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Abstract

Two studies explored how communication within subgroups affected cooperation in a nested social dilemma, in which self, subgroup, and collective interests were opposed. Contributions to the subgroup were higher when communication occurred within subgroups than when no communication or communication in the full collective occurred. More importantly, we hypothesized that asymmetric subgroup communication (i.e., when the focal subgroup communicates but the opposing subgroup does not) would increase subgroup cooperation more than symmetric subgroup communication because this difference between subgroups would heighten the salience of the subgroup boundaries, making the subgroup a more likely target of group identification. Consistent with this hypothesis, subgroup communication increased allocations to the subgroup the most when the opposing subgroup did not communicate. We discuss the implications of these results in relation to the social dilemma literature.

The search for determinants of cooperative behavior in social dilemmas has captivated researchers in psychology, sociology, economics, and political science (Ledyard, 1995). Cooperation is a problem because social behavior is often inherently dilemmatic: the choice to defect (i.e., to act in the interest of oneself) appears rational from an individual's perspective, but when all individuals choose defection, the group as a whole suffers. Hence, what is rational for the individual is irrational for the group. In game theoretic terms, the dominating strategy (defection) converges on a deficient equilibrium (Dawes, 1975). This situation is defined as a social dilemma.

Most research on social dilemmas examines how individuals choose between allocating resources to the self versus a single group (for reviews see Dawes, 1980; Messick & Brewer, 1983; Komorita & Parks, 1995). However, an important contextual feature of most real social dilemmas is the membership of each participant in multiple groups (Allen, Wilder & Atkinson, 1983; Simmel, 1955). Individuals often consider the interests of these multiple groups, along with self-interest, when deciding how to allocate their time, money, or other resources (Thomas-Hunt & Gruenfeld, in press). The dilemmatic nature of many resource allocation decisions increases when the interests of these multiple groups diverge. Thus, behavior that appears to be self-interested when examined within the confines of the immediate group context may actually be cooperation with an unobserved group (Homans, 1950). For example, an individual who does not act in the best interest of the whole organization may be cooperating fully with a department or other subgroup within the organization, rather than acting out of self-interest. However, if cooperation with the whole organization is the only factor studied, the individual may appear to be acting in a self-interested manner.

This observation highlights a facet of social dilemmas that has received little attention: cooperation with one group may be at odds with both individual self-interest and cooperation with other groups (Homans, 1950; Simon, 1945). This is often the case in organizations, where individual employees belong to multiple groups -- for example, those defined by function,

hierarchical level, demographics and physical location -- that must cooperate to achieve superordinate organizational goals, while simultaneously competing for scarce resources (Mannix, 1993), including budgets, personnel, projects, promotions, and managerial attention (Ocasio, 1993). This structural configuration means that individuals must grapple with the trade-offs associated with self-interest, subgroup interests, and the interests of the organization as a whole.

When subgroups are nested within a larger collective, multiple group membership can have an interesting constellation of psychological effects (Brewer, 1991; Brewer & Schneider, 1990; Yoon, Baker & Ko, 1994; Lawler, 1992; Albert & Whetten 1985; Huo, Smith, Tyler & Lind, 1996). One feature that has received attention is that members of distinct subgroups can view one another as either out-group or in-group members, depending on whether the subgroup or collective boundary is used as a basis for social categorization (Turner, 1987; Kramer, 1991; Gaertner, Mann, Dovidio, Murrell, & Pomare, 1990). This distinction is important because relations among in-group members tend to be more trusting and cooperative than relations between in-group and out-group members (Brewer, 1979; Messick & Mackie, 1989). Thus, in a nested social dilemma, choosing to cooperate is a more complex decision than has previously been portrayed because decision makers must decide not only <u>whether</u> to cooperate, but <u>with whom</u> to cooperate. Further, decision makers may be affected by the characteristics of both their own subgroup and opposing subgroups to which they do <u>not</u> belong (Schwartz-Shea & Simmons, 1990).

The purpose of this paper is to examine how participants in a nested social dilemma make these decisions. In the nested social dilemma paradigm (Wit & Kerr, 1994), each subject belongs to both a subgroup and the larger collective, and can allocate resources (e.g., points,

dollars) among personal, subgroup, and collective accounts. Allocations to the personal account are returned directly to the subject, allocations to the subgroup are multiplied by a constant and divided equally among all subgroup members, and allocations to the collective account are multiplied by a larger constant and divided among all members of the collective. Thus, subjects receive a payoff consisting of the resources they allocated to themselves, an equal share of the resources allocated to the subgroup, and an equal share of the collective resource allocation. A dilemma arises because the rational economic choice for each individual is to allocate his or her entire share of resources to his or her personal account, but if all individuals do this, all will have lower outcomes than if all had contributed to the subgroup or collective levels. The same logic holds at the subgroup level, as allocations to the subgroup maximize the subgroup's joint profit, but not the collective joint profit.

Communication in Nested Social Dilemmas

In research on social dilemmas, one of the strongest determinants of cooperation is communication. Specifically, cooperation increases when group members are allowed to communicate (Dawes, McTavish & Shaklee, 1977; Caldwell, 1976; Orbell, van de Kragt, & Dawes, 1988; Bornstein & Rapoport, 1988; Isaac & Walker, 1988; Ostrom & Walker, 1991; Kerr & Kaufman-Gilliland, 1994; Chen & Komorita, 1994; Bouas & Komorita, 1996). In a traditional social dilemma, this means that allocations to the collective account are greater, and allocations to the personal account are smaller, when players are allowed to communicate than when they are not. In a nested dilemma, communication can occur at both subgroup and collective levels, and allocations can be distributed among personal, subgroup, and collective accounts. This configuration of nested group boundaries creates the potential for asymmetric subgroup communication to occur, where members of one subgroup communicate while members of the other subgroup do not. Researchers have studied neither the effects of communication at two different levels when all three allocation options are available nor the effects of asymmetric subgroup communication.

Despite the preponderance of social dilemma research comparing full communication to

the absence of any communication within a particular group, communication may be present or absent in a variety of locations within a collective, with subgroups frequently demarcating communication boundaries (Homans, 1950). Communication may be more likely to occur within subgroups rather than among all members of a collective because it is simply easier to coordinate communication among a smaller rather than larger number of people (Brewer & Schneider, 1990). Members of the same subgroup are also likely to be in closer proximity to each other than to members of different subgroups (Merton, 1968). Concurring with this notion, Braver and Wilson (1986: 53) noted that communication within subgroups, rather than either communication within an entire collective or no communication, may be a "more appropriate analog for real-life public goods situations" because people are typically neither restricted from talking to anyone nor feasibly able to talk to everyone.

