When leaders are in the numerical majority or minority: Differential effects on problem-solving.

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Abstract

Two experiments examined the effect a leader has when supported by a numerical majority or minority. In both experiments participants read a team problem-solving scenario where a solution was supported by either a numerical majority or minority of the team. In some conditions the team leader also supported the same solution as the majority or minority in other conditions the leader did not. When the leader was supported by the majority, its solution was rated as more favorable by participants than when supported by either the leader or majority on its own. When the leader was supported by the minority, its solution was rated as either less favorable or equally favorable than when supported by the leader or minority on its own. However, when the leader was supported by the minority participants rated an alternative (better) solution that was not discussed by the leader, as more favorable. These findings indicate that leadership endorsement results in greater compliance to a majority-endorsed position but to more elaboration, and better decision-making, to a minority-endorsed position. The policy implications of this research for the role of leaders in team decision-making are discussed.

Introduction

Team working provides frequent opportunities for creativity and decision-making to occur (Paulus, Levine, Brown, Minai & Doboli, 2010). Within a team it is common for different opinions and views to be expressed, and discussed, before reaching a decision. The distribution of opinions within the team might represent different sub-groups. Consider, for example, a team of seven discussing a problem where five team members endorse one solution (majority) while the remaining two team members endorse a different solution (minority). Within this context the team leader, who has responsibility for helping the team reach a decision, will be in either the numerical majority or the minority of the team. While there has been a long tradition examining the processes underlying majority and minority influence and how these impact upon attitudes, opinions and behaviors (see Martin & Hewstone, 2010), by contrast there has been virtually no research examining the role of the leader within these processes. Given that leadership is a social process (Thomas, Martin & Riggio, 2013b) and that leaders and level of numerical support can both be sources of influence, there are compelling theoretical and practical reasons to examine the consequences for attitudes and decision-making when they co-occur (De Dreu, Nijstad & Van Knippenberg, 2008). Sources of influence have generally been examined in isolation, although they often co-occur (as the example above shows) which raises important theoretical issues concerning the types of processes this leads to and their consequences for attitudes and judgments. This paper examines this specific issue, asking the question, what consequences follow when a proposal to a problem is endorsed by either the numerical majority or the minority of the team and whether it is also supported by the leader?

To examine these issues we turn to contingency models that propose that each source (majority vs. minority) can lead to different processes, resulting in different types of influence outcomes (Baker & Petty, 1994; Crano, 2001; Mugny, Butera, Sanchez-Mazas & Pérez, 1995; Martin & Hewstone, 2001; 2003). In particular, Martin and Hewstone (2008) integrated

concepts from conversion theory (Moscovici, 1980, 1985) and dual process models of persuasion (e.g., ELM, Petty & Cacioppo, 1986; HSM, Chen & Chaiken, 1999) to develop the 'Source Context Elaboration Model' of majority and minority influence (SCEM; see also Martin, Hewstone & Martin, 2007)[1].

SCEM proposes that majorities and minorities can lead to either elaborative or non-elaborative processing depending on source status, heuristic cues and the context in which the source is encountered. *Elaborative processing* involves understanding the content of the source's position in detail, and why the source holds that position. As a result of extensive scrutiny of the source's position, elaborative processing can lead to change in attitudes and judgments on an indirect, private or latent level (Alvaro & Crano, 1997; Butera, Mugny, Legrenzi & Pérez, 1996; Wood, Lundgren, Oullette, Busceme & Blackstone, 1994) or to what Moscovici (1980) refers to as 'conversion'. Elaborative processing has similarities to Nemeth's (1986, 1995) concept of 'divergent thinking' which involves considering the issue from multiple perspectives, other than the one provided by the source, and this can lead to more creative thinking, improved judgments and performance (e.g., Butera, et al., 1996; Martin & Hewstone, 1999; Nemeth & Kwan, 1987; Nemeth & Wachtler, 1983). *Non-elaborative processing*, by contrast, does not involve extensive processing of the source's position and an evaluation of its merits. When non-elaborative processing occurs pre-existing views remain intact and no conversion takes place. However, attitudes and judgments can be guided by heuristic cues (such as source status and leadership) and when this occurs there is public compliance to the source position with no private change. SCEM proposes that the type of processes that people engage in, and the consequence this has for attitudes and judgments, depends upon the interplay between source cues concerning (i) numerical support of position (majority vs. minority) and (ii) leader support (leader support vs. non-leader support). These cues can individually, and collectively, lead to elaborative vs. non-elaborative processing which are moderated by the presence of various heuristic cues. To understand the specific

study predictions, we first outline some of the heuristic cues that can occur in this context.

