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When Motivated To Scrutinize: When and How Do People Use Majority Size in Conformity Decisions?

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When Motivated To Scrutinize:

When and How Do People Use Majority Size in Conformity Decisions?

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When Motivated To Scrutinize: When and How Do People Use Majority Size in Conformity Decisions?
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Abstract

Motivational factors thought to differentially influence the use of majority size as a

criterion for conformity were investigated, along with the particular manner in which

majority size is used. Specifically, performance goals and individuals' uncertainty about

their own judgment were hypothesized to increase the need for valid social information,

thereby leading to greater scrutiny of the source itself. In two studies, participants

performed a mental rotation task and viewed piecharts representing the ostensible

normative judgments of their peers. The apparent competence of the majority was

manipulated by associating large majorities with either correct or incorrect judgments,

which would have taken multiple trials to detect. I predicted that only with a performance

goal (as opposed to an affiliation goal or a learning goal) would participants be motivated

to track the validity of the information, and thus show differential conformity to

apparently incompetent and competent majorities. In a third study, participants' certainty

in their own judgment was manipulated. I predicted that uncertain participants would be

more persuaded by a large than small majority, which would contradict previous research

findings showing only a majority status effect. None of the hypotheses were

straightforwardly supported. However, additional analyses including participants'

perceptions of their own performance provided mixed support.

Introduction

The purpose of this research is to examine some of the cues used by individuals when assessing the validity of a majority, how they use those cues in decisions to conform, and what motivational conditions are necessary for such a validation process to occur. Of particular interest in this thesis is majority size. Previous research suggests that on single shot presentations of social consensus information, majority size makes no difference in terms of persuasion (Gardikiotis, Martin, and Hewstone, 2005; Mackie, 1987; Martin, Gardikiotis, and Hewstone, 2002)–that is, people are more likely to conform to or be persuaded by a majority regardless of how proportionally large it is. However, a pilot study conducted at Lehigh University suggested that people might use majority size to track the validity of a social majority over time, implying that majority size can act as a cue and influence conformity. The research presented here was designed as a follow-up to both lines of research. Motivational factors such as performance goals and states of uncertainty are proposed as factors that increase the importance of assessing the validity of social information, and therefore the use of majority size as a validity cue.

Conformity to the opinions and actions of peers is both a common and arguably necessary aspect of psychological functioning. From a young age, children use adults and peers as guides for learning (Allen, 2012). By adulthood, most people have lived in social environments that generally warrant trust in the competence of their peers, and so conformity with the actions and judgments of others becomes heuristically useful as a tool for competently interacting with the environment, both social and otherwise (Campbell, 1990; Cialdini & Trost, 1998). No wonder, then, that even when trust in a consensus appears to be entirely unwarranted from an observer's perspective (such as

when groups of peers express obviously wrong perceptual judgments, as with Asch, 1951), some individuals still conform to it (Wolosin, Sherman, & Cann, 1975). However, conformity is not simply a blind transmission of the norms of a group or prestigious individual to a hapless receiver. Instead, it is a motivated process that at least sometimes involves more careful selection of social information for use in judgment and ongoing interaction.

Social influence researchers have long recognized that conformity to social norms is motivated by individuals' temporary and long-term needs and is regulated by goals (Cialdini & Goldstein, 2004; Cialdini & Trost, 1998; Deutsch & Gerard, 1955). Even young children discriminate between adults as reliable and unreliable as sources of guidance and information (e.g., Einav & Robinson, 2011; Harris & Corriveau, 2011; Koenig, Clément, & Harris, 2004; Koenig & Harris, 2005). They also discriminate between what is relevant and irrelevant when selecting what actions to imitate, which depends on the underlying motivation for imitating (Allen, 2012). Most research studying adults has focused on conformity that is motivated by a need for accurate information about the world or a need for approval by peers. Conformity in the former case requires that the attitudes and actions of peers be accepted as a valid source of information (that is, peers exercise *informational influence*), but this is not so in the latter case—approval only requires compliance to norms (*normative influence*, Deutsch & Gerard, 1955).

While peer approval may act as a superordinate goal regulating conformity in some circumstances, an individual must first value membership in a group for that group to exercise any kind of normative influence over his or her actions (e.g., Johnston & White, 2003; Terry & Hogg, 1996; Terry, Hogg, & White, 1999). Furthermore, even

when the individual values group membership, the integrity of the group itself may be superordinate to compliance with the group's norms in terms of the individual's regulatory priorities (Packer, 2008). The normative conflict model predicts that conformity to and dissent from a group's norms depends critically on the individual's identification with that group and the extent to which the norms of that group conflict with the individual's goals and values (Packer, 2008). Identification is the extent to which an individual values a group into which they self-categorize (Packer, 2008; Tajfel, 1981). Low identifiers, when they conform at all, do so only when conflict is low and something is to be gained by doing so; high conflict will lead the low identifier to dissociate from the group. On the other hand, high identifiers will gladly conform to social norms under low conflict conditions, but they will seek to change norms seen as problematic for the integrity of the group if change seems possible. Thus, concerns over the validity of a social norm can be present and capable of inspiring non-conformity even among those who are normally amicable to the normative influence of their peers. For instance, Packer and Chasteen (Study 1, 2010) had participants indicate several groups with whom they strongly and weakly identified, how often they disagreed with the groups, and whether they disagreed for personal reasons or for reasons pertinent to the good of the groups. Results showed that participants not only disagreed more in groups with which they identify more, but they did so for collective reasons more so than for personal reasons, whereas in groups with which they identified less, they disagreed more for personal reasons. The remaining three studies showed that highly identified individuals will be more willing to dissent from a group norm if they perceive it to be harmful to the group,

but not if they perceive it to be personally harmful. These studies clearly demonstrate that motivational factors underlie the dynamics of conformity (and dissent).

So far I have argued that individuals with a high need for accurate information and individuals with a high need for the approval of their group may still resist conformity if they evaluate the group or its norms as being invalid. However, an as yet unexamined assumption lies within this argument that individuals *do in fact* exercise the kind of scrutiny of norms that would enable them resist conformity. Although the conformity literature has not examined conformity as a function of systematic examination of social norms *per se*, a robust literature examining *persuasion* as a function of systematic examination of persuasive messages does exist (for a review, see Petty, Brinol, & Priester, 2009 and Chaiken & Ledgerwood, 2012). If conformity can be considered at least partially analogous to persuasion (both are certainly within the realm of social influence), then some of the same factors involved in persuasion should be evident in conformity.

An overarching thesis in the persuasion literature is that persuasion results from an interaction between the validity of a persuasive message and the extent to which an individual engages with the message (Petty, Brinol, & Priester, 2009 and Chaiken & Ledgerwood, 2012). People who engage less with a message will tend to be persuaded by heuristics and peripheral cues. On the other hand, people who engage more with a message will be persuaded by arguments that are more central to it. Crucially, the level of engagement with a message depends on the individual's motivation. Thus, a message more pertinent to the interests and goals of the individual will be engaged with more systematically, and if the arguments are perceived as valid, then the message will be more

persuasive. Could it be that conformity follows a similar pattern with respect to group norms?

I propose that in the case of conformity, the "message" being scrutinized for validity is the group itself, especially when the group is being considered as a potential source of information. While people may employ a "consensus is correctness" rule in general, an enhanced need for valid information may increase the standard by which a consensus is viewed as useful. Consistent with the predictions of the elaboration likelihood model (Petty, Brinol, & Priester, 2009), the criteria for conformity to social information may fall along a continuum of increasing levels of scrutiny, where majorities are preferred to minorities when the need for valid social information is relatively low, large majorities are preferred to small majorities when the need is higher, and large majorities with a record of high performance over time are preferred when the need is at its highest. The first two levels are heuristic in nature, where a simple rule is applied, and the rule becomes more stringent as the need for valid information increases. The third is more effortful and requires the individuals to compare their own judgment to that of the group. During instances when individuals are confident in their own judgment, they can use the size of majorities agreeing with their position in order to gauge the validity of the majority. Thus, after several instances encountering consensus information about a group, they should develop sense of the validity of the majority as a source of information. If individuals have a higher need for valid information, and have been tracking the performance of a majority over time, then when they are uncertain about their own judgment, they should be more likely to conform to the majority if they view the majority as a valid source of information.

A pilot study conducted at Lehigh University demonstrated that the more effortful form of scrutiny involving the tracking of group performance over time does indeed occur. In that study, participants performed multiple trials of a mental rotation task (Shepard & Metzler, 1971), and social information was provided in the form of a piechart representing the ostensible percentage of students who thought that the stimuli were the same or different. Participants viewed piecharts from a majority that was either competent or incompetent, which could only be detected by noting the relative sizes of majorities giving correct and incorrect answers trial by trial. In the competent majority condition, large majorities were always correct and small majorities were always incorrect. In the incompetent majority condition, this relationship was flipped—large majorities were always incorrect and small majorities were always correct. The task was simple enough that participants should have been able to compare their own judgment to that of the majority represented by the piecharts when they were confident in their own judgment. Conformity, then, would result when participants were uncertain about the correct answer, but only if the majority was determined to be a valid source of information. Results supported this conjecture; participants conformed more to a competent than incompetent majority. This result differs from previous studies in the persuasion literature that show no effect of majority size (Gardikiotis, Martin, and Hewstone, 2005; Mackie, 1987; Martin, Gardikiotis, and Hewstone, 2002). However, those studies utilized a one-shot paradigm, where participants were not able to track the validity of the majorities over time. Furthermore, participants' level of uncertainty was neither measured nor manipulated in those experiments.

The studies I will describe below were designed to examine motivational factors that influence the degree to which people use majority size as a cue to validity. Although the aforementioned pilot study showed conformity to a competent majority generally, perhaps participants in that study were motivated by a goal to perform well on the task, rather than, for instance, to affiliate with the group represented by the piecharts. The first two studies will manipulate goals and measure performance on a mental rotation task where the competence of the majority is manipulated systematically by correlating majority size with performance in a similar manner as in the pilot study described above. I hypothesized that only when pursuing a performance goal (as opposed to an affiliation or learning goal) will conformity differ between competent and incompetent majority conditions. The third study will manipulate participants' sense of certainty about their own judgment, which is hypothesized to increase the need for valid information from a social majority. I anticipated that a large majority would be more persuasive than a small majority when people were made to feel uncertain and thus more reliant on social information. If successful, these studies would demonstrate that the use of majority size as a cue to validity, whether in a dynamic context or in a one-shot context, requires specific types of motivation (i.e., performance goals, states of uncertainty).

In the pages that follow, I will review some of the literature on conformity to social norms and majorities. I will begin by reviewing some of the early history of conformity research and theory that led ultimately to the Asch (1951) paradigm, which has been a fundamental tool for studying conformity since that time. Next, I will discuss the research examining the effects of group and majority size on conformity behavior, including the results of two pilot studies conducted at Lehigh University. Following that

discussion, I will examine some of the motivational factors that have been explored in the conformity literature, especially as they pertain to the influence of groups both large and small. Lastly, I will describe and discuss the results of three studies I conducted at Lehigh University.

Conformity and the Asch Paradigm

A central assumption of this thesis is that the act of conformity is, generally, reasonable, that individuals use conformity as a tool to navigate both social and non-social environments, and that they conform because it is usually warranted to do so. Asch (1948, 1952) argued that social influence is a productive aspect of human functioning, and that it is so because people can generally rely on each other as an adequate source of information. He argued for what Campbell (1990) called a *moral epistemology*, where individuals have a moral responsibility to their peers to be truthful about their perceptions so that the group can function more competently. Indeed, as Boyd, Richerson, and Henrich (2011) argue, humans exist within a cultural niche, and without the ability to learn from others, humans cannot resolve the many adaptive problems posed by the sometimes rather extreme environments they inhabit. If social influence were functional only in an informational sense, then it should only occur when individuals have reason to doubt that they have all the information, and it should not occur when they do not. However, the results of Asch's own research suggest that this is not always so.

Asch was disappointed to discover that even on straightforward perceptual judgments (matching the lengths of lines) some people will betray their senses and conform to a clearly erroneous group of peers (Asch, 1951). His disappointment, argues Campbell (1990) and Hodges and Geyer (2006), was perhaps shortsighted, as the well-

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being of groups is not only dependent on the accuracy of their judgments, but also the relations between individuals in the group. Groups need accurate information from group members, but they also need compliance to norms in order to function. To paraphrase Campbell (1990), it is true that a groups need to act competently, but they cannot *begin* to act without agreeing on what to do.

Before Asch, research on conformity was primarily situated within the *prestige suggestion* framework, which can be traced back to the work of hypnotists in the late nineteenth century who discovered that even non-hypnotized persons were susceptible to suggestion, and to the writings of sociologist Gabriel Tarde, who claimed that almost all social relations were acts of imitation and that the social person is no different from a hypnotized person (1903). Early theories of social influence attributed conformity to *suggestibility*, a willingness to believe or carry out the statements and commands of others (for a review, see Asch, 1948, 1952). Majorities were thought to possess *prestige*, a quality which afforded its bearer the ability to influence the beliefs, desires, and actions of others (Tarde, 1903). Later behaviorist researchers, such as Thorndike, considered prestige to be a kind of reinforcer, where agreement or disagreement with prestigious others was rewarding or punishing respectively (Thorndike, 1935). Taken together, the phenomenon of prestige suggestion was thought to account for conformity, and it was within that framework that the experimental paradigm examining conformity was developed.

At its most general, the experimental paradigm in conformity research has remained more or less the same since Moore's (1921) study, where participants made a series of linguistic, ethical, and musical judgments repeatedly over the course of several

experimental sessions. The first two sessions acted as control conditions, where changes

in ratings were recorded as a baseline. The next several sessions occurred two months

later. Before the fourth session, the experimenter informed the participants what the

majority opinion had been for the third session. Before the fifth session, the experimenter

told participants of the ostensible opinion of an expert (in each category). Conformity

was indexed as reversals of ratings between critical sessions compared to reversals

between the first two sessions (that is, by chance). Relative to the control sessions,

reversals occurred at a dramatically higher rate during both critical sessions. The general

paradigm utilized by Moore, where participants recorded their judgments, viewed an

ostensible (or real) majority or expert opinion, and then recorded their judgments again,

became fairly standard for researchers investigating prestige suggestion (e.g., Lorge &

Curtiss, 1936; Marple, 1933; Sherif, 1935; Asch, 1940).

Despite the predominance of the prestige suggestion framework, some researchers

began to look to more cognitive explanations. Sherif (1935), for instance, argued that

prestige was not a force acting on the individual from outside, but a kind of cognitive

bias. To illustrate this point, he had a group of participants rank a set of authors by

preference. A month later, they returned to the lab and rated a series of quotations by

preference. Each quotation was accompanied by a name from the first list; however, the

quotations were, in reality, all from authors not on the original list, and the passages were

all of indistinguishable quality. The correlation between the two lists was fairly high

among participants who reported making no special effort to avoid bias in favor of the

author names, but no correlation was obtained for those who *did* report trying to avoid

bias. Sherif concluded that participants' preferences created a bias (an avoidable one) in favor of quotes associated with their favorite authors.

Asch (1940) also took a cognitive approach to conformity, attempting to demonstrate that people use what they know about a judgment stimulus to first make sense of a potentially contradictory majority opinion, and then to reassess the stimulus based on a changed understanding of it. He referred to this process as a *cognitive restructuring* of the stimulus. Asch's participants ranked a set of ten professions, including politics, in order of intelligence, social usefulness, and other qualities. Experimental participants were also presented with an example ranking which ostensibly represented the average ranking for "politician" of 500 fellow students. Both control participants and participants who viewed a peer ranking that was low (10) rated politicians around 9 or 10 on average. However, those who viewed a peer ranking that was high (1) rated politicians around 4 or 5 on average. So far, this experiment conceptually replicates the findings from other studies using the Moore (1921) paradigm. However, following the rankings, participants were asked to write what they were thinking about when they ranked politicians. Among those who viewed high peer rankings, thoughts about politicians like Roosevelt and Lincoln were evoked, along with national politics (then held to higher esteem than it is today). In contrast, among controls and participants who viewed low peer rankings, thoughts about disreputable politicians and shady local politics was most commonly evoked. Apparently, viewing the high rankings resulted in a more elaborate[1] assessment of what it was that constituted the category of "politician". Asch took these results to suggest that social influence is the interactive consequence of individuals' understanding of their social environment and an

understanding that other people constitute a reliable source of information about the world.

Asch's later studies involved objective perceptual judgments (1951, 1952, 1955). He argued that previous research always created ambiguous, subjective situations, and it was this that made social influence possible (Asch, 1940, 1948). He hypothesized that if the judgment stimulus and the situation were perfectly clear to participants, that if the experimental situation involved no ambiguity or elements that could be reinterpreted, social influence would be dramatically reduced if not eliminated. Thus, rather than subjective judgments and opinions, Asch utilized a line matching task, where participants indicated which of three lines on a card matched a single line on another card in length. Furthermore, rather than being told about the judgment of an expert or a majority, single participants performed the experiment with 7 to 9 confederates who declared their answers out loud (participants were led to believe that the confederates were actually fellow participants). On seven out of nine trials, the confederates (who answer before the participant) unanimously give the same wrong answer. Whereas control conditions (confederates not present) showed almost no errors at all, among participants in the experimental condition (confederates present) 30% of all critical trials (confederates unanimously incorrect) had errors. These critical errors were not spread evenly among participants. Around 70% of the errors were made by participants who erred only once or twice, and around 25% of participants never conformed at all, suggesting that most participants did not conform most of the time—however, there were a handful of participants who conformed quite often.