Subgroup communication in real dilemmas is frequently asymmetric. Unequal volumes of subgroup communication may occur because of different norms among the subgroups (Trice & Beyer, 1993), unequal proximity among the members of different subgroups (Merton, 1968), or random variation. To study this phenomenon, we explore a condition in which the members of one subgroup communicate with each other while the members of the other subgroup do not, with each subgroup having full knowledge of the other's communication status. To our knowledge, no one has studied the effect of the presence or absence of communication in one subgroup on the decisions of people in another subgroup, in a dilemma in which the members of both subgroups belong to the same collective and are therefore interdependent. Nevertheless, theoretical mechanisms from the social dilemma literature provide two plausible explanations for how the communication status of one subgroup may affect decisions in another subgroup. Before developing hypotheses for asymmetric subgroup communication we first predict the effects of communication in a focal subgroup without considering the opposing subgroup.

Subgroup Communication

Within-subgroup communication may lead to higher allocations to the subgroup by increasing identification with the subgroup and providing the subgroup members the opportunity to make commitments to

cooperate (Dawes, van de Kragt, & Orbell, 1990; Kerr & Kaufman-Gilliland, 1994; Komorita & Parks, 1996). However, both of these mechanisms may be more complex in nested social dilemmas because of the existence of multiple group boundaries.

Communication in a single-group dilemma may cause members to shift their self-categorization from the individual to the group level, such that depersonalization of the self-perception occurs (Turner, 1987). When this happens, greater weight is attached to group outcomes, leading to decisions that benefit the group (Brewer & Kramer, 1986; Kramer & Brewer, 1984; Orbell et al., 1988). Similarly, communication within a subgroup may shift subgroup members' self-categorization from the individual to the subgroup level. In a nested social dilemma, however, the collective boundary is a third readily available alternative for self-categorization. Like the subgroup boundary, the collective boundary encircles all the subgroup members involved in the discussion, is highly relevant to the subjects' forthcoming allocation decision, and is likely to be explicitly considered during the discussion. However, given the interdependence between the subgroups caused by their shared membership in the collective, members of a communicating subgroup may discuss how members of the opposing subgroup ("they") are likely to allocate their resources. The subgroup rather than the collective or the individual is likely to be the referent, such that the term "we" refers to fellow subgroup members (Dawes et al., 1990). Such discussion should cause members to use the subgroup boundary, rather than the collective boundary or the individual level, as the basis for social categorization (Wilder, 1986; Gaertner, Mann, Murrell, & Dovidio, 1989; Gaertner, Mann, Dovidio, Murrell, & Pomare, 1990). This cognitive categorization of the aggregate should set the stage for discussion to increase identification with the subgroup, increasing the importance placed on subgroup welfare compared to either collective or personal welfare (Dawes et al., 1990).

Along with enhancing subgroup identification, discussion within subgroups provides members with the opportunity to make commitments to cooperate, and may even elicit such commitments (Orbell et al., 1988; Kerr & Kaufman-Gilliland, 1994). The making of public commitments can increase trust in mixed motive contexts because members' actions appear predictable, relative to conditions in which no such commitments occur. In a nested social dilemma, members have the option of committing to cooperate with *either* the subgroup or

collective. Subgroup discussion may make the subgroup a more likely target for such commitments for two reasons. First, promises and commitments to cooperate expressed during communication may invoke a norm of reciprocity (Gouldner, 1960). If this is true, such norms should increase cooperation among those participants who communicate together. Specifically, subgroup communication may elicit mutual promises to cooperate within the subgroup, but not necessarily with the larger collective because members of different subgroups do not have the opportunity to reciprocate promises across subgroups. Second, commitments increase cooperation most effectively when all group members commit to cooperate (Orbell et al., 1988; Kerr & Kaufman-Gilliland, 1994; Bouas & Komorita, 1996). Commitments by only a subset of group members are significantly less effective for increasing cooperation. In a nested social dilemma, it is impossible for all members of the collective to commit to each other to cooperate when discussions occur only within subgroups. It is relatively simple, on the other hand, for subgroup members to commit to each other to contribute to the subgroup account.

Based on this reasoning, both group identification and commitment explanations lead to the prediction that subgroup communication will increase cooperation with the subgroup:

H1a: Allocations to the subgroup level will be higher when communication occurs among members of the subgroup than when communication occurs among all members of the collective or when no communication occurs.

Braver and Wilson (1986) provide an alternative hypothesis for the effect of subgroup discussion. They proposed that subgroup communication may provide a mechanism for coordinating allocation decisions to achieve the optimal collective outcome. Providing support consistent with this coordination hypothesis, Braver and Wilson (1986) found that subgroup communication caused higher cooperation with the collective than no communication. However, they found this in a binary-choice public goods problem with a specific provision point that did not

include a subgroup allocation option. Nevertheless, it is plausible that discussion in a subgroup may allow the subgroup members to coordinate their decisions to achieve the maximum return for the collective rather than the subgroup. Subgroup members may expect the members of the other subgroup to similarly direct their efforts to achieve the maximum collective benefit. Because we would not expect subgroup communication to provide any coordination advantage over collective communication, we restrict hypothesis 1b to comparing subgroup communication to a control condition with no communication:

H1b: Allocations to the collective level will be higher when communication occurs among subgroup members than when no communication occurs.

It is important to note that the purpose of our studies is not to establish whether group identity, commitment elicitation, or enhanced coordination is the strongest mediator of the relationship between communication and cooperation (for research in this direction see Kerr & Kaufman-Gilliland, 1994; Bouas & Komorita, 1996). Instead, our primary purpose is to determine if and in what direction communication at varying levels of inclusiveness affects allocation decisions in a nested social dilemma. We elaborate the roles of identification and commitments in nested dilemmas to provide a conceptual basis for the direction of the hypotheses, rather than to disentangle which mechanism might have the stronger effect. In fact, commitments and identification may work in concert, each making the other more likely, together influencing decisions in the same direction (Orbell et al., 1988).

Asymmetric Versus Symmetric Subgroup Communication

Hypotheses 1a and 1b pertain to the presence versus absence of communication within a focal subgroup. We now consider the effect of communication in the opposing subgroup on allocations made by subjects in the focal subgroup.

