may follow that teams comprising individuals who perceive themselves as less competent than their team-mates will strive to *gain* competence, thereby increasing information sharing. Furthermore, this striving may undo the negative influence of competitive environments. Indeed, it has been suggested that whilst individuals may refrain from sharing knowledge for fear of losing power, they may actually increase knowledge sharing if they perceive an opportunity to gain competence and power, particularly when engaging people of higher status (Wang & Noe, 2010).

A motivated information processing perspective allows for consideration of strategic information sharing on the part of individual team members. In a field study, Mitusch (2006) found that in organizations, under competitive circumstances, employees strategically distort their most valuable information. Steinel et al. (2010) demonstrated that information sharing is a strategic behavior dependent on people's pro-self or pro-social motivations, and that people consider the importance of the information when actively deciding whether to reveal, withhold, distort, or even falsify their information. The study found that individuals driven by competitive motives (pro-self individuals) behave more strategically than individuals with cooperative motives (pro-social individuals), as the former predominantly pooled shared and unimportant information and withheld valuable and unshared information (Steinel et al., 2010). Similarly, Toma and Butera (2009) informed participants which pieces of information were shared and which pieces were unshared, and examined the effect of a conflicting individual goal. The

authors found that team members presented with a conflicting individual goal withheld more unshared information and produced poorer quality decisions compared to team members in a cooperative environment (Toma & Butera, 2009). Further, Kimmerle, Wodzicki, Jarodzka, and Cress (2011) found that participants in an information pooling game avoided contributing information that would provide others with a higher benefit than the benefit they would gain themselves. Similarly, Poortvliet, Anseel, Janssen, Van Yperen, and Van de Vliert (2012) found that individual performance goals in an information pooling game led to stronger thwarting behavior and subtle deception towards more competent opponents. Further research is needed regarding how much the competence of one's team-mate is taken into account when adopting strategic information sharing behaviors (Toma & Butera, 2015).

Overview of Present Study

The present study aimed to investigate whether the perception of competence relative to one's team-mate influences information sharing and decision accuracy, and/or impacts strategic information sharing behaviors in the Hidden-Profile Paradigm. The study extended upon the findings of Toma and Butera (2009) and Toma et al. (2013) by directly investigating the role of perceived relative competence on decision accuracy in competitive versus cooperative environments. This investigation of perceived competence relative to one's team-mate also extends upon findings by Kim (2003). Further, the investigation is a response to a call for research that examines how various considerations interact in hidden-profile studies (Sohrab et al., 2015).

Hypotheses

H_{1(a)}. Consistent with findings that perception of competence and experience plays a critical role in sharing information, and in turn producing more accurate decisions (e.g., Kim, 1997;

Wittenbaum, 2000), we hypothesised that teams of individuals who perceived themselves as relatively less competent would make more accurate decisions than teams of individuals who perceive themselves as relatively more competent;

H_{1 (b)}. Extrapolating from findings demonstrating that strategic behavior is dependent on people's pro-self or pro-social motivations (e.g., Kimmerle, Wodzicki, Jarodzka, & Cress, 2011; Toma & Butera, 2009), we hypothesised that an interaction effect would occur, such that individuals who perceived themselves as relatively less competent would make more accurate decisions under a cooperative environment;

H₂ & H₃. Consistent with findings relating to information sharing and seeking and decision-makers' relative perceived competence (e.g., Kim, 1997; Wittenbaum, 2000), we hypothesised that information sharing (H₂) and information seeking (H₃) would be higher in teams of individuals who perceived themselves as relatively less competent;

H₄ & H₅. Consistent with previous findings relating to the strategic withholding of information and decision-makers' perceived competence, (e.g., Kimmerle, Wodzicki, Jarodzka, & Cress, 2011; Poortvliet, Anseel, Janssen, Van Yperen, & Van de Vliert), we hypothesised that strategic withholding intention (H₄) and actual strategic withholding (H₅) would be higher in teams of individuals who perceived themselves as relatively more competent, and extrapolating from other results (Hayek, Toma, Oberlé, & Butera, 2015; Sassenberg, Landkammer, & Jacoby, 2014), predicted that this would be particularly salient under a competitive environment.