Although Asch interpreted the results of the study as indicative of a general independence from influence, many researchers who followed considered the results to be evidence of the opposite—that conformity is common, if not ubiquitous (for a review, see Friend, Rafferty, & Bramel, 1990). The discrepancy between these different interpretations can best be understood in the context of the research to which Asch was responding as opposed to the research agenda of those who followed. The prestige suggestion studies were quite successful, and showed fairly dramatic evidence of conformity, and the predominant theoretical assumption of the time was that conformity was the norm, that social interaction was simply a matter of imitation and suggestion. Asch's study clearly demonstrated that individuals can and will exercise independence from influence, that social life is not necessarily dominated by conformity (Friend, Rafferty, & Bramel, 1990). However, the startling result of his study, which has been repeated time and again over the decades and across the world (for a review, see Bond & Smith, 1996), cannot be denied. The paradigm has proven to be extremely useful in examining in greater detail the variables involved in increased or decreased conformity, including motivational factors and cues to the validity of groups, such as the size of a group or a consensus.

Motivation to Conform

A variety of motivational circumstances have been shown to increase the need for valid information, and thus the informational influence of a group. When a task is difficult or an individual doubts his or her ability to make sound judgments, informational influence increases (Hochbaum, 1954; Coleman et al., 1958; Crutchfield, 1955). Moscovici and Lage (1978) showed that as the need for accuracy increases, majority

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influence becomes more prominent, whereas minority influence is more useful in developing innovative solutions to problems (also see Nemeth, 1986). Baron, Vandello, and Brunsman (1996) demonstrated that when incentives for accuracy are high, the influence of a majority is low on an easy task relative to a difficult task, on which influence is greater.

Asch's view on conformity is now regarded as overly narrow, as individual and group functionality depend on the satisfaction of more than the unbiased expression of individuals' judgment, but also on the ability for group members to coordinate activity in order to pursue and satisfy group goals (Campbell, 1991). Deutsch and Gerard (1955) argue that more difficult tasks can increase normative influence (in addition to informational influence), as cooperative behavior can be instrumental for accomplishing difficult tasks, requiring group cohesion. They argued further that within a group context, individuals become sensitive to the possibility of sanction by the group, and thus they use conformity as a means to maintain positive relations with peers. Normative influence arises, then, as a consequence of the need for social approval. Cialdini and Trost (1998) framed normative influence similarly as resulting from the goal to build and maintain social relationships. Hatfield, Cacioppo, and Rapson (1993) argue that individuals adopt the postures, vocal expressions, and other characteristics of people they value in order to enhance a connection with them. Arguably, the more similar people are, the more easily they can coordinate action with each other, and by engaging in normative behavior, individuals signal to others in the group that they are willing and able to cooperate efficaciously in the group setting (Hodges & Geyer, 2006; Campbell, 1991). Not only does normative influence serve the needs of individuals within the group context, as well

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as the needs of the group itself, but it also serves the goal of maintaining a positive self-image, as group norms provide the criteria for what it is that constitutes the right kind of behavior (Cialdini & Trost, 1998).

Group Size

Some of the earliest research to examine the effect of group size on conformity was reported by Asch in 1951 and 1955. In one condition, the "group" was just one partner, which resulted in little to no influence at all. Participants were not even disturbed by the disagreement, as they had been with a larger group. With two partners, conformity increased dramatically from 0% to 13%, and with three partners, conformity increased to around 31%. More than three partners made little to no difference. This pattern of influence, where one partner makes little difference, a second and third partner make a much larger difference, and four or more make little more difference than three has been noted throughout the social influence literature, and was modeled by Tanford and Penrod's (1984) social influence model (SIM). The SIM models a range of social influence phenomena including majority and minority influence as well as deviate rejection. Campbell and Fairey (1989) argue that SIM is most appropriate as a model of informational influence. As a source of information, a single partner's judgment may be viewed as idiosyncratic. With two or three people, idiosyncrasy becomes less likely, and the probability of its correctness increases, leading to much stronger informational influence of that group on the individual. The same argument can be made for minority influence, but the minority must also be consistent in their position. Moscovici and Lage (1976) found that a minority of two or more could be influential as long as they remained consistent in their position.

A second pattern of conformity, where the greatest influence is produced by a single partner and each additional partner is increasingly less influential was modeled by Latané's (1981) social impact theory (SIT). Campbell and Fairey (1989) have argued that SIT is best suited as a model of normative influence. Although normative influence is often thought of as resulting from a need for approval (Deutsch & Gerard, 1955) or the goal to build and maintain positive social relations (Cialdini & Trost, 1998), another possible source of normative influence is the need to coordinate social action brought on by ambiguous situations. Even a single interaction partner can induce a need to coordinate action or a need for approval. For instance, Asch (1955) found that a single dissenting confederate reduced conformity dramatically as long as they consistently dissented from the other confederates. He noted that participants were much more at ease with a single dissenter present than when no dissenters were present. Conolley (1964) found that when a judgment stimulus was ambiguous, the presence of only one partner resulted in considerable conformity (reported in Gerard, Wilhelmy, & Conolley, 1968). Arguably, an ambiguous stimulus requires some degree of negotiation between individuals to determine its meaning or purpose. A another example which more directly concerns action is Milgram, Bickman, and Berkowitz (1969), in which confederates stopped and looked up at a window on the sixth floor of a building, recording the number of passers-by who looked up in the same direction. The results showed that a single confederate had the most influence (40%), and that each additional confederate made less difference than the last. Similar patterns have been seen with bystander helping effects, where people are less likely to help someone in need if other people are around (Latané & Darley, 1968), tipping as a function of the number of people at a table (Freeman, Walker,

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Borden, and Latané, 1975), and a variety of other social behaviors (for a review, see Latané, 1981).

Consensus in Large Groups

Much of the research discussed so far was conducted with small groups, and clearly some interesting dynamics occur with very small groups. However, the dynamics involved in larger groups have received less attention. Of particular interest for this discussion are studies examining the relative influence of large and small majorities and minorities, which have been predominantly situated within the persuasion literature, rather than the conformity literature. For instance, Mackie (1987) had American students rate their agreement to the proposition that America should maintain military balance in the Western Hemisphere. After a filler task they listened to arguments for or against the proposition, which were said to be endorsed by an 82% majority and opposed by an 18% minority (or vice versa, depending on condition) of fellow students. After hearing the message, participants rated their agreement once again. Results showed that when participants found themselves in agreement with the majority, they were more persuaded than when they disagreed with a minority. Furthermore, processing of the argument was shown to be more systematic when among those in disagreement with the majority, suggesting that the majority status acted as a cue triggering scrutiny of the argument. Further studies varied the size of the majority (82% vs. 64%). However, no difference between large and small majorities was attained. Similar results were attained by Gardikiotis et al. (2005) and Martin et al. (2002). This result is somewhat surprising given the usual finding that larger groups are more influential than smaller groups; even if each additional group member adds little more influence, the function is nonetheless

increasing (Latané, 1981; Tanford & Penrod, 1984). Generally, researchers have concluded on the basis of these studies that people use majority status as a cue to the validity of social information but are insensitive to the size of the majority—a small consensus is apparently as good as a large one.

However, two pilot studies conducted in the Group Processes Lab suggest that the size of a majority can make a difference. In a pair of pilot studies, participants performed a mental rotation task. Over the course of a series of trials, participants were presented with two objects rotated at different angles, and they had to decide whether they were the same or different, a judgment that was accomplished by mentally rotating the objects to see if they match. Those that do not match are actually mirror images of each other. On each trial, after viewing the mental rotation stimuli, participants were presented with a piechart representing the ostensible percentage of Lehigh students who judged the objects to be the same and the percentage who judged them to be different. After viewing the piecharts, participants indicated with a key press whether the stimuli were the same or different.

Participants were randomly assigned to conditions that varied the amount of time the mental rotation stimuli were presented. In an easy task condition, mental rotation stimuli were presented for 8000ms and in a difficult task condition, mental rotation stimuli were presented for 4000ms. The majority represented by the piecharts was correct half the time and incorrect half the time. Also, on half the trials the piecharts presented a 60% majority and on the other half a 90% majority. Majority correctness and size were randomized between trials as a within-subject variable. Results revealed a three-way interaction between majority size, piechart correctness, and task difficulty. In the easy

task condition, only a main effect of piechart correctness was attained (participant accuracy was greater when the majority in the piecharts were correct than when incorrect). This pattern replicated the typical majority status effect (Gardikiotis et al., 2005; Mackie, 1987; Martin et al., 2002), such that participants tended to conform to the majority but were insensitive to its size. However, in the difficult task condition a two-way interaction between piechart correctness and majority size was evident. Participants in this condition conformed more to large than small majorities (i.e., the difference between correct and incorrect trials was greater for the large than the small majority). These results suggest that when the task gets more difficult, participants prefer to use a large majority over a small majority as a source of assistance in performing the task, as evidenced by the larger discrepancy in participant accuracy between correct and incorrect trials. That is, they may start to use majority size in addition to simple majority status as a cue to the validity of social information. Previous research has shown that conformity in general increases as a function of task difficulty and individuals' sense of uncertainty about their own judgment (e.g., Deutsch & Gerard, 1955; Hochbaum, 1954; Coleman, Blake, & Mouton, 1958; Crutchfield, 1955). However, little research has examined conformity as function of both group size and task difficulty (although see Chipman, 1966; Nordholm, 1975). These pilot data suggest that it is important to look at both factors together because group size may only be useful to individuals with a heightened need for valid information from a social group.

In order to investigate whether individuals can detect differences in the validity of a social majority by correlating majority size and performance over time, a second pilot study systematically varied the correlation of performance and size of a majority in a

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similar paradigm as that implemented in the first pilot study. In a "competent majority" condition, participants viewed piecharts in which the majority was always a large majority when correct and a small majority when incorrect. In an "incompetent majority" condition, participants viewed piecharts where the majority was always small when correct and large when incorrect. The task was not so difficult as to render the participants always unable to make correct judgments; when they *did* make correct judgments, they were always in agreement with a large majority and in disagreement with a small majority in the competent majority condition. However, whenever the participant made a correct judgment in the incompetent majority condition, they were in agreement with a small majority and in disagreement with a large majority. If participants' initial judgments were correct on a majority of trials, then they may have developed a sense of the general competence of the majorities represented by the piecharts. Importantly, in absolute terms the majorities shown in the piecharts were incorrect on half the trials in both conditions, so any differences in conformity between conditions would have resulted from noting the size of majorities making correct judgments over time, rather than the rate at which the majorities provided correct answers. Results showed greater conformity in the competent majority condition than in the incompetent majority condition (indexed as the discrepancy between performance on trials when the piecharts were correct vs. incorrect). Furthermore, a performance trajectory could be examined because this study had a large number of trials (256). Analysis revealed that the overall performance of incompetent majority participants improved over time, but the performance of competent majority participants did not. This result suggests that conformity to the competent majority actually hindered participants' ability to learn the task, as they never established

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independence from the group. This study demonstrated that even without a difference in task difficulty (rotation stimuli were presented for 6s) people can be sensitive to relative validity of social information. Importantly in this case, participants were not simply sensitive to majority size, but rather the correlation between majority size and performance—making inferences about the competency of (value of conforming to) a group based on that assessment.

Some evidence exists in the social influence literature to support the claim individuals do track the quality of social information over time. For instance, Moscovici (1980) argued that disagreement with a dissenting minority provokes a validation process whereby individuals evaluate the minority argument and undergo *conversion* if the argument is sound and the minority is consistent in its position (Moscovici, 1980, 1985; Nemeth, Swedlund, & Kanki, 1974). However, as mentioned earlier, the minority must be consistent over time and must maintain a more extreme position in order to be influential, suggesting something similar to the tracking of validity I am proposing here (Moscovici & Lage, 1976; Paicheler, 1976, 1977). Further, the minority influence literature generally suggests that majority arguments/positions do not receive such scrutiny. Research from the developmental literature suggests that children track the reliability of adults and show preferential trust in novel information produced by those who were previously more reliable (e.g., Einav & Robinson, 2011; Harris & Corriveau, 2011; Koenig, Clément, & Harris, 2004; Koenig & Harris, 2005).

Current Studies

I have outlined literature suggesting that different patterns of conformity should emerge as a function of the ongoing goals and needs of individuals. I have also argued

that when the motivation exists to do so, individuals will scrutinize the group itself for validity as a source of information. The studies I describe below were designed to examine some of the motivational factors that would lead to the kind of scrutiny evident in the second pilot study. I propose that the primary driver of such scrutiny is an enhanced need for valid information. If an individual's goal is to perform well on a task, then they will have an increased need for valid information during performance—the higher the perceived quality of information they have access to, the better they can expect to perform on the task. Furthermore, I propose that when an individual is uncertain about their own judgment, they have a special incentive to find quality information when making decisions and thus should find a large majority more compelling than a small majority.

In the first two studies, I implemented goal manipulations along with a similar paradigm as that implemented in the second pilot study. In the first study I used a payment scheme to alter the goal, performance or learning, with which participants performed the mental rotation task. I reasoned that if participants have social information available while performing a task for which they are being paid, they would be selective about whether they would use that information. On the other hand, if they were being paid on a subsequent block of trials during which no social information would be available, participants might have an incentive to avoid conformity altogether in order to develop an independent mastery of the task. Both types of goals are considered achievement goals, but the former is more outwardly oriented, and achievement serves the purpose of attaining external rewards, and the latter are more internally oriented (Elliott & Dweck, 1988). Although both types of goal should increase a need for valid

social information, performance goals require continuous success to be satisfied, especially when the size of reward depends on the number of correct trials, whereas failure on any given trial carries no immediate penalty with a learning goal. The second study implemented a goal priming procedure with both learning and performance goals in addition to a third type of goal, affiliation. I predicted that pursuing a learning or an affiliation goal should not motivate effortful tracking of majority competence, and thus should not result in differentiated conformity to competent and incompetent majorities. Learning, I reasoned, should be mostly self-motivated and fairly independent of social influence, and affiliation is satisfied simply by complying with group norms, regardless of that group's validity as a source of information. Thus, only when participants pursue a performance goal should they be motivated to track the correlation of majority size and performance over time and conform more to a competent than incompetent majority.

The third study is a direct follow-up to the studies from the persuasion literature showing that majority size is not used as a cue to validity (Gardikiotis et al., 2005; Mackie, 1987; Martin et al., 2002). As I argued earlier, the more uncertain participants are about their own judgment, the more likely they should be to seek and comply with a valid source of information, and thus should be more persuaded by a large than small majority.

Study 1

Participants in this study performed a mental rotation task similar to that employed in the pilot studies over the course of two blocks. During Block 1, after viewing the rotation stimuli on each trial, participants viewed a piechart indicating the ostensible percentage of fellow students who thought that the stimuli were the same or

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different. All participants were informed before Block 1 that it was only on that block that they would see the social consensus information. Piecharts showed either a large or small majority, and the majority was either correct or incorrect. Participants in a (between-subjects) "competent majority" condition viewed piecharts with a majority that was consistently large when correct and small when incorrect. Participants in an "incompetent majority" condition viewed piecharts with a majority that was consistently small when correct and large when incorrect. Because the charts were wrong half the time in both conditions, majority status alone failed to provide any useful information about the reliability of the consensus information, and only the size of the majority in combination with its correctness could be used to make inferences about the quality of the social consensus information. But this property of the information would primarily be accessible to those participants sufficiently motivated to scrutinize it (e.g. by tracking the apparent competence of the group across trials).

In an attempt to manipulate the motivation to scrutinize, I utilized a payment regime intended to manipulate participants' goals to be accurate in judgment during Block 1. Participants in a (between-subjects) "performance goal" condition were told at the beginning of the study that they would be paid for performance during Block 1, whereas participants in a "learning goal" condition were told that they would be paid during Block 2. Presumably, participants in the performance goal condition would be more motivated to be accurate in their judgments during Block 1, and thus more likely to scrutinize the social information for its validity and conform more often to a competent than to an incompetent majority. I anticipated that no such difference would be evident among those in the learning goal condition, as they would be motivated to learn how to

perform the task independently of the consensus information since they knew this information would not be present during Block 2.

I also predicted that *if* participants in the competent majority/performance goal condition relied more on the social information than participants in the other condition, they would also fail to learn the task as well as those in the other condition, and thus their performance on Block 2 would be worse relative to other participants'. In order to equate motivation in the goal conditions, just before Block 2 participants in the performance goal condition were informed that they would also be paid for performance on Block 2.