Social categorization processes may play an especially prominent role in comparing symmetric and asymmetric subgroup communication. Turner (1985; Turner et al., 1987) developed self-categorization theory around the idea that perceived similarities among people are used as the basis for social categorization. People

determine who is similar by judging the relative similarities and differences between members of a particular set of people and those outside the set. Category formation is thus based on intraclass similarities and interclass differences (Rosch, 1978). Asymmetry (i.e., differences) between the subgroups in their ability to communicate may heighten the salience of the subgroup boundary beyond the level caused by the communication itself (Turner, 1987). This is consistent with social identity theory's assertion of a positive relationship between intergroup differentiation and ingroup identification (Tajfel, 1982; Hogg & Abrams, 1988). Comparatively, when both subgroups communicate their symmetrical ability to do so constitutes a similarity between them, resulting in a relatively less salient intersubgroup boundary (Kramer & Brewer, 1984).

To the extent that increased subgroup allocations occur because communication within a focal subgroup causes the subgroup boundaries to be used as the basis for subjects' social categorizations, allocations to the subgroup should be greatest when the opposing subgroup does not communicate than when it does. These two factors (i.e., communication in one subgroup and the absence of communication in the other subgroup) might have a synergistic effect if the communicating subgroup uses their communication opportunity to explicitly discuss this difference. While subjects in the single noncommunicating subgroup should similarly perceive the distinction between the subgroups caused by asymmetric communication, they have no way to coordinate, commit to each other, or develop a sense of solidarity because they cannot communicate. Taken together, these reasons suggest that allocations to the subgroup should be greatest by subgroup members who communicate with knowledge that the subgroup with whom they are interdependent cannot communicate. More formally:

H2a: Allocations to the subgroup will be highest in subgroups that 1) communicate, and 2) know that the opposing subgroup is not communicating.

A competing explanation for the effect of asymmetric subgroup communication is suggested by the outgroup schema hypothesis (Hoyle, Pinkley, & Insko, 1989; Insko, Schopler, Hoyle, Dardis, & Graetz, 1990). Members of the focal subgroup may be more likely to categorize the opposing subgroup as a distinct outgroup when the members of the opposing subgroup have their own discussion (compared to when they do not communicate). People have schemas of outgroups that include an expectation of competitive behavior (Hoyle, Pinkley, & Insko, 1989; Insko, Schopler, Hoyle, Dardis, & Graetz, 1990). This expectation may cause a fear of being exploited, and a subsequent competitive response to match the expected competitiveness of the outgroup. This competitive response

to an outgroup, triggered by the knowledge that the opposing subgroup members are having their own discussion, may make it more likely for subgroup members to cooperate with each other (Homans, 1950; Tajfel, 1982; Rabbie, 1982). This leads to the following prediction:

H2b: Allocations to the subgroup will be highest in subgroups that 1) communicate, and 2) know that the opposing subgroup is also communicating.

The competing nature of hypotheses 2a and 2b reflects the potential for communication in an opposing subgroup to generate various psychological responses from the members of the focal subgroup. On one hand, communication in both the focal and opposing subgroups may constitute an important similarity shared by the two subgroups. If so, the salience of the subgroup boundary should be strongest when this similarity is broken (i.e., when the focal subgroup communicates and the opposing subgroup does not). On the other hand, communication occurring among members of an opposing subgroup may lead members of the focal subgroup to categorize them as a distinct outgroup, concurrently strengthening the salience of the focal subgroup boundary because of perceived intersubgroup competition (despite the similarity of the two subgroups both communicating).

Supplemental Hypotheses

Prior studies have not examined the effects of communication on allocation decisions when subjects face three distinct allocation options directly corresponding to the three levels of distinct interests (individual, subgroup, and collective). In prior research, subjects could allocate to either the individual or collective levels, with no distinct subgroup option (e.g., Braver & Wilson, 1986; Kramer & Brewer, 1984;), or to the individual or subgroup level, with no distinct collective option (e.g., Bornstein, Rapoport, Kerpel, & Katz, 1989; Schwartz-Shea & Simmons, 1990). Wit and Kerr (1994) provided subjects with three allocation options, but did not study communication. By extending the reasoning and evidence from prior research to nested social dilemmas, we expected the following results for allocations to personal and collective accounts.

First, defection (allocations to the personal account) should be lower in conditions with communication than with no communication (c.f., Bouas & Komorita, 1996). Second, allocations to the collective account should

be higher when full-group communication occurs than when communication only occurs within subgroups (Bornstein et al., 1989; Bornstein, 1992). Third, if the making of specific promises to cooperate contributes to communication effects, such promises should lead to cooperation in the decision about which promises were made (i.e., cooperation should be decision-specific). However, unanticipated decisions that could not be included in the discussion may not be affected by the making of specific commitments. On the other hand, the effects of identification on cooperation should persist over time and not subside simply because the focal decision has been made.

Study Overview

The hypotheses were examined in two nested social dilemma experiments. In each experiment, subjects participated in three rounds of allocation decisions. In each round, they were given a set amount of money to allocate among personal, subgroup, and collective accounts. Round 1 decisions were made independently, without communication, and without knowledge that communication might occur. After round 1, communication conditions were manipulated and round 2 decisions were completed. After round 2, subjects were informed that there would be a third "surprise" round of allocation decisions. However, they were not allowed any further communication before completing round 3. In addition to making the allocation decisions, participants reported their expectations for others' allocations after each round.

In Study 1, round 2 decisions were made under one of five communication conditions: (a) no communication, (b) communication in other subgroup, but not in own subgroup, (c) communication in own subgroup, but not in other subgroup, (d) communication in both subgroups, or (e) communication in collective. In all conditions, members of both subgroups were in each others' physical presence while making their allocation decisions. Study 2 examined whether the effects of subgroup communication observed in Study 1 would replicate under conditions in which the two subgroups were not in each others' physical presence, a prevalent circumstance among real subgroups.

STUDY 1

Method

Subjects. We recruited 228 (96 males and 132 females) undergraduate business students from a large southwestern university to participate in Study 1. In return for their participation, each received extra credit in the course from which they were recruited and also kept the amount of money that they earned from making resource allocation decisions within the experiment. Subjects ranged in age from 19 - 37, with a mean age of 21.5.

Design. Our design consisted of one between-subjects factor with five communication conditions. Subjects were in a condition in which either 1) no communication occurred among any of the participants in their collective; 2) no communication occurred in their subgroup, but communication did occur in the other subgroup; 3) communication occurred in their subgroup, but not in the other subgroup; 4) communication occurred within each subgroup; or 5) communication occurred among all members of the collective. Note that conditions 2 and 3 occurred in the same experimental session, while conditions 1, 4, and 5 were run in separate sessions. Condition 1 was run with 48 subjects, condition 2 with 36, condition 3 with 36, condition 4 with 66, and condition 5 with 42. The primary dependent variables were the allocation decisions made by subjects, as described below.