Method

Participants

A total of 80 participants (29 male, 51 female), consisting of 40 two-person teams, took part in the study. The sample comprised of undergraduate psychology students attending the

Australian College of Applied Psychology (ACAP) ($n = 39$) and participants from the general public ($n = 41$).

Design

Two-person teams were assembled to solve a hidden-profile task. Team members were led to believe that they were either more or less competent than their team-mate (note: both team members within each team received the same instruction), and instructed to either cooperate or compete with one another. The study employed a (2) perception of relative competence (more versus less) x (2) environment (competitive versus cooperative) between-subjects factorial design, with decision accuracy as the primary dependent variable. An experimental design was used, involving completion of a team decision-making task with pre- and post-discussion questions. Participants were randomly assigned to one of four experimental conditions, with the restraint that equal sample sizes were obtained across conditions. Ten teams (two participants per team, 20 participants in total) were tested in each of the four independent conditions of the factorial design. The independent variables were manipulated through task instructions (see Manipulations section for details). Decision accuracy was measured as a categorical variable, with responses being either correct or incorrect. A score was obtained for each of the secondary dependent variables: information sharing, information seeking, strategic withholding intention, and actual withholding. The measures relating to information exchange (information sharing and information seeking) were computed at the team level, while strategic withholding was computed at the individual level. This distinction between team-level and individual-level variables is similar to the approach used by Toma and Butera (2009).

Materials

Decision task. Participants completed a homicide investigation task designed by Stasser and Stewart (1992) for use in Hidden-Profile Paradigm studies. To complete the task, participants first individually read a 25-page booklet consisting of a series of interviews from a homicide investigation, a handwritten note signed by one of the suspects, two geographical maps of the victim's home and the local area, and a newspaper article. The interviews contained information provided by three known suspects and other individuals associated with the investigation, and constituted the evidence of the investigation. Embedded within the materials were 24 clues that exonerate or incriminate the three suspects. The task was designed to enable participants to rule out two suspects. Specifically, there were six incriminating clues about each suspect, but there were also three clues that exonerated each of the two non-guilty suspects. Considered together, the clues supported the conclusion that the guilty suspect had both motive and opportunity to commit the crime, and attempted to frame one of the non-guilty suspects.

To create a hidden-profile, each team member received 14 clues that were provided to both team members (shared information), while the remaining ten clues were distributed between the two team members such that each team member uniquely held five clues that were not known to the other team member (unshared information). The two team members collectively had all of the information necessary to detect the guilty party, however they were not made aware of the existence of a hidden-profile. After reading their respective materials, the two team members participated in a team discussion and made a collective decision about which of the three suspects was most likely the guilty party.

Manipulations. Participants were randomly allocated to one of four conditions, in which both level of perceived competence relative to one's team-mate (i.e., more or less) and

environment (i.e., competitive or cooperative) were manipulated via the experimenter's instructions (see Instructions section for details).

Perception of relative competence. Similar to the approach used by Kim (2003), participants were falsely led to believe that the information he/she was reading made him/her either more or less competent than his/her team-mate. Both participants in each team were, in fact, provided with identical instructions. This was done to ensure that both of the individuals within each team felt equally either more or less competent than his/her team-mate, thereby enabling examination of the effects of high (or low) perceived relative competence at the team level. Kim (2003) introduced the manipulation after participants read task materials, suggesting future research should introduce the manipulation *before* participants read the materials as this may be more likely to affect participants' processing of information. This suggestion was adhered to in the present study.

Environment. Consistent with the approach taken by Toma and Butera (2009), participants in the cooperative conditions were informed that their goal is to work together to make a joint decision about who committed the crime. On the other hand, participants in the competitive conditions were offered an alternative pro-self goal, being informed that their goal is to work together to make a joint decision about who committed the crime, but that it is also important to make up your own mind about who committed the crime and be the first to propose a solution. This conflicting alternative goal allowed for consideration of the effects using the aforementioned motivated information processing perspective (De Dreu, 2007), and examination of the impact of competitive or cooperative contextual features on the variables. As the purpose of this instruction was solely to create a conflicting individual goal, participants who pursued the

alternative goal were then instructed to continue their team discussion and provide a joint decision in order to meet the experiment's purpose.