Finally, at the end of the study participants were offered an opportunity to earn more money. The computer program presented one last rotation stimulus, and asked participants if they would like to invest some percentage of what they had already earned in a double-or-nothing bet that the majority was correct in its judgment. This measure was designed to allow an inference about whether or not participants in the learning goal condition also tracked the validity of the social information over time. If participants in the performance goal condition invested more in a competent than incompetent majority, but those in the learning goal condition did not, it would suggest that participants in the learning goal condition were not tracking the validity of the social information in Block 1. In contrast, if participants in both goal conditions invested more in a competent than incompetent majority, it would indicate that participants in the learning goal condition *were* tracking the social information, even if they did not utilize it while performing the task.

Method

Participants

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Participants were 93 Lehigh undergraduates drawn from the Lehigh Psychology Department Participant Pool. Four participants were removed from the analysis, leaving 89 participants. Two of these participants expressed awareness of critical manipulations[2], and the other two were obviously distracted[3].

Procedure and Materials

Participants arrived in groups of 1 to 4. An experimenter greeted the participants, sat them at individual computer stations, and provided basic information about the lab and study. This included information that they would be paid for performance during part of the study, but they would not be paid until the study had been completed. Participants then read consent information on the computer monitor and clicked "y" if they agreed to participate. Next, participants read instructions for the mental rotation task and performed 20 practice trials. The mental ration stimuli were similar to those utilized by Shepard and Metzler (1971) and consisted of pairs of three-dimensional objects rotated at 80, 100, 120, 140, 160, or 180 degree angles. Half of the rotation stimuli were mirror images, and thus could not be rotated to match. The objective for the participant was to determine whether or not the stimuli could be matched, indicating that the stimuli were the "same" if they could or "different" if they could not. Immediately before the practice trials, participants reviewed an outline of the study (practice trials – first block – second block) which also explained that they would be paid for 5 cents for every correct answer during either Block 1 (performance goal condition) or Block 2 (learning goal condition).

After the practice trials, instructions informed participants that 1000 Lehigh students had previously been tested on the mental rotation task, and that for each trial

during Block 1 they would view a piechart representing the percentage of students who thought that the stimuli were same and the percentage who thought that they were different. Participants were also reminded that they would be paid either on Block 1 or on Block 2 depending on goal condition (performance or learning, respectively). Each of the 50 trials of Block 1 began with a 500ms presentation of a fixation cross followed by a 6000ms presentation of the rotation stimuli followed by a 6000ms presentation of a piechart and finally a cue requesting response (press "1" if same or "2" if different). Piecharts varied systematically between competence conditions. Participants in the "competent majority" conditions viewed piecharts representing either a large correct majority or a small incorrect majority, and participants in the "incompetent majority" condition viewed piecharts representing either a small correct majority or a large incorrect majority. In both conditions, the majority (regardless of its size) was correct on 50% of trials. Small majorities ranged from 55% to 65%, and large majorities ranged from 75% to 85%.

Presentation time for the rotation stimuli (6000ms) was selected based on the results from the first pilot study. In that study, 4000ms and 8000ms presentation times were employed, and the former proved to be more challenging than the latter. Presumably, when the presentation time was short, participants were less likely to get a sense of the correct answer, and so they relied on the piecharts more, especially when they represented large majorities (affording more confidence in their validity). In this study, I wanted for participants to be confident most of the time in their own judgment, but leave room for doubt on at least some of the trials by employing a short but not too short presentation time. Thus, on trials when participants did not come to a conclusion

about the correct answer, they would be more likely to rely on the piecharts as long as they viewed them as a valid source of information. The particular pattern of conformity on such trials, then, would depend on the motivation of the participant. When being paid (performance goal condition), participants require accuracy on every trial, and thus, they should be especially motivated to scrutinize the social information. As demonstrated by the second pilot study, one way they are likely to do this is by tracking performance on trials for which they are confident in their own judgment (assuming they have come to the correct conclusion) as it correlates to the size of majorities represented by the piecharts. On the other hand, those who are not being paid (learning goal condition), but instead preparing for the second block (on which they will be paid), participants should have an incentive to learn the task independently and little incentive to track the performance of the piecharts over time.

Following Block 1, participants in the learning goal condition were reminded that they would be paid 5 cents for each correct answer during Block 2. Participants in the performance goal condition were informed that "the computer has now decided that you will also be paid for correct responses on this block of trials." I implemented this payment regime in order to ensure that both groups of participants were motivated to perform accurately on the second block. Block 2 proceeded identically to the practice trials, except participants performed on 50 trials.

Once Block 2 had been completed, participants were presented with the following message: "We are offering the opportunity to 'invest' some of the money that you have earned in the experiment thus far. Whatever percentage you decide to invest will be doubled if a majority of other Lehigh students who previously completed this trial

answered it correctly. However, you will lose your investment if a majority answered it incorrectly." After reading this message, participants viewed a pair of rotation stimuli and indicated what percentage of their earnings they would be willing to invest.

Before viewing the result of their investment, participants completed the collective identity scale (Packer, 2008). This scale was employed in order to determine whether any effects were due to changes in identification with the Lehigh student body. That is, it is possible that participants would have felt less identified with their fellow students when viewing consensus information from an apparently incompetent majority, and thus would have conformed less to distance themselves from their group. Items on the collective identity scale asked participants to rate their agreement with statements such as "Being a Lehigh student gives me a good feeling" and "I am not glad to be a Lehigh student" on a scale of 1 (strongly disagree) to 6 (strongly agree). Negative items (7 in all) were reverse coded before analysis. All 15 items ($\alpha = .87$) can be found in Appendix A.

In addition to the collective identity scale, participants answered the question "How accurate do you think your own responses have been in the mental rotation task so far?" on a scale of 1 (very inaccurate) to 6 (very accurate). This question was included in order to determine whether participants' subjective sense of their own competence on the task influenced decisions to conform or not. Those indicating that they were not very accurate may have done so because they were not very good at performing the task, and thus would value the utility of the social information more than someone who is better at the task and rated their performance as highly accurate (e.g., Chipman, 1966; Coleman, Blake, & Mouton, 1958; Crutchfield, 1955; Hochbaum, 1954; Nordholm, 1975). The

possibility exists that the effects of validity on conformity are stronger among those rating their performance as low. Participants answered a number of other questions, but the results of those analyses will not be reported or discussed (see Appendix A for questions).

Results

Conformity – Block 1

Conformity on the mental rotation task can be indexed in terms of the difference in accuracy participants display when the social information they receive is correct vs. incorrect – the greater the difference, the more their responses are swayed by the group's. The primary prediction for the first analysis (conformity during Block 1) was a three way interaction between goal, majority competence, and piechart correctness, such that participants in the performance goal condition would show a greater difference in accuracy between correct and incorrect piechart trials (i.e., greater conformity) in the competent majority condition than in the incompetent majority condition. In contrast, I hypothesized that there would be no such difference between the majority competence conditions among participants in the learning goal condition.

Analysis of performance on Block 1 focused on the accuracy of response to the mental rotation stimuli. For each trial, the participant's response is either correct or incorrect, resulting in a binary dependent variable. Given that a binary dependent variable is unlikely to yield normally distributed residuals, a general linear model (GLM) analysis is inappropriate for this analysis. Thus, I employed a generalized linear mixed model (GLMM) analysis, a generalization of the GLM that includes a *link function* (in this case, the LOGIT function), which maps binary data to an unbounded space that is more likely

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to yield normally distributed residuals. This model also contains a *mixed* component, which allows for the modeling of random and within-subject variables. For the sake of simplicity, I limited random effects to between-subject differences in overall performance (that is, the analysis models the intercept as a random effect). However, inclusion of variables such as angle and trial as random effects could have increased power to detect significant effects, as doing so would potentially make it possible to account for more variance.

For each trial, participants' responses were coded as either 0 (incorrect) or 1 (incorrect). Because the generalized linear model assumes normally distributed residuals, and it is highly unlikely that a normally distributed error term would predict a doubly bounded probability space, the GLIMMIX procedure utilizes a link function which transforms the accuracy data utilizing the logit function, which creates an unbounded probability space with a more normal distribution. In the interest of clarity, means and figures will be presented as percentages, transformed by the inverse logit function.

All data were submitted to a 2 (goal: performance vs. learning) x 2 (majority competence: competent vs. incompetent) x 2 (piechart correctness: correct vs. incorrect) GLMM analysis. The three independent variables were effects-coded (goal: -1 = mastery, 1 = performance; majority competence: -1 = incompetent, 1 = competent; piechart correctness: -1 = incorrect, 1 = correct). Analysis revealed a main effect of majority competence ($F(1,4357) = 5.00$, $p = .03$) such that participants in the competent majority condition ($M = 85.09$) were more accurate than those in the incompetent majority condition ($M = 79.21$), and a main effect of piechart correctness ($F(1,4357) = 107.52$, $p < .01$) such that participants were more accurate when the piecharts were correct ($M =$

87.67) than when incorrect ($M = 75.36$). Further, there was an interaction between majority competence and piechart correctness ($F(1,4357) = 4.26$, $p = .03$) such that the difference in accuracy when piecharts were correct vs. incorrect was greater in the competent majority than incompetent majority condition (see Figure 3). However, the predicted three-way interaction was not attained ($F(1,4357) = 1.51$, $p = .22$).

Although this analysis failed to attain the predicted three-way analysis, some insight may be gained by examining the pattern of means (see Figure 4). Visual inspection of the means suggests greater conformity by learning goal participants to the competent majority than to the incompetent majority, but equal conformity by performance goal participants to both majorities. To more formally test this, I performed separate analyses within each goal condition with majority competence and pie chart correctness predicting accuracy. The results of this analysis support my assessment, with both a main effect of piechart correctness ($F(1,2350) = 76.3$, $p < .01$) and an interaction between piechart correctness and majority competence ($F(1,2350) = 5.75$, $p = .02$) in the learning goal condition, but only a main effect of piechart correctness ($F(1,2007) = 36.17$, $p < .01$) in the performance goal condition. Although the non-significant nature of the three-way interaction renders this analysis inconclusive, the pattern of means suggests that participants in the learning goal condition treated Block 1 in a similar manner as participants in the second pilot study, but participants in the performance goal condition treated both majorities equally. This result suggests that heightened scrutiny did not occur, contrary and in some ways opposite to what I had predicted. Thus, it would appear that performance goal participants evidenced only a majority effect, as seen in previous studies (e.g., Gardikiotis et al., 2005; Mackie, 1987; Martin et al., 2002).

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Follow-up analysis. Prior research has demonstrated that conformity increases when tasks are more difficult and when individuals lack confidence in their own judgment (e.g., Chipman, 1966; Coleman, Blake, & Mouton, 1958; Crutchfield, 1955; Deutsch & Gerard, 1955; Hochbaum, 1954; Nordholm, 1975). I have argued that heightened scrutiny of social information should be most apparent when individuals have a high need for accuracy. Presumably, this need would result from a performance goal, but perhaps people with high confidence in their own performance would derive little utility from conforming to piecharts that contradict their judgment half the time. However, people with less confidence in their own performance might be more likely to see the majority as a useful source of information. As I have argued, however, the greater the need for accuracy, the more likely even uncertain participants should scrutinize the social information for validity. In this study, participants were asked to answer the question "How accurate do you think your own responses have been in the mental rotation task so far?" I conducted an analysis with this variable (perceived own accuracy) as a predictor of conformity along with goal, majority competence, and piechart correctness in order to determine if the predicted pattern of conformity from the main analysis would be evident among participants with low perceived own accuracy but not among those with high perceived own accuracy. That is, among participants with low perceived own accuracy, greater conformity should be evident in the competent than incompetent majority condition for performance goal participants, but equal for learning goal participants.

To examine this hypothesis, I performed a GLMM analysis with goal, majority competence, piechart correctness, and participants' perceptions of their own accuracy

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predicting accuracy. Perceived own accuracy was centered about its mean ($M = 3.92$, SD = 1.04). Results from this analysis reveal a main effect of perceived own accuracy ($F(1,4353) = 31.98$, $p < .001$) such that higher perceived own accuracy scores predicted higher accuracy, which suggests that participants generally had a fairly veridical perception of their own performance. In addition, there as a three-way interaction between perceived own accuracy, goal, and piechart correctness ($F(1,4353) = 8.31$, $p =$ .004, see Figure 5). Among those scoring low (one standard deviation below the mean) on perceived own accuracy, the discrepancy between correct and incorrect trials was greater for learning goal participants than for performance goal participants ($t(4355) =$ 3.12, $p = .002$). In contrast, among those scoring high on perceived own accuracy (one standard deviation above the mean), the discrepancy between correct and incorrect trials was not significantly different between goal conditions ($t(4355) = -1.45$, $p = .148$). There was also a three-way interaction between perceived own accuracy, goal and majority competence ($F(1,4353) = 4.20$, $p = .04$, see Figure 6). Among those scoring low (one standard deviation below the mean) on perceived own accuracy, the discrepancy between performance between the competence conditions was significant only among learning goal participants ($t(4359) = 7.28$, $p = .007$). In contrast, among those scoring high on the perceived own accuracy (one standard deviation above the mean), there was no significant discrepancy between competence conditions for either goal condition.

The results of this analysis suggest that among participants with high perceived own accuracy, conformity was minimal and did not vary by goal condition, as predicted. However, the predictions for low perceived own accuracy were not supported by these analyses. Conformity, as indexed by the correct-incorrect trial discrepancy, was higher

among learning goal participants than performance goal participants, the opposite of what had been predicted. Further, performance was worse with an incompetent majority than with a competent majority among learning goal participants but not among performance goal participants, who did not vary between competence conditions. This result may suggest that learning goal participants conformed mostly to large majorities rather than small majorities, since large majorities were always correct in the competent majority condition and incorrect in the incompetent majority condition. That is, if participants heuristically conformed only to large majorities but did not assess the performance of the majorities over time, then performance would be much lower in the incompetent majority condition, which is exactly what happened. This result could suggest that learning goal participants conformed more to the social information, but did not engage in effortful analysis of its validity. Rather, conformity was driven by a strictly heuristic preference for large majorities. Perhaps the learning goal increased the need for accuracy, resulting in a stricter criterion for conformity (endorsement by a large majority), but not enough to result in the more effortful tracking of competence over time. As for performance goal participants, without an interaction between majority competence and piechart correctness, nothing can be said about heightened scrutiny.

Learning – Block 2

The primary prediction of this analysis was that participants who conformed more often during Block 1 would perform worse during Block 2. Had performance on Block 1 been affected by goals, majority competence, and piechart correctness as hypothesized, the predictions for this analysis would have mirrored those of Block 1—that is, performance goal participants with an incompetent majority would not perform as well as

those with an incompetent majority and learning goal participants would not differ by

competence condition. However, in light of the failure to attain the predicted three-way

interaction in Block 1, those hypotheses no longer make sense. Thus, I employed an

analysis to determine, overall, whether greater conformity on Block 1 led to poorer

performance on Block 2.

The analysis utilized the discrepancy in performance between correct and

incorrect trials on Block 1 to predict performance on Block 2. I created a new variable

(*conformity*) with the percent difference in accuracy between correct and incorrect trials

(piechart correct – piechart incorrect) averaged across Block 1. Using this variable, I

performed a GLMM analysis with goal, majority competence, and conformity predicting

Block 2 accuracy. Analysis revealed a main effect of conformity on Block 2 accuracy

($F(1,4361) = 13.47$, $p < .001$) such that higher conformity scores predict lower accuracy

($\beta = -1.78$), which clearly suggests that higher conformity during Block 1 led to poorer

performance during Block 2. This result supports the hypothesis that greater conformity

(indexed as a discrepancy between correct and incorrect Block 1 trials) leads to

diminished learning of the task. Furthermore, there was a main effect of goal ($F(1,4361)$

$= 4.32$, $p = .038$) such that, on average, learning goal participants ($M = 87.72$) performed

better than performance goal participants ($M = 82.56$). This result, combined with the

perceived own accuracy result, provides evidence that the goal manipulation was

effective, as it seems that learning goal participants learned the task better than

performance goal participants.

Investment

For the third analysis (investment), I anticipated either a main effect of majority competence, such that participants would invest more in the competent majority, or a two way interaction between goal and majority competence such that only participants with a performance goal would invest more in a competent majority than in an incompetent majority.

Two participants did not answer the investment question, leaving the analysis with 87 participants. Analysis focused on the percentage of earned money participants were willing to invest. Data were submitted to a 2 (goal: performance vs. learning) x 2 (majority competence: competent vs. incompetent) general linear model analysis. Results reveal a main effect of majority competence ($F(1,83) = 5.70$, $p = .02$) such that investment percentage was higher in a competent ($M = 53\%$) than incompetent ($M = 38\%$) majority, but no interaction was attained ($F(1,83) = 0.47$, $p = .49$). This analysis suggests that participants were sensitive to the competence of the majority, regardless of goal condition.