Procedure. Six people of the same sex participated in each experimental session.[1] As subjects arrived, they were seated at separate tables around the edge of the room and not permitted to speak with one another. Once all were present, the experimenter randomly assigned

[1] Seven to nine subjects were scheduled for each session to ensure that at least six showed up; the first six who arrived participated in the experiment. Students who arrived later were given the option of booking for a later time or participating individually in a separate experiment in another room. In the few cases where six people did not show up, one or two confederates (as needed) acted as participants. When this occurred, we ran a condition in which no communication occurred among subjects, so that subjects did not

subjects to one of two three-member subgroups by having each participant draw a slip of paper that was one of two colors. The experimenter then asked students to rearrange themselves so that the members of each subgroup were seated at the three tables on the same side of the room. Each table had a unique letter prominently displayed to designate each individual.

In a brief verbal overview, the experimenter then explained that subjects 1) were members of the subgroup to which they had been assigned as well as members of the larger collective made up of all six participants in the room; 2) would be making individual decisions about how to allocate money and would, at the end of the experiment, be paid an amount of money that would be based on the decisions made during the session; and (3) would never see the decisions made by any other participants. The experimenter then handed out a more thorough written description of the exercise, provided subjects with a chance to read this, and then verbally explained the procedure subjects would follow in the experiment.

Each subject was endowed with six dollars. Their task was to decide how to allocate this money among three accounts. The three accounts included a private account (each subject had a private account), a subgroup account (each subgroup had its own subgroup account), and a collective account (one collective account for the six-person collective). Dollars allocated to the collective account would be multiplied by 4, and the resulting pool of money divided equally among the six members of the collective. Dollars allocated to each subgroup account would be multiplied by 2.5, and the resulting pool of money in each subgroup account divided equally among the three members of that subgroup. Dollars allocated to the private account would be multiplied by 1 and kept by the individual. At the end of the experiment, subjects were paid all of the money in their private account, 1/3 of the money in their subgroup account, and 1/6 of the

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interact with a confederate. The data from confederates were discarded.

money in the collective account.[2]

The experimenter then highlighted the two essential features of this payoff structure. First, regardless of how others allocated their money, an individual subject always maximized the amount of money she received by allocating her money to the private account. Second, if everyone did this, the total amount of money that participants made as a group was minimized. So, for each $1.00 that a participant allocated to the individual account, subgroup account, or collective account, she received back $1.00, $.83, or $.67 respectively. She also received $.83 of each dollar that others allocated to the subgroup account and $.67 of each dollar others allocated to the collective account. This payoff structure created a nested social dilemma in which self, subgroup, and collective interests were at odds. Subjects were told that their allocation decisions were completely confidential and anonymous; no other participant would ever know how they allocated their money. They were assured at the beginning of the session that payment would be made in private as they were excused from the room individually so that others' decisions could not be ascertained when payment was given.

After reading and listening to a verbal explanation of the instructions, subjects completed a trial round of calculations so the experimenter could ensure they understood how the payoff structure worked. Mistakes were corrected and reviewed with the subject until the experimenter was satisfied that each subject understood the payoff structure. Subjects were told that there would be two rounds of resource allocation decisions, and that in each round they would each decide how to allocate the six dollars among the three accounts. The amount of their payment for participating in the experiment would be based on the decisions made by participants in one of the two rounds, to be randomly selected at the end of the session. Subjects then completed round 1 decisions by allocating six dollars among their individual, subgroup, and collective

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[2] With these multipliers and a collective of six people, the return for each dollar invested is 1 at the individual level, .833 (2.5 / 3 people) at the subgroup level, and .667 (4 / 6 people) at the collective level. Thus, the return changes by the same increment when moving from the individual to the subgroup level (1 - .833 = .167) or from the subgroup to the collective level (.833 - .667 = .166).

accounts. After the decision forms for round 1 were collected, subjects completed a questionnaire indicating how they believed that members of their own subgroup and the other subgroup had allocated their six dollars among the three accounts in round 1. At this point, round 1 was complete and the communication manipulation was implemented. Subjects received no feedback about decisions until payment was disbursed at the conclusion of the experiment (and then only the total payoff amount for a particular subject was given to that subject). Subjects in all conditions had no knowledge that communication might occur until it actually occurred after round 1.

In the no-communication condition, participants were told that the second round of decisions would be identical to the first. They were not allowed to communicate with others before making their individual decisions in round 2, nor was any mention of communication made before proceeding directly to the round 2 decisions. In the own-subgroup and other-subgroup communication conditions, members of one subgroup (chosen randomly) were given ten minutes to talk to each other before making individual decisions while members of the other subgroup were not permitted to communicate. The subgroup members who communicated (i.e., the own-subgroup condition) were allowed to discuss any topic (including the decision they faced in round 2) except individual decisions made in round 1. Other than this constraint, communication was an unstructured period of informal group discussion. The experimenter left the room while the discussion took place. The subgroup that was not allowed to communicate (i.e., the other-subgroup condition) was taken to a separate room where an experimenter and the participants waited for the other subgroup to talk. Members of each subgroup knew whether the other subgroup was allowed to communicate. In the both-subgroup communication condition, all subjects were provided with the opportunity to communicate with fellow subgroup members for

ten minutes before making individual decisions. The two subgroups met in different rooms where they could neither observe nor hear the other subgroup's discussion. In the full-group communication condition, all six participants were provided with ten minutes to communicate with each other. In this condition, subgroups did not meet separately. All communication occurred at a table in the middle of the room. After communicating, subjects moved back to their individual tables around the edge of the room.

At this point, subjects completed round 2 resource allocation decisions, again allocating six dollars among the three accounts. In every condition, subjects were told that decisions from one of the two rounds would be randomly selected to determine how much they would each be paid. Responses were collected and participants completed a second questionnaire asking how they believed other members of their own subgroup and the other subgroup allocated their six dollars among accounts in round 2.

After responses for round 2 were collected, participants were surprised with a third round of decisions, and were informed that it would be added to the first two rounds when selecting a round for making payments. It was emphasized that their decisions in each round were independent of their decisions in other rounds. Participants were not permitted to communicate with each other between round 2 and round 3. The third round of decisions was identical to the first and second rounds; subjects allocated their six dollars among the individual, subgroup, and collective accounts. After round 3 decision forms were collected, subjects completed a final questionnaire that included expectations for how the members of the subject's own and the other subgroup allocated their money in round 3. Subjects were then debriefed by one experimenter while another experimenter calculated payments for individual participants based on their decisions in one of the three rounds. Subjects were individually paid and dismissed through an

adjoining room so that no one could see how much another received.