A number of heuristic cues can guide attitudes and judgments in decision-making contexts (Gigerenzer & Gaissmaier, 2011). The most important one for this paper, as detailed by Martin and Hewstone (2008), is the *majority default option*. When membership of the majority is psychologically important, people will comply with the majority for social approval and consensual validation and also to avoid being categorized as part of the (deviant) minority. Majority status often acts as a heuristic cue as people assume it is correct ('several pairs of eyes are better than one'), that the majority-endorsed position is more likely to be accepted by the group ('majority views prevail') (see Baker & Petty, 1994) and, as part of the general majority representation, as being dominant and positively evaluated (Gardikiotis, Martin & Hewstone, 2004).

Another heuristic that might guide decision-making is specifically associated with a leader's position. If the leader has power over the team members (e.g., legitimate power if an organizational manager, referent power if leader of a social group, expert power if manager of a sports team; see French & Raven, 1959), then a *follow the leader strategy* can occur (Higgins, 2001; Rahim, 1989; Van Vugt, 2004). If team members believe that the leader's view, due to their power, is likely to prevail then there is no need to consider the leader's view in detail (i.e., non-elaborative processing). Related to this, but from a different perspective, one could argue that when team members agree with the leader, this increases the team members' feelings of power, and this has been shown to reduce perspective taking, the ability to understand how other people see, think and feel about the world (Galinsky, Magee, Inesi & Gruenfeld, 2006), and also to reduce processing of goal relevant information (Guinote, 2007; Slabu & Guinote, 2010). Both the majority default option and follow the leader strategy lead to acceptance of the majority or leader position without engaging in detailed elaborative processing (compliance).

In developing the hypotheses we refer to the decision-making context of the

experiments. In these studies a scenario is described where a team and a leader discuss different solutions to a problem. Different conditions manipulate whether a solution is supported by the numerical majority or minority and if the leader supports or does not support the same solution (source-endorsed). The primary dependent variable is evaluations of the source-endorsed solution. In some conditions a second alternative solution, which is better than the source-endorsed solution, is also described but not linked to any source information. Since the alternative solution is not linked to any source information, agreement with it is likely to be due to engaging in elaborative processing of the problem and from considering a range of solutions other than the one proposed by the source. To some extent the source-endorsed and alternative solutions represent direct and indirect items respectively (Alvaro & Crano, 1997; Butera et al., 1996). Applying the above theorizing yields the following hypotheses.

When the *majority has leader support*, the majority default option and the follow the leader strategy converge, or mutually reinforce each other, and should result in greater compliance to the solution when the leader supports the majority (majority/leader[2]) than when it does not (majority) (H1). Since team members assume it highly likely that the leader/majority position will be adopted, they will agree with it with little motivation to engage in elaborative processing and the need to consider alternative solutions (H2). When the *minority has leader support*, however, the majority default option and the follow the leader strategy are in conflict, or mutually contradict each other, and a different set of processes will occur. In terms of the solution endorsed by the source (source solution), we do not expect an effect of whether the minority has leader support (minority/leader) than when it does not (minority). However, an alternative solution, i.e. one not proposed by the source, we would expect the context to affect elaborative processing (Martin & Hewstone, 2008). If the minority has leader support, the clash of heuristics ('I want to follow the leader but it proposes a minority solution') leads to greater elaborative processing of the minority-endorsed and alternative solutions to understand the incongruity[3]. The impact of the increased elaboration in

the minority/leader condition on judgments of an alternative solution will lead to more favorable ratings of the alternative solution than if the leader does not support the minority (H3)[4].

We tested these general hypotheses in two experiments in which participants evaluated different solutions to a problem. In both experiments we manipulated the numerical support for a solution (majority vs. minority). In addition, the first experiment also manipulated whether the leader supported the source or did not (leader support vs. non-leader support), while the second experiment presented two solutions (source-endorsed and alternative) to determine the types of processing.

Experiment 1

In the first experiment participants rated the favorableness of a solution to a problem that they believed was supported by (i) numerical majority, numerical minority, or no numerical information (no numerical information) and (ii) by the team leader or not the leader (leader support). The experiment allows a test of whether majority/leader results in greater compliance to the source's solution than majority support alone (H1).

Method

Participants and design. The participants were 102 (44 males and 58 females; average age 23.52 years, *SD* = 5.58) students from a British university who were randomly assigned to one of six conditions created by crossing the two factors of 3 numerical support (majority vs. minority vs. no numerical information) x leader support (leader support vs. no leader support), with 17 participants per cell.