Collective Identity

Collective identity scores were submitted to a GLM analysis with goal and majority competence predicting collective identity. No significant main effects or interactions of the two predictor variables were obtained (goal: $F(1,85) = 0.03$, $p = .87$; majority competence: $F(1,85) = 0.18$, $p = .68$; interaction: $F(1,85) = 0.01$, $p = .94$). This indicates that effects in the previous analyses were not the consequence of conditions affecting identification with Lehigh students (which might have resulted in participants' distancing themselves from the majority).

Discussion

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The purpose of this study was to examine the effects of performance and learning goals on the scrutiny of social information. I hypothesized that participants with a performance goal would be motivated more than participants with a learning goal to track the performance of a social majority over time, using the size of majorities agreeing trial-by-trial with their own judgment as a cue to validity. Greater conformity to the "competent majority" than to the "incompetent" majority (indexed as the difference in performance between correct and incorrect piechart trials) would have provided evidence of this process. In the learning goal condition, I predicted that participants would conform less and show little difference between majority competence conditions. The primary analyses did not support my hypotheses, as the predicted three-way interaction was not significant. The pattern of means in the interaction was not suggestive of support for the hypothesis either.

I also conducted follow-up analyses using perceived own accuracy as a predictor variable, hypothesizing that the predictions of the main analysis would be evident among participants with low perceived own accuracy but not among those with high perceived own accuracy. Only the predictions for high perceived own accuracy were supported (that is, that no interactions would be attained). In some ways, the opposite of what had been predicted was evident among participants with low perceived own accuracy. Conformity was more evident in the learning goal condition than in the performance goal condition. However, the interaction between goal and majority competence might suggest that conformity was primarily to large majorities. Without baseline trials (indicating baseline performance, with no influence), and an interaction between both majority competence and piechart correctness, it is impossible to be certain whether this is correct.

If it is, it may suggest that the learning goal induced a higher standard than just majority status for selection of social information for conformity, but the motivation was not strong enough to more rigorously assess the quality of the information by tracking its performance over time. None of the predicted interactions occurred among performance goal participants, who showed evidence of some conformity, but no interactive effects. Perhaps the payment scheme raised the stakes too high for performance goal participants, and having noticed that the piecharts were frequently wrong, they preferred not to risk their payoff by conforming.

I also examined whether increased conformity would result in decreased learning of the task. Analyses suggest that indeed this is the case. Participants who conformed more during Block 1 had poorer performance on Block 2 than those who conformed less during Block 1. The current finding suggests that this type of measure could be usefully implemented in future studies.

Study 2

One purpose for this study was to examine the influence of a third type of goal: affiliation. In Study 1, I argued that people who are motivated to *learn* how to perform a task should be less likely to conform to social consensus information, as prolonged conformity would not be useful in learning how to do something oneself. In contrast, if people are motivated to affiliate with a group, then they should be more likely to conform to that group's social consensus information, irrespective of its apparent validity. Arguably, conforming to a group's norms and demonstrating similarity to its members is instrumental to affiliating with that group (for a review, see Cialdini & Trost, 1998; Levine, 1989).

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A second purpose for this study was to conceptually replicate the first study using a different type of goal manipulation: priming. Goal priming involves exposing participants to words and objects associated with particular goals of interest, which often results in behavior consistent with the active pursuit of the target goal. For instance, Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel (2001) embedded either achievement-oriented or neutral words in a word search task. As the authors predicted, participants with the achievement oriented word search task found more words than those with the neutral word search task. Numerous studies since the Bargh et al. (2001) paper have had similar results for a variety of goals using a multitude of priming manipulations (see Bargh, 2006, for a review). Priming manipulations can be performed independently from the target task on which participants' behavior is measured. For instance, studies using the "unrelated studies" paradigm, where the priming task and the target task are treated as different studies in different labs, demonstrate that performance on a target task is consistent with pursuit of the goal from the priming task (Hassin, Bargh, & Zimerman, 2009). This study will use a similar goal priming manipulation, where participants first perform a word search task and then a mental rotation task. Following a long block of trials with pie charts to assess conformity, as in Study 1, participants will perform a short block of trials without the pie charts in order to assess learning. Predictions are similar to those in Study 1 for the performance and learning goal conditions and as outlined above for the affiliation condition.

Method

Participants

Participants were 172 Lehigh undergraduates drawn from the Lehigh Psychology Department Participant Pool. Eight participants' data were excluded because they did not complete the study, did not follow instructions, or experienced a malfunction in the experimental software, leaving 164 participants.

Procedure and Materials

Participants arrived in groups of 1 to 4. An experimenter greeted the participants, sat them at individual computer stations, and provided basic information about the lab and study. Participants then read consent information on the computer monitor and clicked "y" if they agreed to participate.

After completing the consent process, participants read instructions for the word search puzzle, which consisted of a 13 x 13 matrix of letters and a list of words to be found. Each puzzle had four neutral words (lamp, plant, carpet, turtle) and eight goal relevant words (*affiliation*: together, affiliate, friend, partner, ally, team, bond, comradery; *learning*: learn, advance, refine, improve, develop, study, progress, train; *performance*: beat, prize, overcome, prevail, succeed, triumph, trophy, victory). Participants were instructed to find as many words as they could, that words would be presented forward, up, down, or diagonal, and that they could take as long as necessary.

The priming manipulation employed in this study is similar to that used by Bargh et al. (2001), Engeser (2009), and Hassin et al. (2009). Those researchers examined the priming of more general achievement goals, and so words used in their prime were relevant both to performance and learning. In order to find a set of words to use for each of the three goals, I conducted a pilot test where I presented 45 participants, recruited from Amazon's Mechanical Turk service, with a list of 43 words that a priori seemed to

be associated with each of the three goals (see Table 1 for the full list) in random order and asked them to group the words together into as many categories as they thought appropriate (up to a maximum of six). Participants' category decisions were submitted to a multidimensional scaling analysis in PASW. The procedure created distances from the data and modeled it with two dimensions ($R^2 = .77$; see Figure 7). Visual examination suggested that, indeed, the words clumped into three categories corresponding to performance, learning and affiliation. I selected eight words for each goal that appeared to be central to the category.

Following the priming task, participants read instructions for the mental rotation task and performed 6 practice trials. Trial-by-trial, the mental rotation task was identical to that used in Study 1. The two exceptions were that only 100, 120, 140, 160, and 180 degree angles were employed and decreased amount of time the piecharts were presented to 2000ms. I excluded the 80 degree angles in order to make the task a bit more difficult, contributing to participants' uncertainty regarding their own judgment and thereby increasing the likelihood of conformity. Following the practice trials, participants performed 70 trials of the mental rotation task with pie charts (Block 1). However, twenty out of the 70 were baseline trials and did not present social information, but instead a message indicating that no information was available. Next, participants performed 20 more trials of the mental rotation task without pie charts (Block 2) to assess whether learning was affected by conformity during Block 1. Finally, after completing Block 2, participants answered the same questions as in Study 1 about their impressions of their own and the group's performance, as well as the collective identity scale (Packer, 2008).

Results

Conformity

  As in Study 1, conformity was indexed as the difference between correct and incorrect piechart trials during Block 1. I predicted a three way interaction between goal, majority competence, and piechart correctness such that conformity would not differ between competent and incompetent majority conditions in both the affiliation and learning goal conditions, but would be greater with the competent than incompetent majority in the performance goal condition. As argued earlier, a performance goal should increase an individual's need for accurate social information, since the objective is to produce correct trial-by-trial results. Hence, they should be motivated to evaluate the social information in an effortful manner, using majority size and their own judgment to track performance of the majority over time. I also hypothesized that conformity would be greater on average among affiliation than learning goal participants, since conformity is a means by which to satisfy an affiliation goal, but not a learning goal, which would be better satisfied by independent performance of the task.

  The inclusion of baseline trials (those with no piechart) also affords an additional and perhaps more precise measure of conformity. In a given competence condition, if baseline accuracy falls somewhere between correct and incorrect trials, then conformity can be thought of as equal on each of those two types of trials, suggesting a general conformity to the piecharts. However, if baseline accuracy is closer to one type of trial but more discrepant from the other type, then conformity can be said to have occurred only with a large or small majority within that competence condition. For instance, suppose baseline accuracy in the competent majority condition is the same between the

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baseline and incorrect piechart trials but accuracy is much higher during correct piechart

trials, then it can be inferred that participants conformed mostly to piecharts with a large

consensus, as with the first pilot study. Analysis involving baseline trials were

exploratory in nature, so I made no a priori predictions. However, if a similar result to

Study 1 is evident, then the baseline trials may be useful in clarifying the nature of that

effect.

Analysis of performance on Block 1 focused on the accuracy of responses to the

mental rotation stimuli. All data were submitted to a 3 (goal: performance vs. learning vs.

affiliation) x 2 (majority competence: competent vs. incompetent) x 2 (piechart

correctness: correct vs. incorrect) GLMM analysis. The independent variables were

treated as categorical variables for this analysis. The analysis revealed a main effect of

piechart correctness ($F(2,11564) = 62.3$, $p < .001$) such that baseline trials ($M = 78.81$)

were less than correct piechart trials ($M = 83.41$) and greater than incorrect piechart trials

($M = 72.74$). Furthermore, there was a two-way interaction between majority competence

and piechart correctness ($F(2,11564) = 7.07$, $p = < .001$). Visual inspection suggests that

the discrepancy accuracy between trials when the group was correct versus incorrect was

greater in the competent than incompetent majority condition, a result which replicates

the second pilot study. However, as in Study 1, the predicted three-way interaction

between goal, majority competence, and piechart correctness was not significant

($F(4,11564) = 1.33$, $p = .255$).

Baseline trials. Examination of baseline trials in the majority competence by

piechart correctness interaction may provide insight into the nature of the conformity

evidenced by that interaction. Baseline trials did not differ from correct piechart trials in

the incompetent majority condition ($t(11564) = -1.06$, $p = .896$), but did differ from incorrect piechart trials ($t(11564) = -5.08$, $p < .001$); that is, incorrect responses from the incompetent majority worsened participants' performance, but correct responses did not improve it. On the other hand, both incorrect piechart trials ($t(11564) = -3.55$, $p = .005$) and correct piechart trials ($t(11564) = -6.05$, $p < .001$) differ from baseline in the competent majority condition (see Figure 8). This result suggests that participants conformed to the piecharts generally, but those in the incompetent majority condition did not. Instead, it seems that they only conformed to large majorities (heuristically) if they conformed at all.

Follow-up analyses. As in Study 1, I utilized participants' perceived own accuracy as a means to examine whether the predicted effects would be evident among participants who were low in perceived own accuracy but not among those who were high in perceived own accuracy. To reiterate the hypotheses, among participants with low perceived own accuracy, I anticipated a three-way interaction between goal, majority competence, and piechart correctness such that conformity does not differ between competence conditions in the affiliation and learning goal conditions, but in the performance goal condition, conformity is greater in the competent than incompetent majority condition. I did not expect to see this pattern among participants high in perceived own accuracy.

I conducted a GLMM analysis with goal, majority competence, piechart correctness, and perceived own accuracy predicting trial-by-trial accuracy during Block 1. Because goal and piechart correctness had three levels, I split each of those variables into two effect coded variables (goal 1: affiliation = 1, learning = 0, performance = -1;

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goal 2: affiliation = 0, learning = 1, performance = -1; piechart 1: incorrect = 1, baseline = 0, correct = -1; piechart 2: incorrect = 0, baseline = 1, correct = -1). I also effect coded majority competence (incompetent = -1, competent = 1), and centered perceived own accuracy about its mean ($M = 3.96$, $SD = 1.01$).

Analysis revealed a main effect of perceived own accuracy ($F(1,11622) = 62.85$, $p < .001$) such that higher scores predicted higher accuracy ($\beta = .40$, $t(11551) = 2.18$, $p = .029$). Furthermore, there was two-way interaction between perceived own accuracy and piechart correctness ($F(2,11622) = 5.39$, $p = .005$), with a greater discrepancy between correct and incorrect piechart trials among those scoring low than those scoring high on perceived own accuracy ($t(11549) = 2.48$, $p < .013$; see Figure 9). These results suggest that, in general, participants with perceived own accuracy conformed more than those with high perceived own accuracy.

A marginally significant four-way interaction between perceived own accuracy, goal, majority competence, and piechart correctness ($F(4,11622) = 2.13$, $p = .074$) may qualify the effects reported above. Figure 10 provides means for the two-way interactions between majority competence and piechart correctness for each of the three goals and for low and high perceived own accuracy. As can be seen in Figure 10, the predictions for low perceived own accuracy were nearly attained in the affiliation and performance goal conditions.

In the affiliation goal condition, conformity should not differ between majority competence conditions. This hypothesis was confirmed, as evidenced by a non-significant two-way interaction between majority competence and the correct-incorrect piechart contrast ($t(11549) = -0.37$, $p = .714$). Conformity was evidenced by a significant

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difference between accuracy on correct and incorrect piechart trials in both competence conditions (incompetent: $t(11550) = 21.44$, $p < .001$; competent: $t(11550) = 24.54$, $p < .001$). Furthermore, in the competent majority condition, baseline trials differed significantly from both correct ($t(11549) = -2.93$, $p = .003$) and incorrect trials ($t(11549) = 2.09$, $p = .037$), suggesting overall conformity to the consensus in that condition. The incompetent majority condition was a little different—only correct piechart trials differed significantly from baseline trials (correct vs. baseline: $t(11550) = 9.78$, $p = .002$; incorrect vs. baseline: $t(11550) = 2.45$, $p = .118$), which might suggest somewhat different conformity dynamics between majority competence conditions. However, note that baseline performance appears worse in the incompetent majority condition than in the competent majority condition (although the difference is not significant, $t(11549) = 1.92$, $p = .166$). It is possible that a floor effect prevented the observation of a significant difference in that case. In general, the pattern of results support the original hypothesis, albeit imperfectly. Conformity was evident and did not differ as a function of majority competence among participants with low perceived own accuracy in the affiliation goal condition.

As for the performance goal condition, recall that conformity *should* differ as a function of majority competence in the performance goal condition, a hypothesis that was confirmed by a significant two-way interaction between majority competence and the correct-incorrect piechart contrast ($t(11548) = -3.23$, $p = .001$). As predicted, there was a significant difference between correct and incorrect piechart trials in the competent majority condition ($t(11548) = -4.79$, $p < .001$) but not in the incompetent majority condition ($t(11548) = -1.52$, $p = .12$). Interestingly, only the correct piechart trials

differed significantly from baseline trials (correct vs. baseline: $t(11548) = 4.44$, $p < .001$; incorrect vs. baseline: $t(11548) = -0.40$, $p = .692$), perhaps suggesting a special preference for a large consensus even within a competent majority. However, the effect could well be a floor effect. In general, the hypothesis was supported. Participants with low perceived own accuracy in the performance goal condition tracked the apparent quality of social information over trials, and conformed to the competent but not incompetent majority.

Given general support for hypotheses regarding the affiliation and performance goal conditions, results from the learning goal condition were surprising. First, recall that conformity was predicted to be low compared to the affiliation goal condition. However, the difference in conformity (indexed as the difference in performance between correct and incorrect piechart trials) between affiliation and learning goal conditions was non-significant in both incompetent ($t(11548) = -0.33$, $p = .741$) and competent ($t(11550) = -0.12$, $p = .904$) majority conditions. On the other hand, the hypothesis that conformity would not differ between competence conditions was supported by a two-way interaction between majority competence and the correct-incorrect piechart contrast ($t(11549) = 0.32$, $p = .569$) and significant differences between correct and incorrect piechart trials in both the incompetent ($t(11548) = 14.66$, $p < .001$) and competent ($t(11550) = 24.50$, $p < .001$) majority conditions. Interestingly, examination of the baseline trials suggests these participants conformed to large majorities only. In the incompetent majority condition, performance was significantly worse on incorrect piechart trials ($t(11548) = -2.95$, $p = .003$) than on the other two types of trials, which did not differ ($t(11548) = 0.90$, $p = 368$); recall that large majorities were always incorrect in this condition. On the other

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hand, in the competent majority condition, where large majorities were always correct, performance was significantly higher on correct piechart trials ($t(11550) = 13.48$, $p <$ .001) than on the other two, which were not significantly different ($t(11550) = 1.88$, $p =$ .171). What these results suggest is that learning goal participants low in perceived own accuracy employed a heuristic conformity to large but not small majorities, congruent with the proposed explanation for the results in Study 1 where performance was worse for learning goal participants in the incompetent majority condition than in the competent majority condition. Although unpredicted, these results are nonetheless interesting, and suggest that there is more to the dynamics of learning as it pertains to conformity than anticipated.

High perceived own accuracy results are difficult to interpret, especially given a lack of a priori hypotheses. However, given that conformity decreases with increased task difficulty and task relevant self-efficacy, then it would be expected that social influence is less powerful, generally, among those with high perceived own accuracy, which is supported by the two-way interaction between the correct-incorrect piechart contrast and perceived own accuracy (averaged across goal and majority competence; $t(11549) = 2.48$, $p = .013$) such that conformity (indexed as the difference in performance between correct and incorrect piechart trials) was greater among participants low than high in perceived own accuracy. I will reserve further interpretation of the results for the discussion, as the lack of a priori hypotheses renders such interpretation speculative.