Analyses. To test our hypotheses, we conducted a doubly multivariate repeated measures analysis of variance (MANOVA) (Bray & Maxwell, 1985; Stevens, 1996). The multiple dependent variables were subjects' allocations to each of the three accounts. Because subjects made these allocation decisions in each of three rounds, round was a repeated measure. Communication condition was a between-subjects factor with five levels. Because allocations to the collective, subgroup, and private accounts were linearly related, the value of any one allocation could be determined with certainty once the values of the other two allocations were known. Because of this feature of the three dependent variables, including all three simultaneously in a MANOVA causes the computational procedures to break down (see Harris, 1985, pp.109-115 for a full explanation). To overcome this problem, only two of the three dependent variables were included simultaneously. The multivariate statistical tests are identical regardless of which two of the three dependent variables are included because the third provides completely redundant information (i.e., there are only two hypothesis degrees of freedom for the multivariate test). However, the three dependent variables were not perfectly correlated, as are allocations in a dilemma with two choice options, so that knowledge of the univariate test statistics for any two of the dependent variables does not provide certain knowledge of the test statistics for the third dependent variable. Thus, we report the univariate tests for all three dependent variables (see Insko, Schopler, Drigotas, Graetz, Kennedy, Cox, and Bornstein (1993) for a similar treatment of linearly related dependent variables).

Results

The overall MANOVA revealed significant multivariate main effects for round ($F(4, 220) = 4.71$, $p<.001$) and communication condition ($F(8, 442) = 3.34$, $p<.001$). The main effect for

round was significant in the presence of linearly related dependent variables within each round because only two of the three dependent variables were simultaneously considered in this multivariate test, and allocations to each account varied across rounds. The univariate tests for the main effect for round were significant for allocations to the collective account ($F(2, 446) = 3.20$, $p<.05$) and private account ($F(2, 446) = 5.81$, $p<.01$), and marginally significant for allocations to the subgroup account ($F(2, 446) = 2.64$, $p<.08$). The univariate tests for the main effect for communication condition were significant for allocations to the collective account ($F(4, 223) = 3.27$, $p<.02$), subgroup account ($F(4, 223) = 3.21$, $p<.02$), and private account ($F(4, 223) = 3.60$, $p<.01$). Rather than describing these main effects further, we now turn to the interaction effect between round and communication condition. This interaction was of more interest than either of the main effects for testing the hypotheses because we manipulated communication between the first and second rounds.

The MANOVA revealed a significant multivariate interaction effect between round and communication condition ($F(16, 874) = 5.46$, $p<.001$). The univariate tests for this interaction were significant for allocations to the collective account ($F(8, 446) = 8.48$, $p<.001$), subgroup account ($F(8, 446) = 2.31$, $p<.02$), and private account ($F(8, 446) = 8.16$, $p<.001$). To further discern the nature of this interaction effect, we conducted within-subjects contrasts for subsets of the three rounds. We considered round 1 to be a 'control round' to which we could compare allocations in round 2 and round 3. Given two contrast degrees of freedom for the three rounds, our first contrast tested the difference in allocations by communication condition between round 1 and round 2, and our second contrast tested the difference in allocations by communication condition between round 1 and round 3. For the first contrast, the interaction between round (i.e., round 1 and round 2) and communication condition was significant for allocations to the

collective account ($F(4, 223) = 12.64$, $p<.001$), subgroup account ($F(4, 223) = 2.80$, $p<.03$), and private account ($F(4, 223) = 14.19$, $p<.001$). This was also true for the second contrast, where the interaction between round (i.e., round 1 and round 3) and communication condition was significant for allocations to the collective account ($F(4, 223) = 7.86$, $p<.001$), subgroup account ($F(4, 223) = 2.77$, $p<.03$), and private account ($F(4, 223) = 7.19$, $p<.001$).

Because these tests of the interaction effects analyzed changes (i.e., differences) in allocations by communication condition across rounds, we interpreted these effects by examining the increases or decreases in allocations from round 1 to round 2, and from round 1 to round 3. We conducted planned contrasts to test the hypotheses, and followed these with Newman-Keuls post hoc pairwise comparisons to further discern which changes in mean allocations among the five communication conditions were significantly different. These mean increases and decreases and the post hoc comparison results are reported in Table 1.

Hypotheses 1a predicted that subgroup communication, compared to all other conditions, would increase allocations to the subgroup, while hypothesis 1b predicted that subgroup communication would increase allocations to the collective compared to no communication. To test hypothesis 1a, we conducted a planned contrast to compare mean subgroup allocations in the two conditions with subgroup communication (own-subgroup and both-subgroup conditions) to the three conditions without subgroup communication (no-communication, other-subgroup, and full-group conditions). As predicted, subgroup allocations increased significantly more in the conditions with subgroup communication ($M = .60$) than without subgroup communication ($M = -.11$) (contrast significant at $p<.01$). To test hypothesis 1b, we conducted a planned contrast to compare mean collective allocations in the two conditions with subgroup communication (own-subgroup and both-subgroup) to the control condition (no-communication). This hypothesis was also supported, as collective allocations increased slightly in the subgroup communication conditions ($M = .06$), while collective allocations decreased in the control condition ($M = -.86$) (contrast significant at $p<.03$).

Hypothesis 2a predicted that subgroup allocations would be highest in subgroups that communicated while

the opposing subgroup did not communicate, whereas hypothesis 2b predicted that subgroup allocations would be highest in subgroups that communicated while the opposing subgroup also communicated. To test these hypotheses, we conducted two planned contrasts in which we compared subgroup allocations in a single subgroup communication condition to the mean subgroup allocation across the other four conditions. Hypothesis 2a was supported, as subgroup allocations in the own-subgroup condition increased significantly more (M = .84) than did subgroup allocations in the other four conditions (M = .09) (contrast significant at $p<.05$). As shown in Table 1, post hoc pairwise comparisons revealed that this effect was driven by the significant difference in subgroup allocations between the own-subgroup and full-group conditions. Hypothesis 2b was not supported, as subgroup allocations in the both-subgroups condition did not increase significantly more than in the other four conditions.

We also tested the supplemental hypotheses. The first was that defection would decrease more in conditions in which communication occurred than in conditions in which no communication occurred. The pairwise comparisons revealed strong support for this hypothesis, as defection in the three conditions with communication (M = -1.00; M = -0.47; M = -1.67) decreased significantly more than in both the control condition (M = 0.69) and the other-subgroup condition (M = 0.53). For allocations to the collective account, the prediction that allocations would increase more in the full-group communication condition than in either of the conditions with subgroup communication was also strongly supported. Pairwise comparisons revealed that allocations to the collective account increased significantly more in the full-group communication condition (M = 2.36) than in either the own-subgroup condition (M = 0.16) or the both-subgroup condition (M = 0.00).