Stimulus materials. The materials concerned different solutions for the treatment of a tumor using light rays, and were originally developed by Gick and Holyoak (1980, 1983) (see also Martin & Hewstone, 1999).

Procedure. Participants were tested individually. Each participant received a booklet which contained all the instructions. The participants read a case study of team decision-

making in the health sector concerning the best way to treat cancer tumors. The main aspects of the case study are described below. The team consisted of seven people who represent different professional skills related to applying engineering to medicine. One member of the team is the manager (which from here will be referred to as 'leader'), who is responsible for ensuring that the team comes to an agreement on the best solution to the problem. The problem is to find the best way to treat tumors that are inside the body with minimal harm to the patient. The team is told that there are two types of rays available: high-intensity rays that destroy the tumor but also damage the surrounding tissues and low-intensity rays that are not strong enough to completely destroy the tumor but do not damage surrounding tissues. There are multiple machines available that can produce many high- and low-intensity rays. Team members are told that there are a number of potential solutions to the problem. The case study then describes that, prior to team discussion, team members indicated their preferred solution without identifying themselves. The study participants were then informed of the initial (private) preferred solution of each team member within the case study.

Two independent variables were manipulated in the description of the case study. First, numerical source was manipulated by indicating that (i) 5 (out of 7) team members preferred the same solution (majority), (ii) 2 (out of 7) team members preferred the same solution (minority), and (iii) no information was given for number of team members supporting the solution (no numerical information). Second, participants were informed that in the case study either the team leader supported the proposed solution (leader support) or the team leader did not support the solution (non-leader support). The source-endorsed solution proposed in the case study, which was given to all participants, was then explained by the following: ‘Cut an opening through the surrounding tissues to get direct access to the tumor and then use high-intensity rays to destroy the tumor’. This is referred to as the ‘tunnel’ solution. After reading the source-endorsed solution, the participants completed the dependent variables.

Dependent measures. Participants rated the source solution on three 9-point semantic

differential scales that were anchored with the following evaluations: *Bad* (1) to *Good* (9), *Unfavorable* (1) to *Favorable* (9), and *Foolish* (1) to *Wise* (9). The three items were averaged to make a solution evaluation score with higher scores reflecting more positive evaluations of the solution (Cronbach's alpha = 0.85).

Results

Overview. The solution evaluation score was analyzed using a 3 numerical support (majority vs. minority vs. no numerical information) x 2 leader support (leader support vs. non-leader support) x factorial analysis of variance (ANOVA). The means and standard deviations for the solution evaluation measure are shown in Table 1.

<Table 1 about here>

Source solution evaluation. While the main effects for numerical and leader support were not reliable, $F(1,96) = 0.06$ and $F(2,96) = .89$, respectively; there was a reliable interaction between numerical and leader support, $F(2,96) = 9.12$, $p < .001$. As expected, the majority/leader condition led to a more positive evaluation of its solution than the majority/non-leader condition ($M = 6.80$, $SD = 1.53$ vs. $M = 5.24$, $SD = 1.79$), $F(1,98) = 8.78$, $p < .005$, and the no numerical information/leader condition ($M = 6.80$, $SD = 1.53$ vs. $M = 5.67$, $SD = 1.01$), $t(96) = 2.15$, $p < .03$ (see Figure 1). This pattern of results shows that the majority/leader condition led to more favorable ratings of its solution than majority or leader status alone and supports H1. The minority/leader led to a worse evaluation of the source-endorsed solution than the minority/non-leader ($M = 4.71$, $SD = 1.62$ vs. $M = 6.33$, $SD = 1.79$), $F(1,98) = 9.46$, $p < .004$, and with the no numerical information/leader ($M = 4.71$, $SD = 1.62$ vs. $M = 5.67$, $SD = 1.01$), $t(98) = 1.81$, $p < .07$. This shows that the minority/leader condition led to worse favorable ratings of its solution than minority or leader status alone.

<Figure 1 about here>

Discussion

To summarize, these results provide a first support for our hypothesis. As expected,

when the leader and majority sources co-occurred (majority/leader) there was greater agreement with its solution than when supported by just the majority (majority/non-leader) or by just the leader (no numerical information/leader). This shows that the specific combination of the leader and majority support leads to greater agreement above that due to the individual sources of influence (i.e., majority or leader). By contrast, the combination of minority and leader support seems to hinder influence as this led to less agreement than just the minority (minority/non-leader) or leader support (no numerical information/leader) alone. Thus leadership enhances majority influence but hindered minority influence.