Learning

As with Study 1, the influence of conformity on learning was assessed by calculating an average discrepancy score between correct and incorrect trials for each

participant and utilizing the discrepancy variable, along with goal and majority

competence, to predict accuracy on Block 2 in a GLMM analysis. Results show a main

effect of discrepancy ($F(1,2281) = 10.22$, $p = .001$) such that greater conformity in Block

1 resulted in lower accuracy in Block 2. In addition, there was a two-way interaction

between goal and majority competence ($F(2,2281) = 7.55$, $p < .001$). Visual inspection

suggests that accuracy was lower with the incompetent than competent majority

condition among performance goal participants only (see Figure 11). Recall that

performance goal participants with low perceived own accuracy generally performed

poorly during Block 1, and gained nothing in performance as a consequence of

conformity, since they apparently did not conform at all. In contrast, conformity was

evident among both affiliation and learning goal participants, and their performance was

much better than that of performance goal participants during Block 2. Perhaps

conformity actually benefits those who have a difficult time with the task. The two-way

interaction may be driven primarily by the performance of participants with low

perceived own accuracy. Indeed, there was a three way interaction between discrepancy,

goal, and majority competence ($F(2,2281) = 3.69$, $p = .025$), such that low conformity

participants exhibited the pattern described above, but the effects were attenuated among

high conformity participants (see Figure 12). If my interpretation is correct, this result

may help to explain why learning goal participants still conformed. Perhaps my original

assumption that learning would be hindered by conformity was not entirely correct, and

conformity is actually beneficial to those who have a difficult time with a task. Research

on social learning (e.g., Bandura, Ross, & Ross, 1961; Lee, Dineen, McKendree, &

Mayes, 1999) suggests that such learning occurs; perhaps it is the case that social learning is most efficacious for those with the most to learn.

Collective Identity

Collective identity scores were submitted to a GLM analysis with goal and majority competence predicting collective identity. No significant main effects or interactions of the two predictor variables were obtained (goal: $F(2,156) = 0.32$, $p = .728$; majority competence: $F(1,156) = 1.07$, $p = .304$; interaction: $F(1,156) = 0.96$, $p = .386$). This indicates that effects in the previous analyses were not the consequence of conditions affecting identification with Lehigh students (which might have resulted in participants' distancing themselves from the majority).

Discussion

Similar to Study 1, the purpose of this study was to examine how specific goals (i.e., affiliation, learning, performance) motivate the use of majority size as a cue for decisions about conformity. I anticipated that only with a performance goal would participants be motivated to track the performance of a majority over time by comparing their own judgment to the judgment of small and large majorities. Evidence of this process would be found in greater conformity to a competent majority than to an incompetent majority. With affiliation and learning goals, I did not anticipate differential conformity to competent and incompetent majorities. Instead, I anticipated strong conformity to both majorities with an affiliation goal and little or no conformity to either majority with a learning goal.

The results of the main analysis did not support my hypotheses. The predicted three-way interaction between goal, majority competence, and piechart correctness was

not significant. However, the main analysis did appear to conceptually replicate the results of the second pilot study, where conformity (indexed as the difference between correct and incorrect piechart trials) was greater with the competent than incompetent majority. Examination of the baseline trials seems to suggest that participants conformed to both a small and large consensus with a competent majority but only to a large consensus (which was consistently incorrect, interestingly) with an incompetent majority. Taken alone, this result suggests either that the goal priming manipulation failed to induce the anticipated goals, or that the dynamics of conformity do not change between these three types of goals. Follow-up analyses including participants' perceptions of their own accuracy suggest that neither conclusion is entirely warranted.

As argued earlier, if people feel less confident about their own judgment, then they should be more likely to seek social consensus as a source of information (e.g., Chipman, 1966; Coleman, Blake, & Mouton, 1958; Crutchfield, 1955; Deutsch & Gerard, 1955; Hochbaum, 1954; Nordholm, 1975). I argued that under conditions of uncertainty, the predicted patterns of conformity with respect to goal would become evident. This hypothesis was mostly confirmed in the performance and affiliation goal conditions. Affiliation goal participants with low perceived own accuracy conformed equally to both majorities, and performance goal participants only conformed to the competent majority. Learning goal participants also conformed equally between majorities, but they apparently only conformed to large majorities. This result was surprising, but potentially informative, especially because a similar pattern was observed in Study 1. Originally, I argued that a learning goal should motivate independence from influence, and this may be so among those who are more confident in their judgment, but

perhaps low confidence results in a greater need for a model from which to learn. With this heightened need, perhaps a stricter heuristic than "consensus is correctness" is applied in determining whom to conform to. If nothing else, it is clear that the dynamics of learning goals are more complex than originally anticipated.

While the low perceived own accuracy results were mostly intelligible, the high perceived own accuracy results were less easily interpreted (see Figure 10). The primary reason for this is that no a priori hypotheses had been proposed. Speculation is possible nonetheless. Arguably, the dynamics of conformity should be the same between those with low and high perceived own accuracy with an affiliation goal, as conforming to norms is presumably the way to satisfy that goal. However, the participants were students at a prestigious science and engineering university, where intellectual competence is a norm, and so those with more confidence in their own judgment were engaging in normative behavior by exercising independence from the majority (Hornsey & Jetten, 2005). In other words, performance is normative for Lehigh students, and thus to affiliate is to adopt a performance goal when possible. Thus, the pattern of results for high perceived own accuracy affiliation goal participants is similar to low perceived own accuracy performance goal participants (see Table 2 for test statistics). Learning goal participants with high perceived own accuracy performed as originally expected for all learning goal participants. That is, there was very little conformity (the contrasts suggest that conformity was not nonexistent, see Table 2), and majority competence made no difference at all. Results from the performance goal condition suggest that performance goal participants did not conform much, but if they did, it was always to a large majority, as evidenced by the baseline trials. Evidently, even when confident in their own

judgment, those with a performance goal still find utility in referencing a social consensus. However, relative to those with low perceived own accuracy, those with high perceived own accuracy did not apply the same effortful tracking of performance.

Lastly, analysis of learning as a function of conformity on Block 1 revealed, as with Study 1, that more conformity leads to worse performance on Block 2. The one exception to this was with performance goal participants. Among those with low perceived own accuracy, those who conformed less (that is, those in the incompetent majority condition) did worse on Block 2 than those who conformed more (that is, those in the competent majority condition). As I argued earlier, perhaps conformity can be useful in learning after all, as suggested by the social learning literature (Lee, Dineen, McKendree, & Mayes, 1999).

Study 3

The purpose of this study is to conceptually replicate the first pilot study using the one-shot paradigm employed by persuasion researchers (Mackie, 1987; Martin et al., 2002; & Gardikiotis et al., 2005). If conformity is analogous to persuasion, then the effect of uncertainty (such as that in the difficult task condition of the first pilot study) should be similar between a conformity paradigm and a persuasion paradigm. That is, if participants are uncertain about their own judgment, then they may have an enhanced incentive to selectively accept a persuasive message by a large than small majority, as they may have a greater need for valid social information.

The studies described so far deal with motivational factors (e.g., goals) thought to result in heightened scrutiny of social consensus information, and thus greater selectivity in conformity. One factor that has been demonstrated to affect scrutiny of social

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information (such as persuasive messages) is confidence in one's own thoughts (Petty, Briñol, & Tormala, 2002; Briñol & Petty, 2003). Studies on metacognition in persuasion and attitude change have demonstrated that individuals' confidence in their own thoughts influences evaluation of a persuasive message. For instance, if a message evokes positive thoughts about the message (e.g., "good point!"), but the individual feels uncertain about the validity of his or her thoughts, then the message will be evaluated less positively than it would be if they were more certain. To test this, Petty et al. (2002) had participants read a persuasive message and write down their thoughts about it. After that, they wrote about five instances in which they felt either confident or doubtful about their thoughts. Finally, participants were asked to reflect on the thoughts they had while reading the message. The message itself had been either a strong or weak message—the former tends to provoke more message-positive thoughts and the latter tends to provoke more message-negative thoughts. Among participants who engaged in more elaborative evaluation (indexed by a self-report measure of the degree to which participants felt they had thought about and attended to the message) of the message, doubtful participants were unaffected by the strength of the argument, but confident participants found the strong message more compelling than the weak message. Among participants who engaged in less elaborative evaluation, no effects were observed (although the pattern of means suggested that doubtful participants found the strong message more compelling than the weak message).

Suppose rather than doubting one's thoughts about a persuasive message, an individual doubted their own opinions or ability to make good judgments. Such a condition may render an individual more susceptible to social influence than if they were

confident in their opinions and judgment (e.g., Chipman, 1966; Coleman, Blake, &

Mouton, 1958; Crutchfield, 1955; Deutsch & Gerard, 1955; Hochbaum, 1954; Nordholm,

1975). The results of the first pilot study suggest that doubt in one's own judgment

(resulting from too little time to observe the rotation stimuli) can lead to not just

heightened conformity but heightened scrutiny of social information and selective

conformity to large majorities. Something like this pattern was seen again with learning

goal participants in both Study 1 and Study 2, where those rating their performance as

low conformed more to large than small majorities. The mechanism for self-doubt was

(presumably) the same in all three cases—that is, lack of ability to perform the task—but

in none of these studies has there been an effort to directly manipulate individuals'

confidence in their own judgment.

Mackie (1987), Martin et al. (2002), and Gardikiotis et al. (2005) found that

majorities could be more persuasive than minorities, but all three failed to find a specific

effect of large majorities as more influential than small majorities. Perhaps individuals in

those studies were generally more certain about their own attitudes going into the

persuasive attempt. Indeed, none of those researchers attempted to manipulate confidence

at all. However, I have argued that people may be more concerned about the validity of

social information when they need it – for example, when they are not particularly

confident in their own judgments. To test this prediction, in Study 3, I augmented the

experimental paradigm from Martin et al. (2002) and Gardikiotis et al (2005) by

including the confidence manipulation from Petty et al. (2002). Participants first rated

their agreement with several controversial propositions and then wrote about a time when

they felt certain or uncertain about their judgment. After that, participants read an article

advocating for one of the propositions (i.e., closing NASA). According to the hypotheses outlined above, participants' first thinking about their opinions and then thinking about being certain or uncertain about their own judgment should lead to differences in how motivated they are to scrutinize the validity of social information contained within the persuasive attempt. Specifically, uncertain participants should be more favorable to the proposition when endorsed by a large majority than by a small majority, but certain participants should show little or no difference in favorability to the proposition, regardless of what size of majority endorsed it (consistent with Mackie, 1987; Martin et al., 2002; & Gardikiotis et al., 2005).

Method

Participants

Participants were 276 American adults recruited from the Amazon Mechanical Turk service, 141 of which were part of an additional pair of conditions (small and large minority) which were excluded from analysis due to a programing error that resulted in non-randomized assignment in those conditions. Additionally, five participants were excluded from analysis because their responses to the written part of the study were incoherent, suggesting that they did not take the study seriously. Seventeen of the remaining participants failed the manipulation check, leaving 113 participants in the analysis.

Procedure and Materials

All materials were presented to participants over the internet using Qualtrics survey software. The consent procedure was similar to Study 1 and Study 2.

After the consent process, participants rated on a scale of 1 ("Do not agree at all") to 9 ("Agree completely") their agreement with five controversial propositions (see Table 3), including "NASA's usefulness as an American institution has passed, and so it should be shut down." This issue was selected because in a pilot study asking participants to rate their agreement with several controversial propositions, the proposition to close NASA was rated as highly disagreeable ($N = 52$, $M = 2.47/9.00$, $SD = 1.91$) but neutral in terms of personal relevance ($M = 5.69/9.00$, $SD = 2.49$) and high in terms of relevance to Americans ($M = 6.71/9.00$, $SD = 1.71$; see Table 4 for the full list of propositions and ratings). Next, participants wrote about five instances in which they felt uncertain (uncertain condition) or certain (certain condition) about their own judgment, or they wrote nothing at all and continued to the next part of the study (control condition). After that, participants read an article written by myself and my collaborators arguing in favor of closing NASA (see Appendix B), which began with the headline "82% of Americans Agree: NASA Should Be Closed" in the large majority condition and the same headline with "52%" in the small majority condition. The arguments were intended to be strong arguments, eliciting a more positive response to the argument itself (Petty & Cacioppo, 1979), leaving only the percentage endorsement by Americans as a cue to message validity.

After reading the message, participants rated on a scale of 1 to 9 whether they thought closing NASA was bad/good, foolish/wise, harmful/beneficial, ineffective/effective, whether they were unfavorable/favorable, and convinced/unconvinced by the proposition. For each participant, scores from the six scales were combined ($\alpha = .94$) to create a single post-message score. Following the

ratings, participants listed their thoughts about the proposal and then were asked to reflect on their thoughts and rate on a scale of 1 ("Not at all") to 9 ("Extremely") how confident, valid, secure, and certain they were. Scores from these four scales were combined to create a single confidence score for each participant ($\alpha = .95$). After the thought listing and ratings, participants completed the collective (American) identity scale (this time on a 9-point scale; $\alpha = .93$). Finally, as a manipulation check they were asked to indicate what percentage (on a discrete scale: 0%, 10%, 20%, … ,100%) of Americans the article had suggested endorsed the proposition to close NASA.

<div align="center">

Results

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Manipulation Check

Participants' answers to the final question (percentage of Americans endorsing the proposition) were examined for accuracy. Those in the large majority condition who selected values less than 80% ($N = 12$) and those in the small majority condition who selected values greater than 60% ($N = 4$) or less than 50% ($N = 1$) were removed from analysis.

Persuasion

The first analysis compared pre-message attitude ratings to post-message attitude ratings to see if a systematic shift toward or away from the proposition was evident as a function of certainty and majority size conditions. Pre- and post-message ratings were highly correlated ($r(111) = .642, p < .001$). Furthermore, the difference between post- and pre-message ratings was significantly greater than 0 ($M_{post\text{-}pre} = 1.49$, $t(112) = 8.513$, $p < .001$). Together, these analyses suggest that while a general increase in ratings was

evident overall, the general pattern of attitudes remained the same (i.e., people who were initially opposed remained relatively opposed, etc.).

Difference scores (post-message rating – pre-message rating) were submitted to a 2 (Majority size: small vs. large) x 2 (Certainty: uncertain vs. certain) general linear model (GLM) analysis in order to test the main hypotheses. Namely, participants in the uncertainty condition should be more persuaded by a large than small majority (evidenced by a larger difference score in the large majority condition than in the small majority condition), but no difference in persuasion should be evident among participants in the certainty condition (a two-way interaction between majority size and certainty). Analyses reveal no significant main effects of either variable (majority size: $F(1,107) = 0.12$, $p = .728$; certainty: $F(2,107) = 0.47$, $p = .629$), and no significant interaction ($F(2,107) = 1.57$, $p = .213$). Thus, the results of this analysis do not support the hypotheses.

Given that the pre- and post-message ratings were different types of scales (i.e., one was a single-shot attitude measure and the other was an aggregate measure), the validity of the previous analysis may be questionable. Thus, I conducted an additional GLM analysis with majority size and certainty predicting just the post-message ratings. However, as with the difference scores, there were no significant main effects (majority size: $F(1,107) = 0.09$, $p = .771$; certainty: $F(2,107) = 1.27$, $p = .285$) or an interaction ($F(2,107) = 0.97$, $p = .381$).

Collective (American) Identity

Collective identity scores were submitted to a GLM analysis with goal and majority competence predicting collective identity. No significant main effects or

interactions of the two predictor variables were obtained (majority size: $F(1,107) = 0.00$, $p = .996$; certainty: $F(2,107) = 0.17$, $p = .843$; interaction: $F(2,107) = 0.40$, $p = .674$). I also conducted an analysis with collective identity as a predictor variable. If strongly identified group members have greater trust in the judgment of ingroup members than weekly identified group members, then perhaps only strongly identified group members would be influenced by a majority judgment when uncertain about their own judgment. Furthermore, such a state of uncertainty may increase the need for valid social information, and thus they will be more persuaded by a large than small majority.

I performed a GLM analysis with majority size, certainty, and collective identity predicting post-message ratings. Results reveal a significant two-way interaction between certainty and collective identity ($F(1,105) = 6.47$, $p = .012$) such that among highly identified participants, uncertain participants rated higher agreement with the proposition to close NASA than certain participants ($t(101) = 2.98$, $p = .004$) and marginally higher baseline participants ($t(101) = 1.79$, $p = .076$), but among low identifiers, no such differences were observed (see Figure 13). The predicted three-way interaction was not significant ($F(1,105) = 0.49$, $p = .485$). Suggesting that the uncertainty manipulation had some effect on persuasion among high identifiers, but majority size did not make any difference.