Instructions. All participants were told that they will read a series of interviews about a fictitious murder investigation with three listed suspects. They were asked to read over the materials carefully and decide together who committed the crime, and advised that they will not have access to the materials during the team discussion. Participants were also informed that they will individually answer questions before and after the team discussion. Further specific instructions differed according to experimental condition.

Questions. Participants completed a pre-discussion questionnaire, team decision answer sheet, and post-discussion questionnaire. The pre- and post-discussion questionnaires were used to obtain scores for strategic withholding. The post-discussion questionnaire was also used to obtain scores for information sharing.

Decision accuracy. Team members provided a team response indicating a collective choice about which suspect was most likely to have committed the crime. There was one accurate answer and two inaccurate answers.

Strategic withholding. Toma and Butera (2009) demonstrated that team members are less likely to reveal unshared information under competitive conditions. The authors suggest that this is a deliberate behavioral strategy based on pro-self motivation (Toma & Butera, 2009). To replicate and extend upon these findings, the current study directly measured team members' strategic withholding intentions and behaviors. Bock and colleagues (2005) developed a measurement model and scales to measure the various facets of information sharing, using the framework of behavioral intention and reasoned action. Elements of the scale, which is applicable to the organizational context, were adapted to measure strategic withholding

specifically in relation to the task at hand. The tailored version included both pre- and post-discussion questions regarding participants' strategic withholding intentions and behaviors. Ten-point Likert-type agreement scales were used to calculate the degree of strategic withholding. Scores were obtained on pre-discussion strategic withholding intentions and post-discussion actual strategic withholding.

Information sharing. Similar to the approach used by Super et al. (2016), the study used a post-discussion questionnaire to calculate the number of items of unshared information mentioned during team discussion. The questionnaire asked individuals whether they shared each of their five unique clues to obtain a score out of five. The scores for each team member were added to obtain a team information sharing total.

Discussion coding/information seeking. The experimenter/coder observed each team discussion, recording the frequency of information seeking behaviors to obtain an information seeking score. The coding procedure was similar to that used by Stasser et al. (1995). A frequency count was taken of all general and specific requests for information, as well as confirmatory and opinion-seeking questions. An overall frequency count was calculated to obtain a team information seeking total.

Procedure

Testing was conducted by the researcher in a quiet setting between 9:30am and 4:30pm. Two participants were scheduled to attend each session in order to form teams. Participation took between 45 minutes and one hour to complete. Preliminary information stated that the study was interested in how teams use information, with the goal of identifying the factors that are important when people work together to make a decision. Each participant was separately taken out of the room to privately receive verbal instructions, which were read from a standard

script (as per Instructions section above). The private reading was essential to the experimental manipulation, to ensure that each participant was not aware that his/her team-mate's level of perceived relative competence was, in fact, the same as his/her own.

Participants were given up to 25 minutes to individually read the task materials, after which they completed the pre-discussion questionnaire which had been uploaded to the Qualtrics software platform (www.qualtrics.com). Participants then engaged in team discussion, which was observed by the experimenter/coder for information seeking behaviors. The team was then asked to indicate their decision, and each participant then completed the post-discussion questionnaire on Qualtrics.

Upon completion of the experiment, participants were advised of their decision accuracy, provided with a debriefing script, and invited to ask questions. Due to the deception used in the study, the researcher provided additional detail regarding conditions that were less conducive to success (i.e., competitive conditions).

Results and Analysis

Decision accuracy (H₁). A loglinear analysis technique was used to analyse the 2 x 2 x 2 multiway frequency design. The three-way frequency analysis was performed to assess the relationship between decision accuracy (accurate or inaccurate), perception of relative competence (more versus less), and environment (cooperative versus competitive). As predicted, results revealed a significant two-way interaction, $\chi^2(4, N = 40) = 12.86, p = .020$ and a significant three-way interaction, $\chi^2(1, N = 40) = 4.25, p = .041$. Tests of partial associations for all possible effects resulted in a significant decision accuracy by perception of relative competence interaction, partial $\chi^2(1, N = 40) = 6.99, p = .008$. Based on the odds ratio, it can be interpreted that teams of individuals who perceived themselves as relatively less competent were

5.64 times more likely to produce an accurate answer than teams of individuals who perceived themselves as relatively more competent. However, using backward elimination, the best fitting model was found to be the model that retained all effects. As predicted, there was a three-way interaction of decision accuracy by perception of relative competence by environment, with a likelihood ratio of $\chi^2(0, N = 40) = 0, p = 1$. This indicates an extremely good fit between the observed and the expected frequencies generated by the model (Hills, 2011).