While the results gave initial support for our hypothesis (H1), the nature of the study does not allow a direct examination of the underlying processes and whether, for example, the increased influence associated with the majority/leader combination is due to compliance and whether the minority/leader combination leads to a greater consideration of a wider range of issues (both of which we predict). To examine the type of processing underlying these effects the second experiment was a partial replication of the first experiment but we also asked participants to judge a second proposal, which is not described in the case study, which is better quality than the source-endorsed solution.

Experiment 2

In the first experiment participants rated the favorableness of a solution endorsed by the source. As explained in the introduction, one might consider this to be the direct level of influence (Martin & Hewstone, 2001). However, in order to examine the type of processes (elaboration vs. non-elaboration) we included an additional measure of influence at the indirect level. To do this we asked participants to rate a second alternative solution to the problem that was not stated by the source in the case study. It is important to note that the alternative solution is better in quality to the source-endorsed solution and it is not linked to the source (i.e., it is presented as being independent to the team). The later point is particularly important because evaluations of the alternative solution will be a result of the types of processing

engaged in evaluating the source-endorsed solution and not directly due to the source status. The more participants elaborate on the source-endorsed solution, and consider a wider range of alternatives, the more likely they should rate the alternative (and better) solution favorably. Consistent research in minority influence supports the use of indirect item measures to indicate greater message processing (Alvaro & Crano, 1997; Butera et al., 1996; Nemeth, 1986). Since we predict that the agreement to the majority/leader condition is due to non-elaborative processing leading to compliance, then there should be little impact on the alternative solution (H2). In addition, we predict that the minority/leader condition leads to greater message elaboration, and consideration of a wide range of alternatives, therefore leading to more favorable ratings of the alternative solution (H3).

Method

Participants and design. The participants were 56 (22 males and 34 females; average age 21.45 years, *SD* = 2.04) postgraduate students from a British university who were randomly assigned to one of four conditions created by crossing the two factors of 2 (numerical source: majority vs. minority) x 2 (leader support: support vs. non-support), with 14 participants per cell.

Stimulus materials. The materials were similar to those employed in Experiment 1.

Procedure. The procedure and manipulation of independent variables was the same as Experiment 1 with the except that the 'no information' condition was not included. After reading the tunnel solution (source-endorsed), the participants completed the first set of dependent variables. The participants were then informed of an alternative solution to the tumor problem called the 'convergent' solution, although this was not identified as being supported by the team members who did not support the tunnel solution (for the rest of the paper this is referred to as the 'attack-dispersion' solution[5]). The attack-dispersion solution was explained as 'Attack the tumor from several angles with low-intensity rays to converge on the tumor with increased intensity to destroy it' (alternative solution). Previous research has shown

that the attack-dispersion solution is judged better than the tunnel solution in dealing with the tumor problem (Gick & Holyoak, 1980, 1983; Martin & Hewstone, 1999)[6]. After reading this solution, the participants completed another set of dependent measures.

Dependent measures. The first measure concerned the likelihood that the source's solution would be accepted by the team in the case study and was measured with an item that asked to what extent 'Do you think it is likely that the tunnel solution will be accepted by the team?' on a 9-point scale anchored 1, *Not at all likely* to 9, *Highly likely*. After reading the tunnel and attack-dispersion solutions participants were asked to indicate how favorable they thought each solution was on a 9-point scale anchored 1, *Unfavorable* to 9, *Favorable*.

Results

Overview. Unless noted otherwise, responses to all measures were analyzed using a 2 (numerical source: majority vs. minority) x 2 (leader support: support vs. non-support) factorial analysis of variance (ANOVA). The means and standard deviations for all dependent measures are shown in Table 2.

<Table 2 about here>

Likelihood of adoption of source-endorsed (tunnel) solution. There were reliable main effects for both numerical source, $F(1,52) = 6.94$, $p<.01$, and leader support, $F(1,52) = 20.64$, $p<.004$. The two way interaction was not reliable, $F(1,52) = 1.97$. As expected, participants were more likely to believe the source's solution would be adopted by the team when it was endorsed by a majority than by a minority ($M = 6.11$, $SD = 1.42$ vs. $M = 5.04$, $SD = 1.84$), and when there was leader support than non-leader support ($M = 6.18$, $SD = 1.42$ vs. $M = 4.96$, $SD = 1.79$).

Source-endorsed and alternative solutions. Participants' ratings of favorableness of the source-endorsed and alternative solutions were examined using a 2 (numerical source: majority vs. minority) x 2 (leader support: support vs. non-support) x 2 (solution type: source-endorsed vs. alternative) mixed model ANOVA with repeated measures on the last factor. There was a

reliable main effect of leader support, $F(1,52) = 7.04$, $p<.01$, and the three-way interaction between numerical source, leader support and solution type was also significant, $F(1,52) = 9.33$, $p<.005$ (see Figure 2).