Our final supplemental hypothesis concerned whether communication effects would persist and influence unforeseen decisions in round 3. As seen in Table 1, the pattern of differences between round 1 and round 3 were generally similar to the differences between round 1 and round 2. Defection continued to decrease more in the conditions with communication (M = -1.00; M = -0.33; M = -0.93) than in those with no communication (M = 0.73; M = 0.17), with the single exception that defection was no longer significantly different between the other-subgroup

and the both-subgroup conditions. As in round 2, allocations to the collective increased significantly more in round 3 in the full-group condition (M = 1.90) than in either the own-subgroup (M = 0.59) or both-subgroup (M = 0.29) conditions. Subgroup allocations in round 3 exhibited a pattern identical to round 2, as allocations in the own-subgroup condition (M = 0.41) increased significantly more than in the full-group condition (M = -0.98), but allocations in the both-subgroup condition (M = -0.33) fell between these two extremes. These differences suggest that the effects of communication persisted beyond the decision which was discussed.

Complementary dependent variables.

We measured subjects' expectations for allocations by the members of their own subgroup and by the other subgroup for each round of decisions. We submitted these expectations measures for the three accounts for each round to the same doubly multivariate repeated measures analysis of variance we used for the allocation dependent variables. For expectations of allocations by the subject's own subgroup members, there were significant multivariate effects (all at $p<.001$) for round, communication condition, and the interaction between round and communication condition. The univariate tests for the interaction effect, which is of greatest interest, were significant for allocations to the collective, subgroup, and private accounts (all at $p<.001$). Further, the within-subjects contrasts were significant for allocations to all three accounts for changes between rounds 1 and 2 and between rounds 1 and 3 (all at $p<.01$). We ran the same tests for subjects' expectations for members of the *other* subgroup, and found the same patterns of significant effects as those reported above for expectations of the subjects' own subgroup members. For both sets of expectations, we conducted Newman-Keuls post hoc pairwise comparisons to determine which communication conditions were significantly different.

Expectations for allocations to personal accounts. As noted earlier, the results of our hypothesis tests revealed that allocations to the personal account decreased in all three conditions

in which communication occurred. Subjects expected this to occur. Specifically, subjects in the full-group, both-subgroup, and own-subgroup communication conditions expected a decrease in personal-account allocations by members of their own subgroup (across all three conditions: M = -1.46). In contrast, subjects in conditions where no communication occurred expected others in their own subgroup to increase personal-account allocations, and this was true for both other-subgroup communication and no-communication conditions (M = 0.26). Results of Newman-Keuls tests showed that expectations for all three communication conditions differed significantly from expectations for the two no-communication conditions, but expectations within each category did not differ significantly from one another. However, subjects expected members of the other subgroup to behave differently from members of their own subgroup. Collapsing across all communication conditions, subjects expected a decrease in personal-account allocations (M = -1.12) by members of the other subgroup. However, subjects in the full-group communication condition expected that decrease to be significantly greater (M = -1.97) than subjects in any other condition (M = -0.50), whose expectations did not differ statistically from one another.

Expectations for allocations to the collective account. The previously reported finding that allocations to the collective account increased more in full-group than subgroup-communication conditions is also supported by expectations data. When judging the behavior of their own subgroup members, subjects in the full-group communication condition expected a significantly greater increase in allocations to the collective account (M = 3.23) than subjects in either condition in which only subgroup members communicated (M = 0.63). However, whereas subjects in the both-subgroup communication condition expected an increase in collective-account allocations (M = 1.03), subjects in the own-subgroup condition expected a slight

decrease in collective-account allocations (M = -.10). The pattern of expectations for other-subgroup members' behavior was identical: subjects in the full-group condition expected a greater increase in allocations to the collective account (M = 3.10) than subjects in the both-subgroup condition (M = .80), but subjects in the own-subgroup condition expected a decrease in collective-account allocations (M = -.17).

Expectations for allocations to subgroup accounts. Allocation results suggested that subjects in the own-subgroup communication condition increased contributions to the subgroup account more than subjects in the full-group communication condition. With regard to their own subgroup members, subjects expected this to occur (M = 1.52 and M = -1.37 in own-subgroup and full-group conditions, respectively). In addition, subjects expected their own subgroup members to increase subgroup-account allocations significantly more in the own-subgroup condition (M = 1.52) than the both-subgroup condition (M = 0.14). This pattern of means provides clear evidence that asymmetric subgroup communication elicited different expectations than symmetric subgroup communication. Expectations for allocations to the subgroup by members of the other subgroup were similar in that the full-group condition resulted in decreased expectations (M = -1.13) compared to all other conditions. However, expectations in the own-subgroup (M = .58) and both-subgroup (M = .12) conditions were not significantly different.

Discussion

Our findings demonstrated that the specific effects of communication within a nested dilemma depend on the group level at which communication occurs. Whereas full-group communication elicited the greatest increase in allocations to the collective account, subgroup communication elicited the greatest increase in allocations to the subgroup account. Consistent with prior research, communication in all conditions reduced the incidence of defection, defined

as allocation to the personal account. More importantly, these results provide the first evidence that communication in one subgroup affects allocation decisions in another subgroup. The pattern of this effect appears to be that cooperation with the subgroup is highest when subgroup members communicate while knowing that the opposing subgroup is not communicating. This pattern was observed in round 2 decisions, about which participants communicated, as well as round 3 decisions, which were unanticipated and therefore not explicitly discussed.

Although differential effects of subgroup and full-group communication have been observed in prior research, the specific nature of these effects in a nested social dilemma involving trade-offs among individual, subgroup and collective interests has not been previously demonstrated. Communication in the full collective had its typical effect of dramatically increasing cooperation with the collective compared to all other conditions. Because subjects were allowed to allocate resources among all three of these levels, we were able to discover that subgroup communication increased both subgroup allocations (compared to all other conditions) and collective allocations (compared to the no-communication control conditions). However, subgroup communication was far less effective than full-group communication at increasing collective contributions. Nevertheless, past studies have overlooked the possibility of both subgroup and collective benefits ensuing from subgroup communication because these studies have provided subjects with only two allocation options (defection versus cooperation with a single group).

The most intriguing finding from Study 1 is that the effects of communication on cooperation within subgroups were moderated somewhat by the consistency of communication conditions between subgroups. Specifically, a planned contrast showed that allocations to the subgroup were higher when communicating subgroup members had knowledge that the other subgroup was not communicating (i.e., under asymmetric subgroup

communication conditions) than across the other conditions. Post hoc comparisons further revealed that the own-subgroup communication condition was the only condition in which subgroup allocations were significantly greater than in the full-group communication condition. Moreover, subjects in the own-subgroup communication condition expected a significantly greater increase in subgroup allocations by members of their own subgroup than subjects in any other condition.