To investigate the three-way interaction, 2 x 2 (decision accuracy by perception of relative competence) Chi-square analyses were performed separately for cooperative environment and competitive environment. There was no significant association between perception of relative competence and decision accuracy under a competitive environment, $\chi^2(1, N = 20) = .22, p = .639, \phi = .11$. As can be seen from the frequencies reported in Table 1, around the same number of teams under competitive conditions made an accurate decision for both levels of perception of relative competence; more (30%) and less (40%). However, under a cooperative environment, there was a significant association between perception of relative competence and decision accuracy $\chi^2(1, N = 20) = 11.02, p = .001, \phi = .70$. It can be seen in Table 1 that under cooperative conditions, teams of individuals who perceived themselves as relatively less competent made more accurate decisions (90%) than teams of individuals who perceived themselves as relatively more competent (20%). Based on the odds ratio, it can be interpreted that teams of individuals who perceived themselves as relatively less competent under cooperative conditions were 36 times more likely to produce an accurate answer than teams of individuals who perceived themselves as relatively more competent under cooperative conditions. Further, it can also be seen in Table 1 that teams of individuals who perceived themselves as relatively less competent made more accurate decisions under cooperative

conditions (90%) than under competitive conditions (40%). Based on the odds ratio, teams of individuals who perceived themselves as relatively less competent under cooperative conditions were 13.43 times more likely to produce an accurate answer than teams of individuals who perceived themselves as relatively less competent than their team-mate under competitive conditions.

Table 1

Frequency of decision accuracy as a function of environment and perception of relative competence

Environment	Competence	Accurate			Inaccurate		
		f_e	f	%	f_e	f	%
Cooperative	More	5.5	2	20	4.5	8	80
	Less	5.5	9	90	4.5	1	10
Competitive	More	3.5	3	30	6.5	7	70
	Less	3.5	4	40	6.5	6	60

Information sharing (H₂). A 2 x 2 between-subjects factorial ANOVA ($\alpha = .05$) was performed to determine the effects of perception of relative competence ($n = 20$) and environment ($n = 20$) on information sharing. Descriptive statistics are provided in Table 2.

Table 2

Mean information sharing scores across the four conditions

Environment	Competence	$M (SD)$	95% CI
Cooperative	More	4.40 (0.67)	[3.05, 5.75]
	Less	6.60 (0.67)	[5.25, 7.95]

Competitive	More	5.00 (0.67)	[3.65, 6.35]
	Less	5.50 (0.67)	[4.15, 6.85]

As predicted, there was a significant main effect for perception of relative competence, $F(1, 36) = 4.12, p = .050$ (two-tailed), $\eta^2 = .10$ (moderate effect), obs. power = 0.51. Regardless of environment, teams that perceived themselves as relatively less competent ($M = 6.05, SD = 2.01$) shared significantly more information than teams that perceived themselves as relatively more competent ($M = 4.70, SD = 2.18$). There were no significant interactions.

Information seeking (H3). A 2 x 2 between-subjects factorial ANOVA ($\alpha = .05$) was performed to determine the effects of perception of relative competence ($n = 20$) and environment ($n = 20$) on information seeking. Descriptive statistics are provided in Table 3.

Table 3

Mean information seeking scores across the four conditions

Environment	Competence	<i>M (SD)</i>	<i>95% CI</i>
Cooperative	More	10.00 (2.88)	[4.16, 15.84]
	Less	14.90 (2.88)	[9.06, 20.74]
Competitive	More	9.90 (2.88)	[4.06, 15.74]
	Less	17.10 (2.88)	[11.26, 22.94]

As predicted, there was a significant main effect for perception of relative competence, $F(1, 36) = 4.41, p = .043$ (two-tailed), $\eta^2 = .11$ (moderate effect), obs. power = .53. Regardless of environment, teams that perceived themselves as relatively less competent ($M = 16.00, SD =$

9.92) sought significantly more information than teams that perceived themselves as relatively more competent ($M = 9.95, SD = 7.76$). There were no significant interactions.