<Figure 2 about here>

When the source was a majority, as predicted, participants rated the source's solution as more favorable with leader support than non-leader support ($M = 7.07$, $SD = 1.39$ vs. $M = 5.28$, $SD = 1.86$), $F(1,52) = 8.37$, $p<.007$. This replicates the finding in Experiment 1 and supports H1. More evidence that participants complied to the majority/leader-endorsed solution was the finding that the source's solution was rated as more favorable than the alternative solution ($M = 7.01$, $SD = 1.39$ vs. $M = 5.64$, $SD = 1.82$), $F(1,52) = 4.15$, $p<.05$. This confirms our prediction that when a majority has leader support there is increased compliance to its proposal, but this does not transfer to the alternative solution even through it was of higher quality (supporting H2). There was no difference across solution types (source vs. alternative) when the majority did not have leader support ($M = 5.28$, $SD = 1.86$ vs. $M = 6.21$, $SD = 2.05$), $F(1,52) = 1.75$.

When the source was a minority, there was no difference in ratings of favorableness for the source's solution if the minority had leader support to when they did not have leader support ($M = 6.00$, $SD = 1.62$ vs. $M = 5.93$, $SD = 1.64$), $F(1,52) = 0.01$. However, as predicted (H3), in the minority/leader-endorsed condition the alternative solution was rated as more favorable than the source-endorsed solution ($M = 7.64$, $SD = 1.15$ vs. $M = 6.00$, $SD = 1.62$), $F(1,52) = 5.48$, $p<.03$, but this was not the case when the minority did not have leader support ($M = 5.64$, $SD = 2.24$ vs. $M = 5.93$, $SD = 1.64$), $F(1,52) = 0.17$. Further support for hypothesis H3 was the finding the alternative solution was rated more favorable than in the minority/leader than majority/leader conditions ($M = 7.64$, $SD = 1.15$ vs. $M = 5.64$, $SD = 1.82$), $F(1,52) = 8.09$, $p<.007$.

Discussion

To summarize, these results support our hypotheses. As expected, participants believed

the source's solution would be more likely to be adopted if it is supported by the leader and the numerical majority. This supports the heuristic that majority- and leader-endorsed positions are more likely to prevail and be accepted. When the majority was supported by the leader, there was increased agreement with its solution. Furthermore, this is likely to be due to heuristic cues (leader and majority) and not due to elaborative processing because participants did not favor the alternative (and better) solution. When the minority was supported by the leader there was a conflict of heuristics (majority default vs. follow the leader). The incompatible heuristics (wanting to follow the leader but not be in the minority) led to greater focus on the minority's solution and alternatives; the results supported this. While there was no effect of when the leader supported the minority's solution, there was greater support for the alternative better solution showing a transfer of agreement from the minority's solution to the alternative (better) solution.

General Discussion

We believe these experiments are the first to examine the consequences of a leader supporting a numerical majority or minority (see also Papastamou, 1985). As well as practical importance, these research questions have considerable theoretical relevance. Most notably, is that most studies examine source status (such as, leadership and numerical support) individually and do not consider when they co-occur. When they do co-occur, as they often do in real life, there is a need to consider the types of information processing strategies they lead to and how this affect attitudes and judgments. Our theoretical analysis is based on the notion of leadership as a social process of relationship development (Thomas et al., 2013a; Thomas, Martin, Epitropaki, Guillaume & Lee, 2013b) that integrates concepts of the contingency approaches to majority and minority influence (e.g., Martin & Hewstone, 2008). In doing this we focus on the role of various heuristic cues (namely, majority default option and follow the leader strategy). This led to a number of hypotheses which were supported in both experiments.

Of importance, there was support for the heuristic that a majority- and leader-endorsed

solution would be seen as more likely to be accepted by the team (Experiment 2). There was also support for the hypothesis that when the majority was supported by the leader the participants would comply with the source-endorsed solution and not consider, in detail, an alternative solution - even if it is better quality than the source-endorsed solution (H1 and H2). There was also support for the hypothesis that when the minority was supported by the leader this would lead to a consideration of a wider range of solutions than the source-endorsed one (H3). In summary, it appears that leadership enhances the direct impact of numerical majorities and the indirect impact of numerical majorities.