Discussion

The certainty manipulation was intended to induce uncertainty in participants' own judgment, which should have worked if they had been thinking about their judgment while undergoing the manipulation. However, perhaps simply asking participants to rate their agreement with several controversial propositions was not enough to induce the kind

of elaborative cognition necessary to induce uncertainty. Indeed, Petty et al. (2002) argue that elaboration is precisely what is needed for the uncertainty manipulation to induce uncertainty. Perhaps a better experimental paradigm would include not just ratings of agreement, but questions asking why participants feel the way they do and perhaps a ratings scale similar to that implemented by Petty et al. (Study 3, 2002) where participants rated the extent to which they thought about the issues as they responded. Another potential means for inducing uncertainty in participants' judgment could be to have them answer questions about the facts of an issue and then provide false feedback about the accuracy of their knowledge.

Given the results of the analysis with collective identity, it could be that the certainty manipulation was successful, but the effect of the manipulation is only apparent among high identifiers. Furthermore, it appears that majority size does not make a difference among high identifying uncertain individuals. This result is surprising if the uncertainty induced in this study is analogous to the low perceived own accuracy of Study 2, since majority size did appear to be used both heuristically and as a means of assessing the validity of the majority among learning goal and performance goal participants respectively. One potential explanation for the discrepancy between the two sets of findings is that participants in this study were not interested in learning, and the results seen by performance goal participants in Study 2 require multiple trials.

General Discussion

The three studies described above were designed to investigate some of the motivational factors leading to the use of majority size as a cue to the validity of social information. Of particular interest was whether a heightened need for valid social

information would lead to an assessment of the majority's validity using the correlation between majority size and performance over time.

The results of the three studies do not straightforwardly support the hypotheses originally proposed. In Study 1, I predicted that performance goal participants would conform more to a competent than an incompetent majority, whereas learning goal participants would display little conformity and show no difference in conformity as a function of group competence. This prediction was not supported by the data. Instead, there was a general pattern across goal conditions of conformity similar to that seen in the second pilot study. If anything, the pattern of means in the (non-significant) three-way interaction between goal, majority competence, and piechart correctness suggested the opposite of what had been predicted—learning goal participants appeared to have a preference for the competent majority but performance goal participants did not. Corresponding predictions were proposed for Study 2, but once again, only a general preference for the competent majority over the incompetent majority was identified. Study 3 predicted greater persuasive influence by a large than small majority for uncertain but not certain participants, but no effect of size or certainty much less an interaction between the two was attained. Taken alone, these results appear to suggest one of two possibilities. The first possibility is that the goal and uncertainty manipulations were unsuccessful. The second possibility is that the proposed motivational mechanisms simply do not result in the predicted patterns of conformity and persuasion. However, follow-up analyses suggest that the first possibility is unlikely, and the second possibility is only partially correct.

The first two studies included a question at the end asking how accurate participants felt their performance was. Including participants' answers to that question as a predictor revealed some interesting if complicated results. The key predictions revolved around conformity with a performance goal. However, performance goal participants in Study 1 did not appear to conform very much at all, whether they perceived their accuracy to be low or high. On the other hand, the predicted preference for a competent majority was seen clearly in Study 2 among those low in perceived own accuracy. At least three explanations are possible. First, the incentive to perform was higher in Study 1, as participants were being paid for performance on each trial. Perhaps this incentive made conformity to either majority seem too risky. Second, the piecharts were presented for several seconds longer on Study1 than on Study 2. Perhaps this additional time to think about the rotation stimuli and the majority's response was enough to cause doubts. Third, the prime employed in Study 2 contained words such as "triumph" and "victory" which might have induced a competitive type of performance goal, which might have eliminated any normative pressure to conform, rendering the majority merely a tool that was easy to discard when judged to be an invalid source of information.

In contrast to the performance goal conditions, among those with low perceived own accuracy, learning goal participants in Study 1 produced a large discrepancy between correct and incorrect piechart trials, suggesting conformity. Furthermore, among those with low perceived own accuracy, learning goal participants had much worse performance with the incompetent majority than with the competent majority. I suggested that the difference in performance between majority competence conditions was due to conformity strictly to large majorities. Results from Study 2 confirmed this hypothesis.

Indeed, baseline trials were not significantly different from performance on trials with a small majority, but significantly greater or worse on trials with a large majority depending on whether the majority was correct or incorrect respectively. Among those high in perceived own accuracy, learning goal participants showed very little if any conformity at all in either study. These results were surprising given my initial hypotheses. Apparently, I underestimated the extent to which individuals will be motivated to rely on others for help while learning. Interestingly, the pattern of conformity evident among those with low perceived own accuracy suggests that even if they did not scrutinize the majority for validity *per se*, they did apply a stricter standard for conformity than just majority status, as had also been evident in the first pilot study.

One question arising from the results of learning goal participants with low perceived own accuracy is whether the goal that had been pursued was indeed a learning goal at all. Perhaps only the performance goal conditions induced enough motivation to perform that participants were willing to disregard social information in favor of their own judgment (Study 1, both competence conditions; Study 2, incompetent majority condition). It is possible that participants in learning goal conditions were motivated by a more communal attitude toward their group. However, if this explanation were correct, then the dynamics of the learning goal condition in Study 2 should have been identical to the affiliation goal condition, but this was not the case. Learning goal participants appear to prefer only large majorities, whereas affiliation goal participants apparently do not. Another possibility is that participants in the learning goal condition were not motivated by any particular goal other than to complete the task quickly, and thus the observed conformity can be thought of as simple heuristic processing. This may be true, but that

assessment cannot explain why learning goal participants (with low perceived own accuracy) only conformed to large majorities. Given that two entirely different kinds of manipulations were employed in Study 1 and Study 2, but similar results were observed, the best explanation is that the same goal (a learning goal) was induced in both studies, and that the demands of satisfying that goal require more valid social information than, for instance, satisfaction of an affiliation goal.

In Study 2 I predicted that an affiliation goal would result in undifferentiated conformity to both types of majority. Results for participants with low perceived own accuracy supported this hypothesis, although not perfectly. Conformity was both evident and not significantly different between majority competence conditions. The results for those with high perceived own accuracy were more confusing, as one might expect conformity regardless of participants' ability. One potential explanation, as I argued before, is that for those with more confidence in their skills, performing well on the task is exactly what would constitute normative behavior. The pattern of results looks similar to but less extreme than the low perceived own accuracy performance goal results.

Study 3 did not implement a goal manipulation, but instead attempted to manipulate participants' certainty about their own judgment. Although none of the main analyses supported the proposed hypotheses, analysis using American collective identification at least suggests that the certainty manipulation had some effect. If uncertainty increased the standard for evaluation at all, it was only evident with the identification measure. That is, those who do not identify as much with Americans did not see American popular opinion as being a credible source of information, and so those who were uncertain about their own judgment were not persuaded by the message any

more than controls and those who were more certain. On the other hand, those who identify more strongly with Americans did find American popular opinion to be credible, and thus they were more persuaded by it when uncertain.

Taken together, the results of these studies lead to two tentative conclusions regarding majority size as it pertains to conformity. First, majority size is likely to be most readily used in the process of tracking the performance of the group over time. The main analyses from both Study 1 and Study 2 support this conclusion, and the null results of Study 3 are at least interpretable from that perspective. Second, the utility of scrutinizing a social majority for validity may be most apparent among people who are not independently competent, as they lack the necessary skills or confidence to perform well on their own. One of the limitations of this research, however, is that both these conclusions cannot be true. That is, it seems unlikely that as a general rule people track performance as it correlates to majority size *and* that such tracking requires the extra motivation from individuals' sense of incompetence in interaction with their goals.

Another potential limitation of this research is that the first two studies were conducted with Lehigh University students, who may have different motivations and strategies for approaching challenges. Thus, the generalizability of the conclusions is unclear. However, the biggest difference is likely to be in students' chronic goals, which are likely to be performance oriented, given the elite status of the school. This may also explain the seemingly contradictory conclusions of the last paragraph. That is, Lehigh students may generally operate with performance goals, even when motivated by other goals.

A final limitation to conclusions regarding the results of Study 1 and Study 2 is that they resulted from participants with low perceived own accuracy. Participants with low perceived own accuracy performed objectively worse than those with high perceived own accuracy. Furthermore, their lower scores on the perceived own accuracy measure suggest that they had less confidence in their own performance across the board. One problem that arises from this is that it is difficult to determine whether those participants could indeed track the performance of the group over time if they were rarely confident in their own answers. In order to track the competence of the group over time, they would have to have some subjective sense that their answers are correct, and those answers must, in fact, be correct. If neither of those conditions were met, then the interpretability of those results becomes questionable. However, note that in both studies, average perceived own accuracy was around 4 out of 6, and the standard deviation was around 1. Furthermore, averaged across other variables, accuracy among participants with low participants was around 75% (on average) in Study 1 and around 69% (on average) in Study 2. Thus, it is reasonable to conclude that even participants with low perceived own accuracy were accurate and potentially confident enough in their own performance to be able to track the performance of the group over time.

To conclude, the results of this research provide tentative evidence that when people are unsure of their own judgment, they will be more likely to use social information and to evaluate it for validity. Depending on what type of goal individuals are pursuing, the evaluation of social information may be more or less critical. For instance, performance goals are best satisfied when individuals have access to valid information, and so the pursuit of performance goals induces a more critical assessment

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of the information. Learning goals, however, do not require the continuous success that a

performance goal might, and in fact may benefit from failure (at least if feedback is

available), and so individuals have less of a need for validity (see Elliott & Dweck, 1988

for a discussion on the dynamics performance and learning goals). The results of this

research also suggest that the dynamics of conformity may be entirely different for

people with more confidence in their judgment. Social information may not be seen as

useful or as being valid, inspiring a greater sense of independence from the group.

Overall, this research provides a first step for discovering the particular means by which

individuals with different motives and goals scrutinize social information with cues such

as majority size.

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Footnotes

[1] I say "elaborate" here because the rankings only shifted from low to mid-range, suggesting that participants expanded their understanding of "politician" rather than replaced it entirely.

[2] One figured out the pattern between correctness of the piecharts and size of the majority, while the other figured out that the study was using a variant of the Asch paradigm.

[3] One walked out in the middle of the session to give keys to a friend. The other indicated a hurry to get to class before starting and took a fairly short time to complete the task.

[4] I should note that goal is only a significant predictor when discrepancy is included in the model. A model with goal and majority competence predicting Block 2 accuracy contains no main effects or interactions.

[5] On the other hand, it could well be that performance goal participants were less motivated during Block 2, as they had already earned money.

Table 1. Study 2 - These words were presented in random order to participants who then grouped them by meaning in as many groups as they felt necessary up to six. Words are grouped below with respect to the type of goal thought beforehand to be associated.

Goal

Affiliation	Learning	Performance
bond	learn	perform
affiliate	master	triumph
comradery	train	overcome
friend	prepare	succeed
partner	study	attain
together	improve	victory
trust	refine	champion
embrace	advance	conquer
team	progress	dominate
ally	develop	prevail
support	expert	beat
care		ability
		prize
		reward
		score
		award
		trophy
		capable
		bonus
		goal

Table 2. Study 2 - Comparisons of correct, incorrect, and baseline trials by perceived own accuracy, goal, and majority competence.

<u>Low perceived own accuracy</u>   <u>High perceived own accuracy</u>

Affiliation Goal

Comparison		df	t	p	Comparison		df	t	p
Incompetent					*Incompetent*				
Incorrect	Baseline	11550	-1.56	0.1176	Incorrect	Baseline	11550	-1.45	0.1458
Correct	Baseline	11550	3.13	0.0018	Correct	Baseline	11550	-1.08	0.2811
Incorrect	Correct	11550	-4.63	<.0001	Incorrect	Correct	11550	-0.4	0.6918
Competent					*Competent*				
Incorrect	Baseline	11549	-2.93	0.0034	Incorrect	Baseline	11549	-0.19	0.8473
Correct	Baseline	11549	2.09	0.0366	Correct	Baseline	11549	1.91	0.0559
Incorrect	Correct	11549	-4.95	<.0001	Incorrect	Correct	11549	-2.04	0.0415

Learning Goal

Comparison		df	t	p	Comparison		df	t	p
Incompetent					*Incompetent*				
Incorrect	Baseline	11548	-2.95	0.0032	Incorrect	Baseline	11550	-2.74	0.0061
Correct	Baseline	11548	0.9	0.3682	Correct	Baseline	11550	-1.01	0.3109
Incorrect	Correct	11548	-3.83	0.0001	Incorrect	Correct	11550	-1.72	0.0858
Competent					*Competent*				
Incorrect	Baseline	11550	-1.37	0.1709	Incorrect	Baseline	11549	-2.78	0.0054
Correct	Baseline	11550	3.67	0.0002	Correct	Baseline	11549	-0.93	0.3544
Incorrect	Correct	11550	-4.95	<.0001	Incorrect	Correct	11549	-1.84	0.0654

Performance Goal

Comparison		df	t	p	Comparison		df	t	p
Incompetent					*Incompetent*				
Incorrect	Baseline	11548	-1.26	0.2069	Incorrect	Baseline	11548	-2.77	0.0056
Correct	Baseline	11548	0.24	0.8068	Correct	Baseline	11548	0.5	0.6206
Incorrect	Correct	11548	-1.52	0.1283	Incorrect	Correct	11548	-3.22	0.0013
Competent					*Competent*				
Incorrect	Baseline	11548	-0.4	0.6916	Incorrect	Baseline	11550	-0.75	0.4539
Correct	Baseline	11548	4.44	<.0001	Correct	Baseline	11550	2.17	0.0299
Incorrect	Correct	11548	-4.79	<.0001	Incorrect	Correct	11550	-2.88	0.004

Figure 1. Study 1 - Order of presentation for practice trials in Study 1. First, a fixation

cross was presented for 500ms. Next, the rotation stimuli were presented for 6000ms.

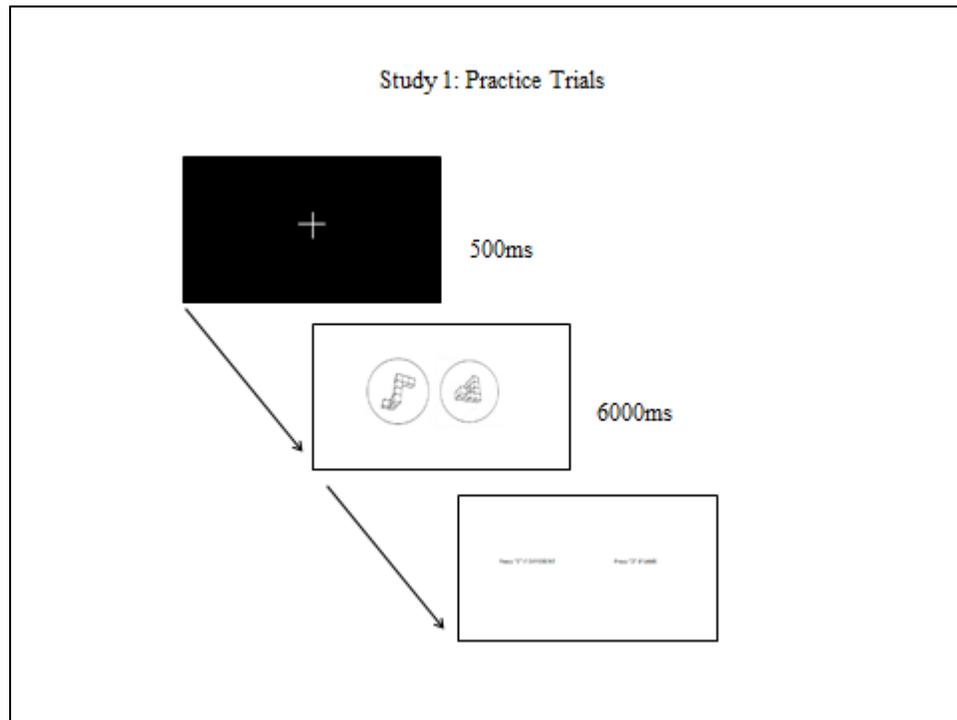Finally, the cue to respond (Press "1" if same, Press "2" if different).

Figure 2. Study 1 - Order of presentation for Block 1 trials. First, a fixation cross was presented for 500ms. Next, the rotation stimuli were presented for 6000ms. Next, a piechart was presented indicating the ostensible percentage of Lehigh students who thought the stimuli were the same and different. Finally, the cue to respond (Press "1" if same, Press "2" if different).