Strategic withholding intention (H4). A 2 x 2 between-subjects factorial ANOVA ($\alpha = .05$) was performed to determine the effects of perception of relative competence ($n = 40$) and environment ($n = 40$) on strategic withholding. Descriptive statistics are provided in Table 4.

Table 4

Mean strategic withholding intention scores across the four conditions

Environment	Competence	$M (SD)$	95% CI
Cooperative	More	6.95(0.99)	[4.99, 8.91]
	Less	8.00 (0.99)	[6.04, 9.96]
Competitive	More	11.95 (0.99)	[9.99, 13.91]
	Less	10.05 (0.99)	[8.09, 12.01]

Contrary to prediction, there was no significant effect of perception of relative competence on strategic withholding intention, $F(1, 76) = .19, p = .668$ (two-tailed). Also contrary to prediction, there was no observed interaction between perception of relative competence and environment on strategic withholding intention, $F(1, 76) = 2.24, p = .139$ (two-tailed). However, a significant main effect was observed for environment and strategic withholding intention, $F(1, 36) = 12.79, p = .001$ (two-tailed), $\eta^2 = .14$ (moderate effect), obs. power = .94. These results suggest that, regardless of perception of relative competence, teams in a competitive environment ($M = 11.00, SD = 4.49$) demonstrate significantly more strategic withholding intention than teams in a cooperative environment ($M = 7.48, SD = 4.35$).

Actual strategic withholding (post-test) (H₅). A 2 x 2 between-subjects factorial ANOVA ($\alpha = .05$) was performed to determine the effects of perception of relative competence ($n = 40$) and environment ($n = 40$) on actual strategic withholding. Descriptive statistics are provided in Table 5.

Table 5

Mean actual strategic withholding scores across the four conditions

Environment	Competence	<i>M (SD)</i>	<i>95% CI</i>
Cooperative	More	26.30 (4.34)	[17.66, 34.94]
	Less	16.80 (4.34)	[8.16, 25.44]
Competitive	More	25.05 (4.34)	[16.41, 33.69]
	Less	30.60 (4.34)	[21.96, 39.24]

Contrary to prediction, there was no significant effect of perception of relative competence on actual strategic withholding, $F(1, 76) = .21, p = .650$ (two-tailed). Also contrary to prediction, there was no observed interaction between perception of relative competence and environment on actual strategic withholding, $F(1, 76) = 3.01, p = .087$ (two-tailed). The p value of the interaction prompted investigation of power; however, the effect size was found to be weak ($\eta^2 = .04$).

Discussion

The aim of the present study was to investigate whether perception of competence relative to one's team-mate influences information sharing and decision accuracy and/or strategic information sharing behaviors in the Hidden-Profile Paradigm. Further, the study extends upon

previous findings by directly investigating the role of perceived relative competence on decision accuracy in competitive versus cooperative environments.

Perception of Relative Competence

The present study employed the rationale that teams of individuals who perceive themselves as relatively less competent may increase information sharing as a means of gaining competence and power, and increase information seeking as a means of leveraging information from those perceived as more competent, resulting in more accurate decisions. That is, the critical features were taken to be increased striving to gain competence and the higher evaluation of information provided by those thought to be more competent. A number of positive effects of perception of relatively less competence were observed, particularly in relation to hypotheses one (decision accuracy), two (information sharing), and three (information seeking).

Decision accuracy (H_{1a} & 1b). The prediction that teams of individuals who perceive themselves as relatively less competent would make more accurate decisions than teams of individuals who perceive themselves as relatively more competent (H_{1a}) was supported by the results. This shows that perceiving oneself as less competent has a positive impact on decision accuracy.

The present findings may help to explain the apparent discrepancy between studies that have examined the effects of the presence of expertise and experience in hidden-profiles. The present findings contrast previous findings regarding the benefits of more competent individuals and lend support to the suggestion that the key mechanism that enhances decision accuracy is not the expert's information itself, but rather non-experts' awareness of the presence of expertise, or perception of relatively greater task-related competence of his/her team-mate. That is, the critical factor leading to increased success is the recognition and leveraging of information by

other team members. This further suggests that an essential element is team members' responsiveness to one another's information, and willingness to process the information and use it to produce a collective decision.