In this paper we have taken the perspective that minorities, under specific situations, can lead to an increased elaboration of the issues (and related ones) associated with the message or decision they propose. As Nemeth (1995) claims 'dissent drives cognition', increases the amount of information available, which can lead to more innovative ideas and better decision-making. However, dissent in a group comes at a cost as it questions the dominant majority position and can decrease group morale (Nemeth, Brown & Rogers, 2001), lower confidence in decisions (Rijnbout & McKimmie, 2012) and increase conflict which can adversely affect team performance (De Dreu, 2006). The way teams manage the potentially negative consequences of dissent is crucial for effective team working. One way is to increase team members' feelings of participation in the team, presumably to encourage a climate of shared responsibility for outcomes (De Drue & West, 2001). While our theoretical analysis is based upon primarily an information-processing perspective, we recognise there may be many moderating factors determining the impact of numerical support and leadership on decision-making. We consider some of these in the next section examining future research.

Future Research

There are a number of useful avenues for future research. First, it would be useful to examine a wider range of outcomes. In particular there are similarities between elaborative processing and Nemeth's (1986) concept of 'divergent thinking'. Therefore, one would expect

that when the minority is supported by the leader, the enhanced elaboration of the minority position (and alternatives) should lead to greater creativity and enhanced performance.

Second, the context in which these experiments were conducted can be considered to be low elaboration (Martin & Hewstone, 2008) in that the topic was low relevance to the participants. In this situation, one would expect heuristic cues to have a powerful impact on attitudes and judgments (Martin et al., 2007). However, if the context is high elaboration (e.g., the topic is highly relevant or message evaluation is encouraged) then one might expect a different pattern of results. One such situation might be when the outcome of the decision has direct relevance to the participants (e.g., students discussing the introduction of a university service program, Crano & Chen, 1998). More specifically, attitudes and judgments will be guided more by message elaboration than source status (both leader and numerical support) although additive effects might occur.

Third, and related to the context issue identified above, it is important to vary the complexity of the task. The above theoretical analysis assumes the task is sufficiently challenging that the increased elaboration can aid decision-making. However, when the task is of low challenge and where a decision can easily be reached, then we would expect no benefits of a leader being in a minority (Rijnbout & McKimmie, 2012).

Fourth, future research could manipulate leadership style as this is likely to moderate the observed effects. According to the MIP-G model (see footnote 4), when the leader is directive or autocratic will lead to a reduction in the amount team members will deliberate about the task (reduced non-elaborative processing; Bechtoldt et al., 2010; De Dreu et al, 2008). Varying the style of leadership (directive vs. participative) would lead to specific predictions (see Rupert et al., 2010). When the majority is supported by the leader and uses a directive style there will be greater compliance to the source-endorsed position than when using a participative style (because participation allows other solutions to be considered and reduces the follow the leader strategy). When the minority is supported by the leader, there

should be greater impact on alternative solutions when the leader uses a directive than participative style (because a directive one enhances the conflict between the two heuristics) and result in greater elaborative processing.

Fifth, leadership is social process where the quality of the relationship between the leader and the follower is crucial (Thomas et al., 2013a,b). Future research could examine whether leader-follower relationship quality changes when the leader is supported by either the majority or minority. Our analysis would suggest that the majority default option is dependent on a good quality leader-follower relationship (to facilitate compliance) compared to when the leader is in the minority.

Finally, while our data supports the information processing strategies we have outlined in SCEM we recognize that we do not show that they mediate attitude change. Future research could measure key indicators of information processing (such as using a thought-listing task to assess cognitive processes, see Martin & Hewstone, 2010) as potential mediators between leader and numerical status and outcomes.

Policy Implications

As well as addressing many theoretical issues, we believe this research has a number of potential policy implications for decision-making processes in teams. The context of this research was to examine when two major forms of social influence (leadership and numerical support) co-occur. We believe this is a common occurrence in a range of settings such as, work manager/work team, captain/sports team, teacher/class pupils, political leader/political party. For the purpose of illustration, we examine some policy implications of this research in the health care context described in these experiments but acknowledge they could apply to many different contexts such as those identified above.

Overall, we find that when a leader is supported by the majority (and hence opposed by a minority), members of the team acquiesce to the leader's position, do not question it or consider alternatives. This has profound implications for decision-making in health-related

teams. Team working is highly prevalent in heath contexts, recognizing that medical problems tend to be complex, multi-faceted and requiring multiple professional disciplines. Good team processes, therefore, are essential for 'evidence-based' healthcare in the way they make decisions (Hopthow, Feder & Michie, 2011). The results of these experiments point to potential problems when the leader has the support of the majority, in that the team performs only as well as the leader would do on her/his own and the team does not utilize different perspectives from the team members. This might lead to situations similar to that of groupthink (Janis, 1972). Building on the analogy to groupthink, one set of policy implications for teams therefore is to make sure there is not over conformity to the leader, that there is open discussion of different views amongst team members, the opinions of external experts are sought and, where appropriate, techniques such as the 'devil's advocate' are employed (MacDougall & Baum, 1997: although there is a need for this to be seen as authentic and consistent with personal views, cf. Nemeth et al., 2001). One strategy to facilitate this is to encourage team reflexivity (i.e., teams collectively reflect upon and adapt working methods, see Schippers, West & Dawson, 2015) with the aim to improve processes and procedures to enhance team functioning and reduce compliance to a leader or majority position.