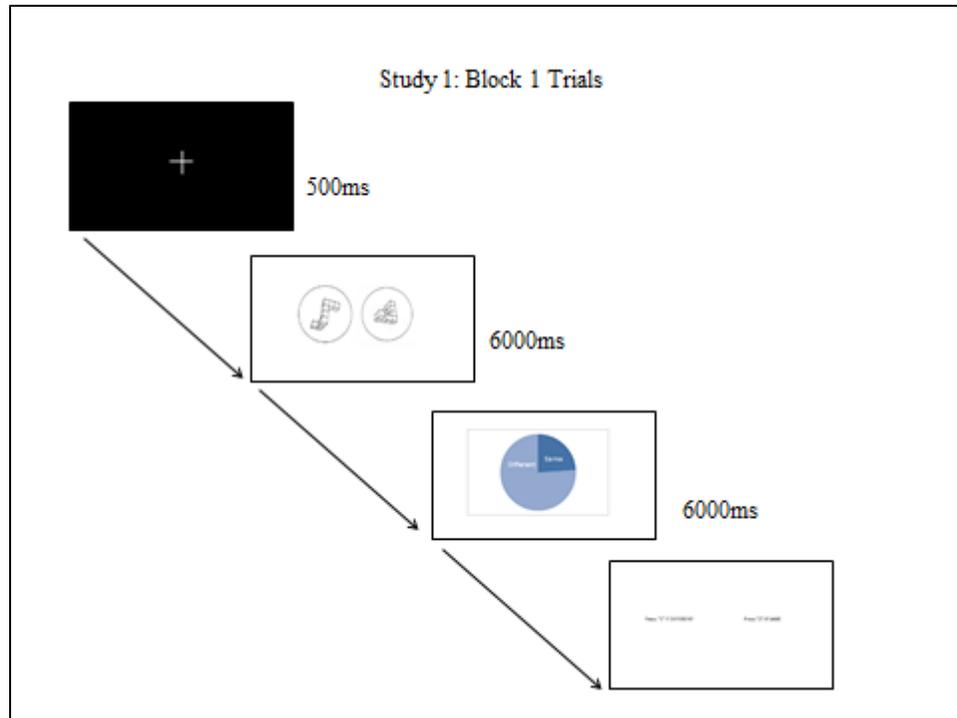Study 1: Block 1 Trials

500ms

6000ms

6000ms

Figure 3. Study 1 - Percent correct as a function of majority competence and piechart correctness in Block 1. The difference between correct and incorrect trials is greater for participants in the competent than incompetent majority condition.
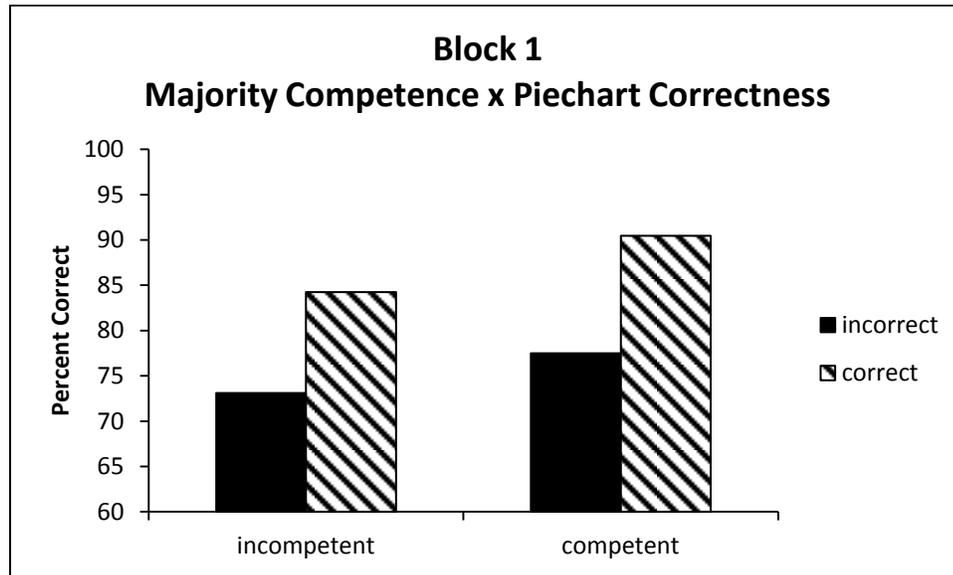
Figure 4. Study 1 - Percent correct as a function of majority competence and piechart correctness for each goal condition in Block 1. The difference between correct and incorrect trials was greater for participants in the competent majority condition than for those in the incompetent majority condition in the learning goal condition, but no such difference of differences was evident in the performance goal condition.
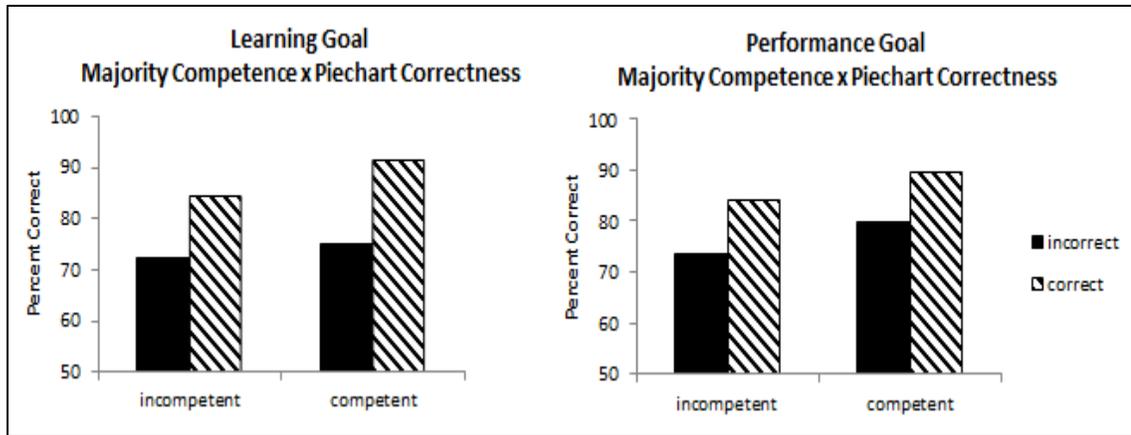
Figure 5. Study 1 - Percent correct as a function of goal, piechart correctness, and perceived own accuracy. Greater conformity is evident with learning goal than performance goal participants only among those scoring low on perceived own accuracy.
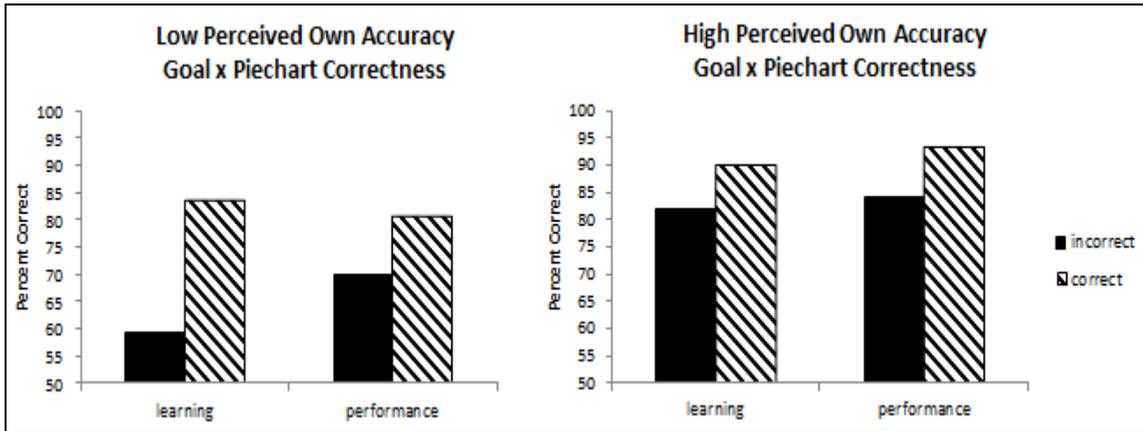
Figure 6. Study 1 - Percent correct during Block 1 as a function of goal, majority

competence, and perceived own accuracy. Among those scoring low on perceived own

accuracy, performance is greater with a competent than incompetent majority, but no

such difference is evident among those scoring high in perceived own accuracy.
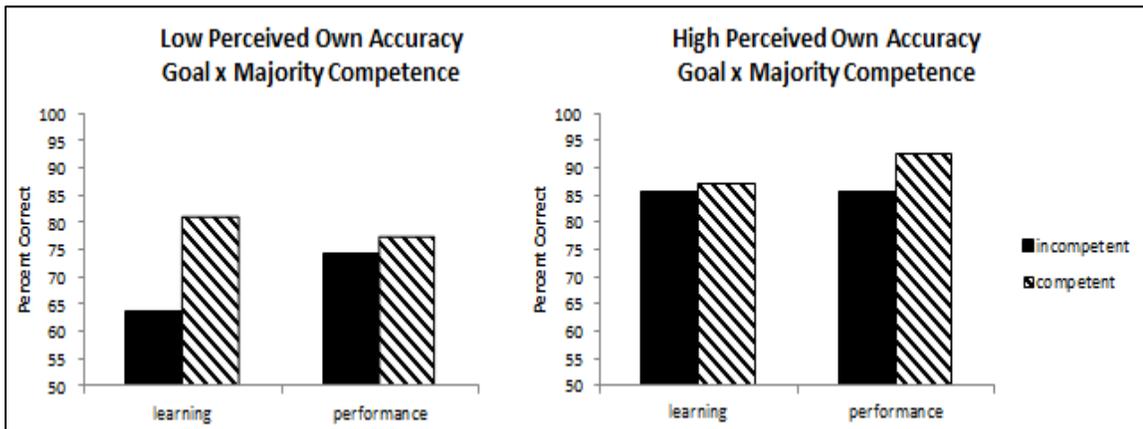
Figure 7. Study 2 - Goal-related words mapped onto a two-dimensional plane. Three

primary groups of words are apparent in this plot. Words central to the groups were

selected for the word search puzzles (affiliation: together, affiliate, friend, partner, ally,

team, bond, comradery; learning: learn, advance, refine, improve, develop, study,

progress, train; performance: beat, prize, overcome, prevail, succeed, triumph, trophy,

victory).
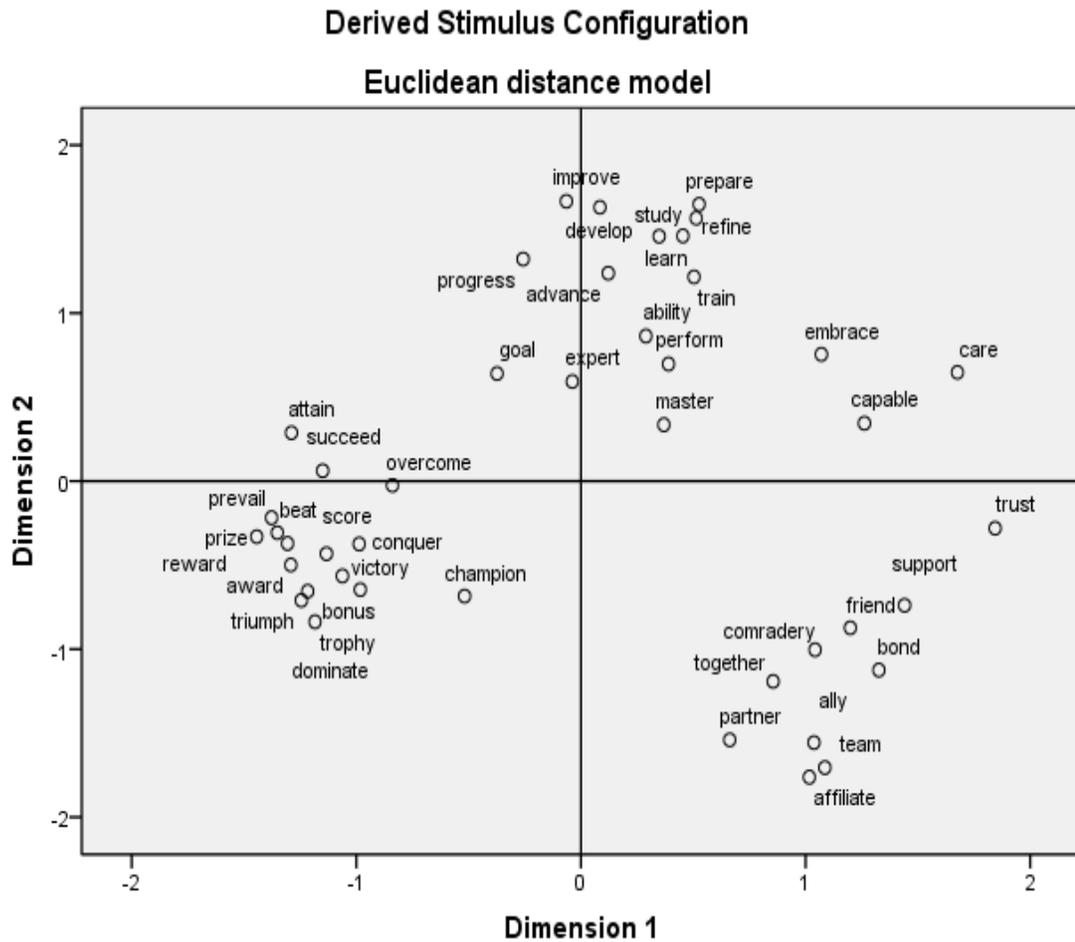
Figure 8. Study 2 - Percent correct as a function of majority competence and piechart correctness on Block 1. The difference between correct and incorrect piechart trials is greater in the competent than incompetent majority condition.
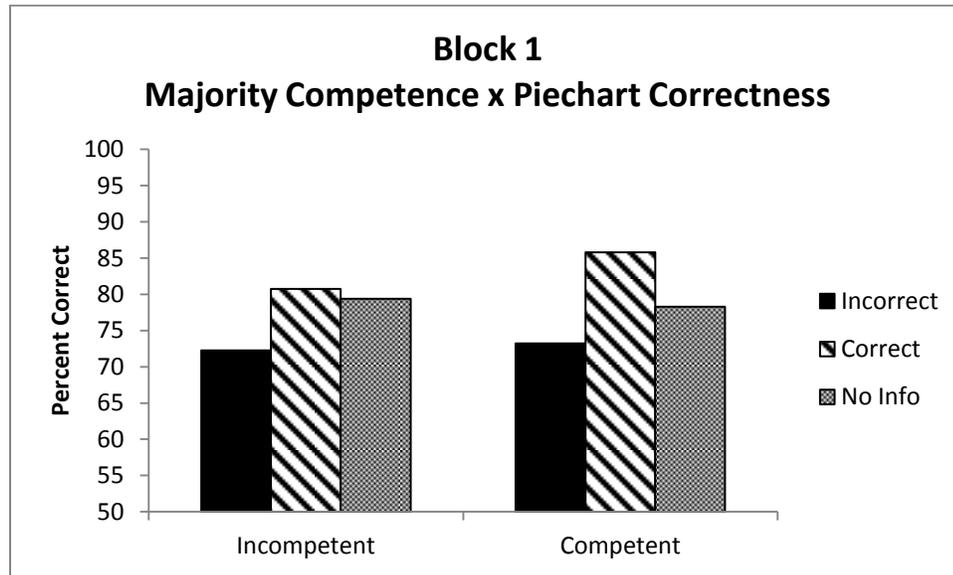
Figure 9. Study 2 - Percent correct as a function of perceived own accuracy and piechart correctness on Block 1. Participants with low perceived own accuracy conformed more than participants with high perceived own accuracy.
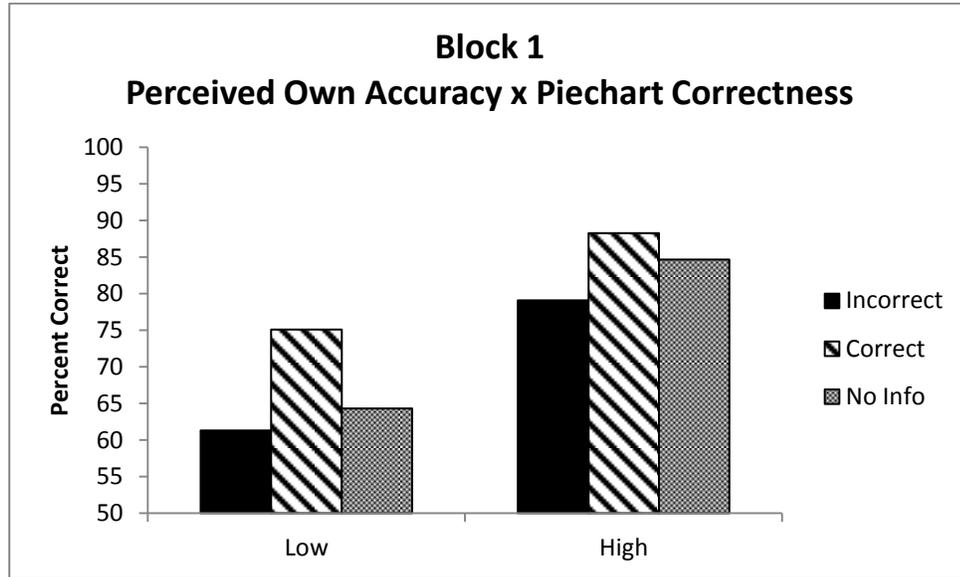
Figure 10. Study 2 - Percent correct as a function of perceived own accuracy, goal,