The prediction that the increased decision accuracy of teams of individuals who perceive themselves as relatively less competent would be more pronounced under cooperative environments (H_{1b}) was also supported. As mentioned, the present findings only partially support findings by Toma et al. (2013) that teams perform better under cooperative environments. Indeed, the worst performing group in the design was teams of individuals who perceive themselves as relatively more competent under a cooperative environment. The current findings suggest that there is an interplay between individual factors and contextual factors, such that the positive effect of cooperation is overturned for teams of individuals who perceived themselves as relatively more competent.

Information sharing and information seeking (H_2 & H_3). The prediction that teams of individuals who perceive themselves as relatively less competent would share more information than teams of individuals who perceive themselves as relatively more competent (H_2) was supported by the results. This shows that perceiving oneself as less competent has a positive impact on information sharing, regardless of the environment. This may have reflected an attempt on the part of individuals who perceived themselves as relatively less competent to have their information validated by those they perceived to be more competent.

The prediction that teams of individuals who perceive themselves as relatively less competent would seek more information than teams of individuals who perceive themselves as relatively more competent (H_3) was also supported by the results. This shows that perceiving oneself as less competent has a positive impact on information seeking, regardless of the

environment. The increased information seeking potentially reflects a striving to gain knowledge, and hence power and competence.

As no interactions were observed for information sharing and information seeking, the findings demonstrate that teams of individuals who perceive themselves as relatively less competent share and seek more information, even under a competitive environment. Indeed, the highest information seeking scores in the present study were found in teams of individuals who perceived themselves as relatively less competent under a competitive environment. Again, these findings bring into question Toma et al.'s (2013) findings that information sharing is poor under competitive environments. It may be that teams of individuals who perceived themselves as relatively less competent under a competitive environment assumed that their information was not as important as their team-mate's information, and therefore did not refrain from sharing information for fear of losing power. It is important to note that, as indicated by the results for decision accuracy, this group was not able to successfully leverage the higher information exchange to make accurate decisions. This indicates that information sharing is only one part of the picture, and that it may have been information processing and use that was negatively impacted by the competitive environment in the present study.

Environmental Factors

Previous studies have examined the moderating effects of environment on information sharing and team decision-making in hidden-profile studies (e.g., De Dreu, 2007; Toma & Butera, 2009). Extending upon these findings, the present study responded to a call for research that examines intervening motivational mechanisms and how various considerations interact in hidden-profile studies (Sohrab et al., 2015) by investigating the effects of individual-level perceptions and the environment. The most noteworthy finding of the present study was that the

previously demonstrated advantage of cooperative environments over competitive environments was void for teams of individuals who perceived themselves as relatively more competent. However, the disadvantage of competitive environments persisted in the present study through strategic withholding behaviors.

Strategic withholding intention and actual strategic withholding (H₄ & H₅). The prediction that strategic withholding intention will be higher in teams of individuals who perceive themselves as relatively more competent, particularly under competitive conditions (H₄), was not supported by the results. However, the results demonstrated a significant effect for environment and strategic withholding intention. This shows that competitive environment has an influence on strategic withholding intention, regardless of the level of perception of relative competence.

The finding regarding strategic withholding intention did not carry through to actual strategic withholding. The prediction that actual strategic withholding will be higher in teams of individuals who perceive themselves as relatively more competent, particularly under competitive conditions (H₅), was not supported by the results. Whilst this interaction did not reach significance, it is worth noting that teams of individuals who perceived themselves as less competent demonstrated low levels of actual strategic withholding under a cooperative environment and the highest levels of actual strategic withholding under a competitive environment. Notwithstanding, the lack of congruity between strategic withholding intention and actual strategic withholding suggests a discrepancy between behavioral intention and action. Applying the Theory of Reasoned Action (Ajzen & Fishbein, 1980), individuals in these teams may have changed their attitude throughout the discussion, moving their behavioral focus towards solving the mystery and thereby abandoning some of their deliberate strategic

information withholding intent. Future research should consider the specific behaviors associated with strategic withholding to determine any moderating, mediating, or confounding influences.