This pattern suggests greater support for hypothesis 2a than hypothesis 2b; subgroup communication appears to have the strongest effect on subgroup cooperation when the opposing subgroup does not communicate. This condition may have highlighted a key difference between the subgroups and consequently heightened ingroup-outgroup distinctions. This distinction may have been especially salient in Study 1 because the opposing subgroup was physically present. Members of the two subgroups watched each other relocate into separate rooms and then reconvene in the same room knowing that only one subgroup had been communicating in the interim. In most real dilemmatic situations, differences between subgroups may be common knowledge, but decisions are often made without being in the presence of the opposing subgroup's members. Physical separation of the subgroups by itself may heighten the psychological distinction between the subgroups. The subgroup categorization prompted by physical separation, coupled with differences between the two subgroups in their ability to communicate, may make the effect of asymmetric subgroup communication more pronounced. An alternative possibility is that the physical separation between subgroups will make the status of communication in the opposing subgroup less salient, dampening any effect from the presence versus absence of communication in the opposing subgroup. Study 2 was designed to assess these possibilities for the effect of asymmetric versus symmetric subgroup communication in a setting in which the two subgroups were physically separate.

STUDY 2

In Study 2, participants made their decisions in one of four subgroup-communication conditions derived from (1) the presence versus absence of communication in subjects' own subgroup crossed with (2) the presence versus absence of communication in the opposing subgroup. These resulted in conditions of no-subgroup communication, own-subgroup communication, other-subgroup communication, and both-subgroup communication. We omitted the full-group communication condition because we were primarily interested in the effect of the various configurations of subgroup communication. Our primary hypotheses were for a main effect for communication, such that subjects in the own-subgroup and both-subgroup communication conditions would increase their allocations to the subgroup account more than would subjects in the no-subgroup and other-subgroup communication conditions (i.e., H1a from Study 1), and an interaction effect, whereby subjects in the own-subgroup communication condition would increase allocations to the subgroup account more than subjects in the both-subgroup, no-subgroup, and other-subgroup communication conditions (i.e., H1b from Study 1).

Method

Subjects. Subjects were 60 business undergraduate students (33 males and 27 females) at a large southwestern university. As in Study 1, they received extra credit in the course from which they were recruited as well as the money that they earned during the experiment. Subjects in Study 2 ranged in age from 18 - 53, with a mean age of 21.7.

Design. Study 2 consisted of a 2 x 2 x 3 factorial design with two between-subjects factors (present subgroup communication and absent subgroup communication) and one within-subjects factor (round). The first independent variable, present subgroup, had two levels (communication versus no communication). The second independent variable, absent subgroup,

also had two levels (communication versus no communication). The third independent variable, round, had three levels (round 1 versus round 2 versus round 3). The first two between-subjects factors were fully-crossed to create four distinct conditions that mirrored the first four conditions in Study 1. There were 12 subjects in the no-subgroup communication condition, 18 subjects in the other-subgroup communication condition, 15 subjects in the own-subgroup communication condition, and 15 subjects in the both-subgroup communication condition. The primary dependent variables were subjects' allocation decisions.

Procedure. Procedures used in Study 2 mirrored those used in Study 1 with several exceptions. First, groups of three rather than six subjects participated in each session. All were assigned to the same subgroup and were told that they had been paired with another subgroup of three members who had already completed the experiment. Second, subjects were given four dollars, rather than six dollars, to allocate between their individual, subgroup, and collective accounts. This change was made to reduce the cost of the experiment. Multipliers for dollars that subjects allocated to each of the three accounts and thus the dilemmatic features of the payoff structure remained identical to Study 1. Third, communication conditions between rounds 1 and 2 were adjusted to reflect the fact that only one subgroup was present in each experimental session.

In the no-subgroup communication condition, subjects were not permitted to communicate and were told that the group with which they had been paired had not been permitted to communicate either. In the other-subgroup communication condition, subjects were not permitted to communicate but were told that the subgroup they had been paired with had been provided with ten minutes to communicate with each other. After this information about the other subgroup was thoroughly explained to subjects in this condition and the subjects were

given the opportunity to process this information and ask clarifying questions, subjects proceeded to the round 2 decision portion of the exercise. In the own-subgroup communication condition, subjects were provided with ten minutes to communicate about any topic except round 1 decisions. Before they began their discussion, they were told that members of the subgroup that they had been paired with had not been permitted to communicate with each other. In the both-subgroup communication condition, subjects were once again provided with ten minutes to talk to each other. However, in this condition, subjects were told that the subgroup they had been paired with had also been allowed to talk for ten minutes. In all four conditions, subjects were told that when making their resource allocation decisions, members of the absent subgroup were aware that the current subgroup would or would not (depending on the condition) be communicating. That is, the communication conditions of both subgroups were always common knowledge. All other aspects of the procedure in Study 2 were parallel to the procedure for Study 1.

Analyses. As in Study 1, we conducted a doubly multivariate repeated measures analysis of variance to test the hypotheses, with round as the repeated measure. The two between-subjects independent variables for these analyses were present subgroup (communicated versus did not communicate) and absent subgroup (communicated versus did not communicate).

Results

Hypothesis 1a predicted that subgroup allocations would increase more when members of the present subgroup communicated than when they did not. Because communication was manipulated between rounds 1 and 2, we tested this hypothesis by examining the two-way interaction between present subgroup communication and round. The MANOVA indicated that this two-way interaction was significant (multivariate test: $F(4,220)=8.28$, $p<.001$), with

significant univariate effects for allocations to the subgroup account ($F(2,112)=4.92$, $p<.01$) and private account ($F(2,112)=15.04$, $p<.001$). The within-subjects contrast for this two-way interaction for the change from round 1 to round 2 was significant for allocations to the subgroup account ($F(1,56)=7.22$, $p<.01$) and private account ($F(1,56)=35.16$, $p<.001$). Supporting hypothesis 1, subgroup allocations increased more in the conditions with present subgroup communication ($M = 1.04$) than in those without present subgroup communication ($M = 0.08$). Concurrently, private allocations decreased more in the communication conditions ($M = -1.10$) than in the non-communication conditions, in which private allocations increased ($M = 0.38$). There were no significant differences by experimental condition in collective allocations.