majority competence and piechart correctness on Block 1.
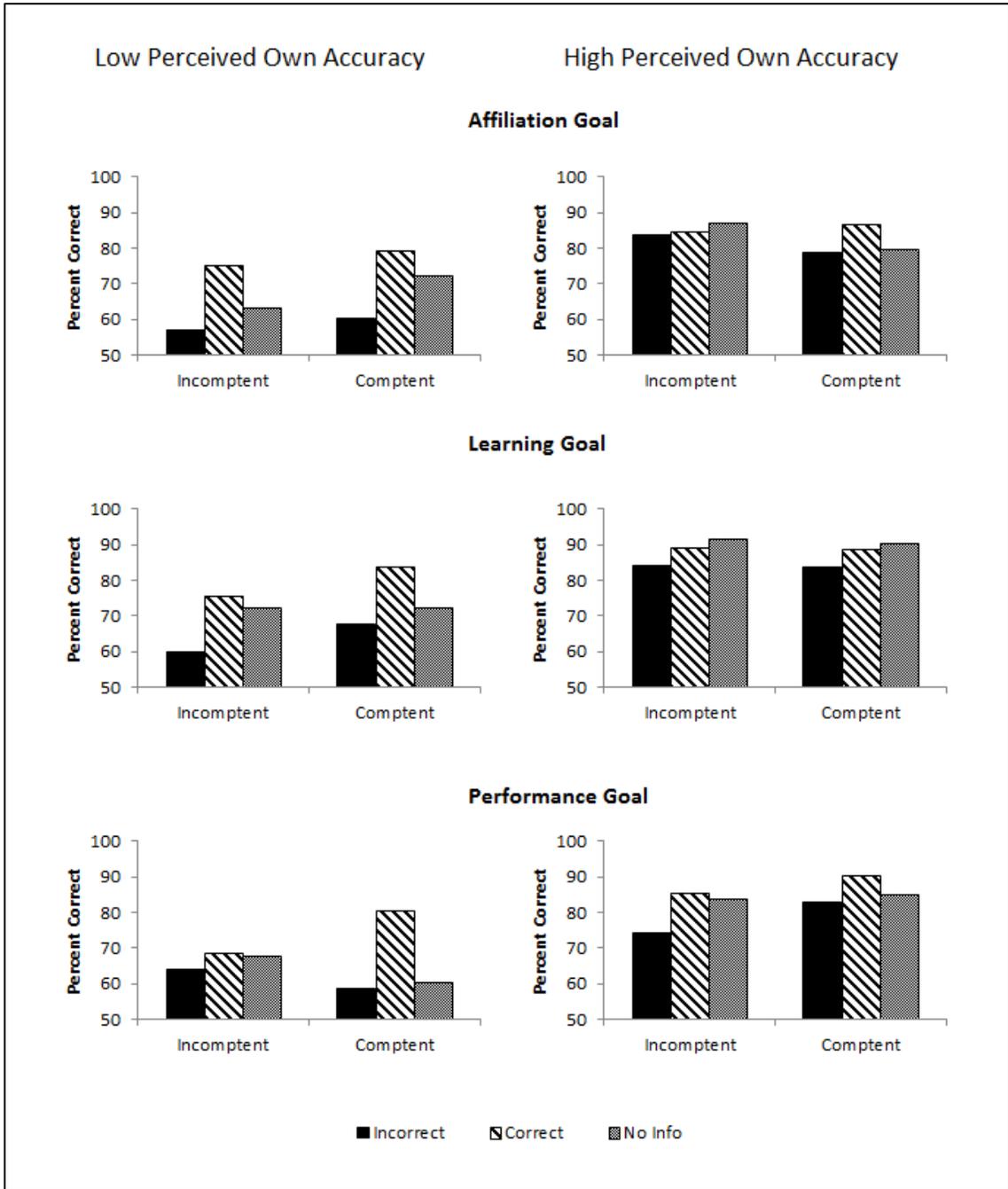
Figure 11. Study 2 - Percent correct as a function of goal and majority competence on Block 2. Performance goal participants in the incompetent majority condition performed worse on Block 2 than those in the competent majority condition.
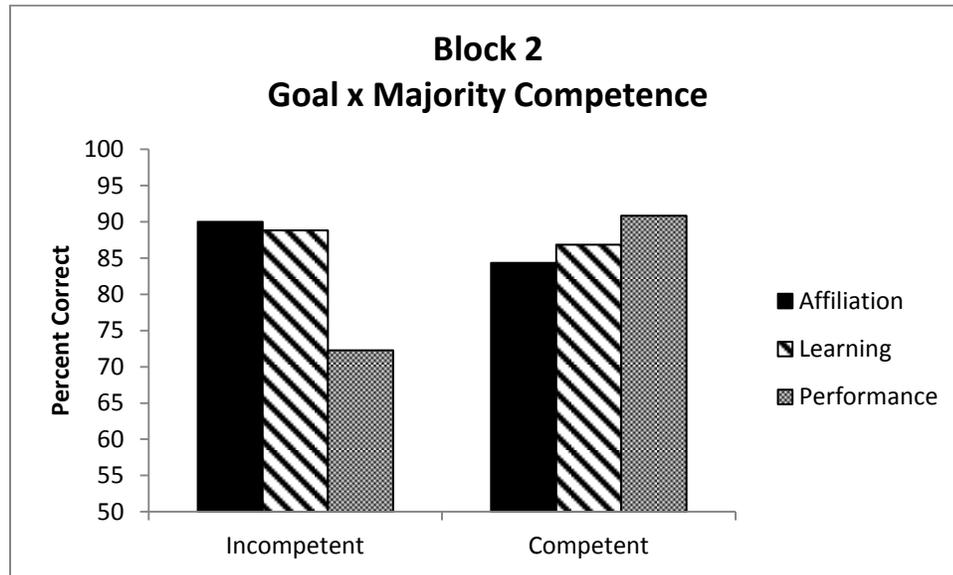
Figure 12. Study 2 - Percent correct on Block 2 as a function of conformity (discrepancy between correct and incorrect piechart trials during Block 1), goal, and majority competence. Performance goal participants who conformed less (those in the incompetent majority condition) performed worse during Block 2 than those who conformed more.
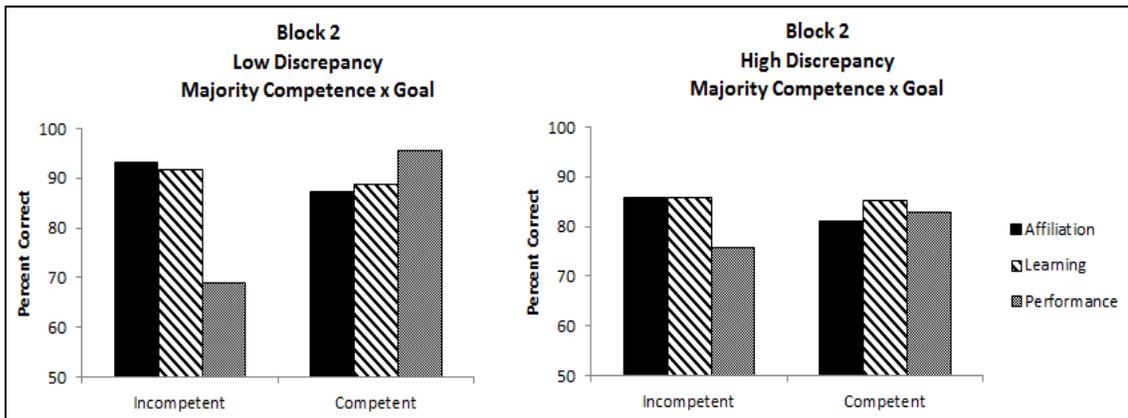
Figure 13. Study 3 - Post-message rating as a function of certainty and collective identification. Among high identifiers, uncertain participants rated higher agreement than certain and control participants, but no differences were evident among low identifiers.

IMPRESSIONS OF ROTATION TASK (STUDIES 1 & 2)

How accurate do you think your own responses have been in the mental rotation task so far?

1	2	3	4	5	6
Very inaccurate					Very accurate

How accurate do you think the responses of your group have been so far?

1	2	3	4	5	6
Very inaccurate					Very accurate

Please rate the frequency with which you did the following things throughout the task so far.
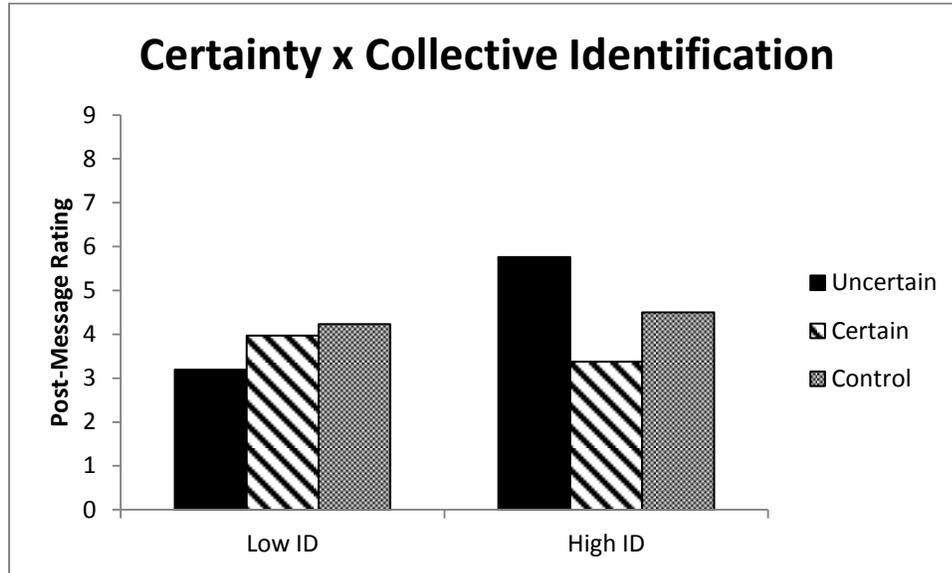
- What percentage of the time did you give the same answer as the majority of other players because you were sure you had the right answer and that the majority was also right?

| 0% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |

- What percentage of the time did you give the same answer as the majority of other players because you were unsure about the right answer and decided to go with the majority response?

| 0% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |

- What percentage of the time did you give the same answers as the majority of other players even though you were sure they were wrong?

| 0% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |

- What percentage of the time did you give a different answer to the majority of other players because you were sure they were wrong?

| 0% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |

- What percentage of the time did you give a different answer to the majority of other players even though you were not sure what the right answer was?

| 0% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |

- What percentage of the time did you give a different answer to the majority of other players even though you were sure they were right?

| 0% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |

Do you have any comments about this study? (Open response)
Do you have any comments regarding the [social stimuli]? (Open response)

COLLECTIVE IDENTIFICATION (ALL STUDIES)

- I feel a bond with [group]

- I feel solidarity with [group]

- I feel committed to [group]

- I am glad to be in [group]

- I think that [group] has a lot to be proud of

- It is pleasant to be [group]

- Being [group] gives me a good feeling

- I often think about the fact that I am [group]

- The fact that I am [group] is an important part of my identity

- Being [group] is an important part of how I see myself

- I have a lot in common with the average [group] member

- I am similar to the average [group] member

- [Group] members have a lot in common with one another

- [Group] members are very similar to each other

- I identify with other [group] people

Appendix B

82% of Americans Agree: NASA Should Be Closed

In a recent poll, 82% of Americans agreed that NASA's usefulness as an institution has run its course, and the time has come for NASA to be closed. NASA's symbolic relevance to Americans faded with the end of the space shuttle program, and their large tax-supported budget would be better spent elsewhere.

NASA's once-great space shuttle program ended in 2011. This program provided several generations of Americans an opportunity to achieve one of the ultimate dream jobs: to be an astronaut! But now that the shuttle program has been retired, Americans interested in visiting space will have to turn elsewhere. What went wrong? As with many public projects, governmental micromanaging and bureaucratic bloat have weighed NASA's programs down and led to its gradual decline. Many projects over the years have been abandoned due to spiraling costs and bureaucratic inefficiency.

Furthermore, it is unclear whether we, as a society, can afford a public space program. Nearly 18 billion dollars are spent on the space program every year. This is money that could be used to educate and train millions of people for the high-tech jobs of America's future. Employers already desperately seek qualified workers. Among those employers are private aeronautics companies, which are developing technologies that will allow America to remain at the forefront of space exploration. Private aeronautics companies are the future of space science and travel. NASA's enormous budget should be redirected to other things, including much-needed training and investment in the commercial aeronautics industry.

Phillip Adrian Snow

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March 8, 2012

Education

May, 2010	Bachelor of Arts
	Summa cum laude
	Major in Psychology
	Major in Mathematics
	Cleveland State University
August, 2009	Associate of Science
	Summa cum laude
	Cuyahoga Community College
August, 2009	Associate of Arts
	Summa cum laude
	Cuyahoga Community College
2003-2010	Overall GPA: 3.9

Research Interests

• Goals, motivation, and self-regulation
• Rationality
• Social Learning
• Philosophy of science

Research Experience

2010 to present   Research Assistant to Dominic Packer
- Supervised undergrad RAs
- Prepared materials for ongoing lab studies
- Designed and executed a series of studies examining uncertainty, goals, and social influence
- Performed data analyses
- Assisted in preparing a manuscript for publication

2010 to 2011   Research Assistant to Gordon Moskowitz

- Supervised undergrad RAs
- Prepared materials for ongoing lab studies
- Performed data analyses

2009 to 2010:   Research Assistant to Andrew Slifkin
- Supervised lab
- Prepared materials for ongoing lab study
- Designed and executed a series of studies examining external sources of feedback and constraint and 1/f noise
- Performed data analyses
- Assisted in preparing a manuscript for publication

2008 to 2010:   Research Assistant to Ernest Park
- Supervised undergrad RAs
- Prepared materials for ongoing lab studies

Publications (and in prep.)

Packer, D. J., Aoki, J. T., & Frazier, P. A. (in press). On the advantages and disadvantages of a low resolution snapshot. [Review of Blumberg, H., Kent, M. V., Hare, P. M., & Davies, M. F. (2012). Small group research: Implications of peace psychology and conflict resolution. New York: Springer]. *Peace and Conflict: Journal of Peace Psychology.*

Slifkin, A.B., Eder, J.R., & Frazier, P.A.; Manuscript in prep.

Posters and Talks

(Note: I have started using the name P. Adrian Frazier for publishing in the last couple years)

Frazier, P.A., Packer, D.J. (2012). Conformity to a Competent Majority Leads to Less Competent Outcomes: Majority Size Serves as a Cue to Competence When Tracked Over Time. Poster presented at Society for Personality and Social Psychology Conference in San Diego, California.

Frazier, P.A. (2012). Perspectives on Social Influence: An Interactive Synthesis. Presented to the psychology department at Lehigh University.

Frazier, P.A. & Allen, J.P. (2011). In the Pursuit of Goals: An Interactivist Approach. Presented at the Interactivist Summer Institute in Syros, Greece.

Frazier, P.A. (2011). When Good Groups are Actually Bad: Why Trusting the Opinions of Seemingly Competent Groups Might Lead You to Failure. Presented to the psychology department at Lehigh University.

Frazier, P.A. (2010). 1/f Noise and complexity in Human Cognitive Dynamics. Presented to the Cognition and Language area meeting in the psychology department at Lehigh University.

Snow, P.A.; Slifkin, A.B., Eder, J.R. (2010). Pink Noise in Human Behavioral Output. Poster presented at the Cleveland State University College of Science Research Day, Cleveland, OH.

Park, E. S.; Snow, P. A. & Thai, L. T. (2009, September). Safety in numbers: How group and individual decisions differ in response to threat. Presented at the McNair Research Symposium in

conjunction with the Cleveland State University College of Science Research Day, Cleveland, OH.

Park, E. S.; Snow, P.A. & Thai, L. T. (2009, September). Safety in numbers: How group and individual decisions differ in response to threat. Presented at the Undergraduate Research Awards Poster Session, Cleveland, OH.

Snow, P. A. (2008, February). A brief introduction to inner-product spaces and orthonormal bases. Talk presented at the Pi Mu Epsilon regional conference, Youngstown, OH.

Snow, P. A. (2008, February). A brief introduction to inner-product spaces and orthonormal bases. Talk presented for the Math Club at CSU, Cleveland, OH.

Ghatage, P.; Mignogna, E.; Snow, P. A. & Ergezer, M. (2008, May). Fourier Series. Poster presented at the Cleveland State University College of Science Research Day, Cleveland, OH.

Awards

2010	Presidential Fellowship, Lehigh University
2010	College of Science Outstanding Senior
2010	Outstanding Mathematics Student Award
2009	Undergraduate Summer Research Award ($1920)
2009	Outstanding Undergraduate Psychology Student of the Year.

Affiliations

o   Society for Theoretical and Philosophical Psychology

o   Society for Personality and Social Psychology

o   Social Psychology Network

o   American Psychological Association

o   Psy Chi National Honor Society in Psychology

o   Pi Mu Epsilon National Mathematics Honor Society, Ohio Eta Chapter

Professional Service

2011 – present	Graduate student representative to Lehigh University Cognitive Science Program
Summer 2009	Social Psychology Lab: Research Assistant

2009	Tutoring & Academic Success Center: Supplemental Instruction Leader
2007 – 2009	CSU Summer Honors Institute: Teaching Assistant
2008	CSU Mathematics Department: Assistant to the Precalculus Program
2005 – 2009	CSU Math Learning Center: Math Learning Assistant
2005	Math Learning Assistant: CSU Tutoring Center