Theoretical Implications

The findings of the present study have theoretical implications for team decision-making and factors affecting information sharing in hidden-profiles. In particular, they highlight the importance of perception of relative competence in relation to accurate decision-making and enhanced information sharing. In addition, the study directly measured the influence of information seeking, highlighting that this is a critical complementary process in information exchange. Whilst it is difficult to distinguish the mechanisms that led to differences in information sharing and seeking, and better decision accuracy, a number of theoretical applications may provide some insight.

Consistent with Social Comparison Theory (Festinger, 1954), the results showed that teams of individuals who were making an upward social comparison (i.e., teams of individuals who perceived themselves as relatively less competent) may have been driven to improve and thereby were motivated to put in more effort, resulting in increased information exchange and better decision accuracy. On the other hand, teams of individuals who were making a downward social comparison (i.e., teams of individuals who perceived themselves as relatively more competent) may have been subjected to an increased overconfidence bias. This bias may have prevented them from seeking and processing information from their team-mates, thereby resulting in decreased information exchange and poorer decision accuracy.

Associated with this is that, as previously mentioned, the cooperative environment was found to be detrimental for teams of individuals who perceived themselves as relatively more

competent. Individuals in these teams may have become complacent due to an assumption that their information was superior to their team-mate's information and the absence of a motivation to compete. It may be that, as suggested by previous studies (e.g., Franz & Larson, 2002; Thomas-Hunt et al., 2003), teams of individuals who perceived themselves as relatively more competent felt that they already possessed all the necessary information, and therefore did not need to search for further relevant information from those who they believed were less competent. Further, the belief that they were more competent than their team-mate may have strengthened their endowment bias (i.e., the increased value placed on their initial preference merely because they already possess it and ensuing reluctance to relinquish their position; Kahneman et al., 1991), which may have had ramifications for how they processed or valued information from their team-mates. This may have in turn increased the damaging impact of Groupshift (i.e., the tendency for members to exaggerate their initial positions during discussions; Robbins & Judge, 2016). Finally, without the distrust of a competitive environment, individuals in these teams lacked a reason to question their own suboptimal pre-discussion preference.

The situation described above (i.e., strong endowment bias and increased Groupshift) may have been reversed for teams of individuals who perceived themselves as relatively less competent under a cooperative environment. Individuals in these teams may have developed something of an "underconfidence advantage" due to an assumption that their information was inferior to their team-mate's information, and therefore needed to search for further relevant information from those whom they believed were more competent. That is, the belief that they were less competent than their team-mate may have led to a striving to gain competence. Furthermore, these teams were unhindered by the constraints inherent in competitive

environments (e.g., distrust). Consistent with the social cognition perspective (Hinsz et al., 1997), this finding suggests that perceiving oneself as less competent than your team-mate under a cooperative environment is most conducive to a high degree of team-level information processing. That is, this condition was most favourable to team interaction in which information, ideas, and cognitive processes were shared, and information was valued, manipulated and used to produce an accurate team decision. The present study found that, under a competitive environment, individuals adopt pro-self strategic withholding intentions that are detrimental to team decision accuracy.

Toma and Butera (2009) suggested that strategic withholding under a competitive environment reflects a striving to maintain the difference in competence with one's team-mate. The present study corroborated this finding, adding that, for teams of individuals who perceived themselves as relatively less competent, strategic withholding may also reflect a striving to *obtain* a difference in competence or gain a competitive advantage. Interestingly, teams of individuals who perceived themselves as relatively less competent under a competitive environment were found to demonstrate high levels of strategic withholding intention that were contradicted by high levels of information sharing. This finding may reflect a dilemma faced by individuals in these teams. Applying the Theory of Reasoned Action (Ajzen & Fishbein, 1980), individuals in these teams may have realised that, without reciprocity, they were unlikely to receive from their team-mate the information required to fill their assumed knowledge gaps. As such, they may have changed their attitude, moving their behavioral focus towards sharing information, and thereby abandoning some of their deliberate strategic information withholding intent. As previously mentioned, these teams did not produce significantly more accurate decisions, suggesting that this condition was not conducive to a high degree of team-level

information processing, valuing, and use. Future research could investigate whether factors such as information processing mediate the relationship between information sharing and decision accuracy under different conditions.