On the other hand, when the leader is supported by the minority (and hence opposed by the majority), this creates conflict within the team that can impede performance on the direct problem. Clearly this would be undesirable in the health context we described in our experiments as it would lead to a sub-optimal solution to the problem. However, this conflict can lead to deeper appraisal of alternative solutions, often ones not originally stated, and this can enhance creativity and performance. However, conflict is not always good for teams, even if it enhances performance, and it might in the long-term lead to lower cohesion and poor team identity. The possible identity conflict that may arise could be countered by the impression that the leader is open to all opinions and follows a democratic approach. Hence, a possible positive outcome of the leader agreeing with a minority position is that team members believe that

everybody's contribution is valuable. Key here is the ability of the leader to manage the conflict and to ensure that task conflict does not become relationship conflict and have a negative impact on the team processes. In terms of our health care example, one might see potential problems when the leader is supported by the minority in that it does not make good decisions on the direct problem. A clear implication of this is for leaders to be trained to recognize different forms of conflict and to encourage information sharing and a deeper examination of the issues (cf. Hopthrow et al., 2011), then this might lead to better decision-making than the leader would have achieved on her/his own. Indeed, this was found in Experiment 2 when the leader was supported by the minority, participants rated the alternative and better solution as more favorable than in other conditions.

In summary, there are many policy implications that emerge from this research in relation to understanding the relation between leadership, team processes and decision-making. Clearly, the leader is crucial in determining how the team behaves and processes within it and therefore team outcomes. Correspondingly they should be selected and trained to understand the value of dissent, how to manage it and how to use it to facilitate team creativity and performance.

Conclusion

To conclude, these experiments are the first attempt to examine the impact of having a leader supported a numerical majority and minority on decision judgments. We believe this is an important issue to examine both practically (due to the prevalence of leadership and numerical divisions of opinions in team decision-making) and also theoretically (to examine the interplay between processing strategies and heuristic cues in different contexts). Future research will, no doubt, give a greater insight into the boundaries affecting and processes underlying these phenomena.

Footnotes

[1] While SCEM was primarily developed to look at the impact of majority and minority influence on attitude formation and change, the basic concepts can be extended to cover creativity in decision-making.

[2] For ease of presentation, we describe different contexts with the convention e.g., 'when the majority has leader support (majority/leader) but clearly this order is arbitrary and theoretically we are concerned with the *joint* effects of both sources of influence.

[3] Some initial support for this hypothesis comes from a study by Papastamou (1985). He found that when the minority was supported by the leader it lead to greater indirect vs. direct influence compared to when the minority was not supported by the leader and this was especially the case when the source was *psychologized* (i.e., the source's position could be attributed to an internal bias). Papastamou (1985) proposes that when the minority supports the leader this changes the representation of the minority to a situation where their behavior needs to be understood leading to greater attention on their position. However, this study only examined minority sources whereas in these studies we wish to compare majority and minority sources.

[4] It should be noted that similar hypotheses to those stated above could also be made within the motivated information processing in groups (MIP-G) approach. The amount of epistemic processing (willingness to engage in deep information processing in order to understand the situation, the group task or the decision that needs to be made), which has some similarities to elaborative processing, can be affected by situational cues (Bechtoldt, De Drue, Nijstad & Choi, 2010) such as minority dissent and group leadership (De Dreu et al., 2008). Therefore, when the minority supports the leader, this results in greater epistemic processing leading to a consideration of a range of alternative solutions to understand the problem.

[5] While this was referred to as the 'convergence' solution in the experimental materials, in the rest of this paper it is referred to as the 'attack-dispersion' solution to avoid confusion with

Nemeth's (1986) concept of 'convergent thinking'.

[6] Martin and Hewstone (1999) found that the attack-dispersion was rated the best out of six alternatives, including the tunnel solution, by 90% of a sample of 20 raters and by three nurses who specialize in treating tumors. The main reason given for this choice is that the attack-dispersion technique is both effective and non-evasive.