Practical Implications

The present study findings have practical implications for organizational contexts. It is notable from these findings that a perception of greater competence (usually associated with actual greater competence) does not necessarily guarantee accurate decision-making. When utilising teams for decision-making, structures and processes should be adopted that facilitate the flow of information from team members who perceive themselves as more competent. These processes should aim to exploit the superior information seeking behaviors of those who perceive themselves as less competent. Furthermore, team members must acknowledge the different levels of competence and experience within the team, and design and implement information sharing strategies that are tailored to exploit these differences and enhance social cognition.

With regard to the environment, care should be taken to ensure that individual goals do not override team goals. Whilst this may be difficult to achieve, some considerations may include: performance evaluation based on team outcomes (i.e., cooperative rewards), cultivating a collectivist culture, and establishing pro-social norms. Furthermore, if team decision-making, role interdependence, and substantial information sharing are critical components of a role, recruitment screening processes should identify cooperative individuals. However, it may be important to strike a balance between cooperation and competition to avoid the problems associated with high conformity and cohesiveness (i.e., Groupthink and rejection of dissident ideas). Future research could consider how this balance might best be achieved.

Limitations

Measures. A limitation was the limited scope of measures adopted in the study. Firstly, trait competitiveness was not measured. Some individuals may be more inclined to compete and this may have had an effect on the findings, despite the experimental instructions. Similarly, pro-social inclination may have led to increased information sharing and openness may have led to increased information seeking. Future research should consider individual traits as possible confounds.

Task. The decision-making task used in the present study required deductive reasoning. That is, selection of the correct answer relied upon a process of elimination, whereby participants would identify clues from a single source and reach the logical conclusion that only one of the suspects had both motive and opportunity to commit the crime. In organizational settings, decision-making typically involves the screening, processing, and interpretation of data from multiple sources (Robbins & Judge, 2016), with decisions often requiring novel solutions or uncertainty (Greenberg & Baron, 2008). That is, evidence is collected, alternatives are generated, and a selection is made. Therefore, it may be argued that inductive decision-making tasks are more ecologically valid. The results observed in the present study may not apply to this type of inductive reasoning or decision-making based on judgement, for which there is not an absolute correct answer. Future research should address whether the present findings are applicable when using decision-making tasks based on inductive reasoning principles.

Experimental manipulations. Whilst participants were instructed to cooperate or compete with one another, and an alternative goal was put in place to authenticate the competitive environment, there was an absence of actual reward or incentive. This lack of real competition may have affected the findings. Again, it may be argued that the present study

lacked ecological validity. However, it is known from previous studies (e.g., De Dreu, 2007) that external validity is sound.

Similar to the approach used by Kim (2003), participants in the current study were falsely led to believe that the information he/she was reading made him/her either more or less competent than his/her team-mate. Kim (2003) introduced this manipulation after participants read task materials, suggesting future research should introduce the manipulation before participants read the materials as this may be more likely to affect participants' processing of information before discussion as participants attempt to meet the perceived demands of their collective task (Wittenbaum et al.). Indeed, Kim (2003) highlights that because the perceptions under investigation were introduced only after participants had read the task materials, they could only exert their influence during group discussion. Consequently, the current design instead provided participants with this manipulation prior to them receiving the task materials. While this current study succeeded in detecting a significant effect for competence using this approach, it remains unclear what role (if any) the ordering of the manipulation played. As such, future studies may incorporate the timing of manipulation of perceived competence as a between-subjects variable.

Conclusions

The present study provides empirical evidence that perception of relative competence moderates the relationship between environment and decision accuracy in hidden-profiles. That is, a cooperative environment was found to be beneficial for teams of individuals who perceived themselves as relatively less competent, but detrimental for teams of individuals who perceived themselves as relatively more competent. The study further highlights that perceiving oneself as relatively less competent has a positive impact on information sharing, and demonstrates that

information seeking is a complementary aspect of information exchange. Finally, the study demonstrated that, under a competitive environment, individuals within teams deliberately adopt strategies to withhold information from their team-mates, thereby compromising decision accuracy. Future studies will further examine the positive impacts of information seeking behaviors and the adverse impacts of strategic withholding behaviors, as well as consider other opportunities for research identified here, such as the impact of individual traits as possible confounds.

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