[7] Note, the words 'majority' and 'minority' were not used in the experimental materials of either study. Numerical support was conveyed by the different number of team members supporting each solution.

Biographies

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Table 1: Means and standard deviations for the dependent measure as a function of leader and numerical support for Experiment 1 (*n*=17 per cell)

	Numerical Support					
	Majority		Minority		No Information	
	Leader Support					
	Leader	Non-Leader	Leader	Non-Leader	Leader	Non-Leader
Source-endorsed Solution Evaluation	6.80 (1.53)	5.24 (1.79)	4.71 (1.62)	6.33 (1.79)	5.67 (1.01)	5.82 (1.92)

Note. Standard deviations shown in parentheses.

Table 2: Means and standard deviations for all dependent measures as a function of leader and numerical support for Experiment 2 (n=14 per cell)

	Numerical Support			
	Majority		Minority	
	Leader Support			
	Leader	Non-Leader	Leader	Non-Leader
Likelihood Solution Adopted	6.43	5.79	5.93	4.14
	(1.34)	(1.48)	(1.49)	(1.75)
Source-endorsed Solution Favorableness	7.07	5.28	6.00	5.93
	(1.39)	(1.86)	(1.62)	(1.64)
Alternative Solution Favorableness	5.64	6.21	7.64	5.64
	(1.82)	(2.05)	(1.15)	(2.24)

Note. Standard deviations shown in parentheses.

Figure 1: Favorability of source-endorsed solution as a function of numerical and leadership support (Experiment 1)

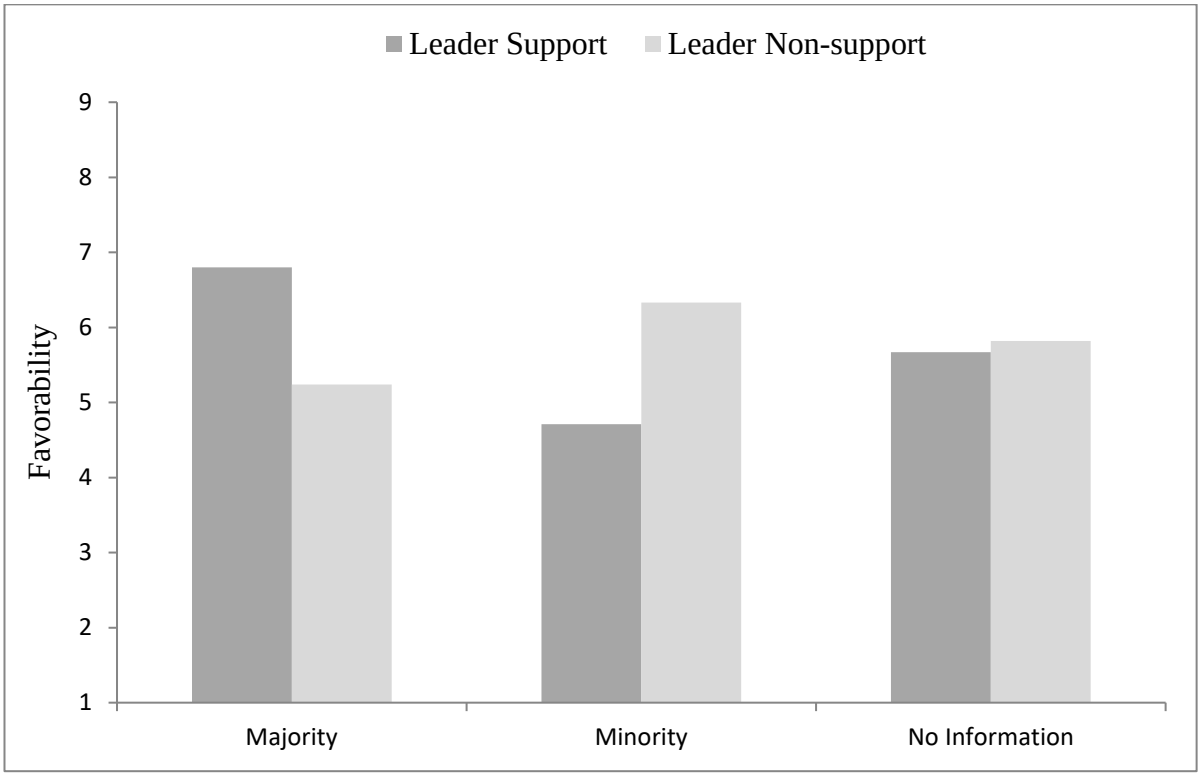

Figure 2: Favorability of source-endorsed and alternative solutions as a function of numerical and leadership support (Experiment 2)