The second hypothesis predicted that subgroup allocations would increase more in the own-subgroup cell than in the other three cells. This effect would be manifested in a three-way interaction among round, present subgroup communication, and absent subgroup communication. The MANOVA revealed that this three-way interaction was significant (multivariate test: $F(4,220)=3.41$, $p<.01$), with significant univariate three-way interaction effects for allocations to the subgroup account ($F(2,112)=4.89$, $p<.01$) and private account ($F(2,112)=3.10$, $p<.05$). Within-subjects contrasts indicated significant differences between rounds 1 and 2 for allocations to the subgroup account ($F(1,56)=6.76$, $p<.02$) and private account ($F(1,56)=5.94$, $p<.02$). From round 1 to round 2, a planned contrast showed that allocations to the subgroup sustained a significantly greater increase in the own-subgroup communication condition ($M = 1.72$) than across the other three conditions ($M = 0.18$) (contrast significant at $p<.001$). Post hoc comparisons demonstrated that subgroup allocations were significantly higher in the own-subgroup communication condition than in each other condition ($M = -0.29$, $M = 0.33$, and $M = 0.37$ in the no-subgroup, other-subgroup, and both-subgroup conditions). Mean

increases or decreases in allocations to each account across rounds along with Newman-Keuls post hoc pairwise comparisons of these means are reported in Table 2. This pattern of subgroup allocations is consistent with the pattern found in Study 1, and supports hypothesis 2a; subgroup communication caused the greatest increase in subgroup cooperation when the opposing subgroup did not communicate. In Study 2, this result was stronger than in Study 1, as subgroup allocations in the own-subgroup condition were significantly higher than in the both-subgroup condition or either of the no-communication conditions.

Within-subjects contrasts for the changes in allocations between rounds 1 and 3 were significant for the two-way interaction between present subgroup communication and round only for allocations to the private account ($F(1,56)=4.47$, $p<.05$). Private allocations decreased more when communication occurred in the present subgroup ($M = 0.64$) than when it did not ($M = 0.02$). For the three-way interaction among present subgroup communication, absent subgroup communication, and round there was a significant within-subjects contrast (between rounds 1 and 3) for allocations to the subgroup account ($F(1,56)=4.39$, $p<.05$). As in round 2, this significant interaction was driven by a higher increase in subgroup-account allocations in the own-subgroup condition ($M = 1.33$) than in the other three conditions.

Complementary dependent variables. For expectations of allocations by the subject's own subgroup members, there was a significant multivariate effect for the interaction between round and present subgroup communication ($F(6,218)=6.88$, $p<.001$). The univariate tests for this two-way interaction effect were significant for allocations to the subgroup account ($F(2,112)=5.47$, $p<.01$) and private account ($F(2,112)=18.60$, $p<.001$). The follow-up within-subjects contrasts were significant for changes between rounds 1 and 2 (allocations to subgroup account: $F(1,56)=7.52$, $p<.01$; allocations to private account: $F(1,56)=36.82$, $p<.001$) and for

changes between rounds 1 and 3 (allocations to subgroup account: $F(1,56)=3.79$, $p<.06$; allocations to private account: $F(1,56)=12.52$, $p<.001$). The patterns of expectations mirrored subjects' allocations. Communication in the present subgroup increased expectations for subgroup-account allocations in round 2 ($M = 1.26$ vs. $M = 0.34$ when no communication occurred in the present subgroup) and decreased expectations for personal-account allocations ($M = -1.38$ vs. $M = 0.22$). The same pattern of expectations occurred in round 3.

We examined the same set of statistical tests for the three-way interaction among present subgroup communication, absent subgroup communication, and round on subjects' expectations for members of their own subgroup. The multivariate test was marginally significant ($F(6,218)=1.84$, $p<.10$), and the univariate tests for the three-way interaction were significant for subgroup allocations ($F(2,112)=3.37$, $p<.05$) and marginally significant for collective allocations ($F(2,112)=2.68$, $p<.08$). The within-subjects contrasts for the change from round 1 to round 2 revealed marginally significant effects for expectations of subgroup account expectations ($F(1,56)=3.44$, $p<.07$) and collective account expectations ($F(1,56)=2.82$, $p<.10$). As in Study 1 and mirroring the subgroup allocations in Study 2, expectations for subgroup-account allocations increased more in the own-subgroup communication condition ($M = 1.82$) than in any other condition ($M = 0.26$, 0.40, and 0.70 in the no-subgroup, other-subgroup, and both-subgroup conditions). Concurrently, expectations for collective-account allocations increased in the both-subgroup condition ($M = 0.43$) but decreased in the other three conditions ($M = -0.24$, -0.80, and -0.24 in the no-subgroup, other-subgroup, and own-subgroup conditions). These effects became slightly stronger with the same pattern of differences among means for round 3 expectations.

Discussion

The most important result in Study 2 is the effect of asymmetric subgroup

communication, which is consistent with the effect in Study 1, but even more pronounced when the opposing subgroup is not physically present. The results of Study 2 replicate Study 1 in several respects, strengthening the confidence of the conclusions we can draw from this research. Subgroup communication decreased defection. In the both-subgroups communication condition, decreased defection was accompanied by a fairly even increase in allocations across both the subgroup and collective accounts. In the own-subgroup communication condition, decreased defection was accompanied only by increased allocations to the subgroup account. We obtained evidence of this effect in Study 2 even when the opposing subgroup members were absent from the experimental setting in which the communicating subgroup members participated. Taken together with the results of Study 1, in which the two subgroups made their decisions in each other's physical presence, the effect of asymmetric subgroup communication appears to be robust across levels of physical proximity between the two subgroups. This effect can be explained by the increased salience of the subgroup boundary that was likely to occur in the asymmetric communication condition because of the difference in the ability of the two subgroups to communicate. When combined with the opportunity to communicate, this increased salience of the subgroup boundary led to higher allocations to the subgroup in the own-subgroup communication condition.

It is interesting to note that subjects in the other-subgroup communication condition expected communicating subgroup members to increase allocations to the subgroup, rather than the collective account. This might explain why their allocations to the collective account decreased, rather than increased, in round 2. If subjects believed that communication in the other subgroup might lead to the discovery of a solution to the collective dilemma, or that it would highlight concern for the "disadvantaged," non-communicating subgroup, it might have instead

increased the spirit of cooperation between subgroups and hence, allocations to the collective. The pervasive and negative effect of subgroup-communication asymmetry on cooperation between subgroups has important implications for understanding the determinants of cooperation in nested dilemma contexts.

Overall Discussion and Conclusion

The primary purpose of this research was to explore the effects of subgroup communication on cooperation with the subgroup and the larger collective. In a dilemma in which distinct interests and allocation options existed at the personal, subgroup, and collective levels, subgroup communication decreased defection and increased cooperation primarily with the subgroup. Most interestingly, asymmetric subgroup communication had different effects than symmetric subgroup communication. Specifically, members of a communicating subgroup allocated more resources to their subgroup when the opposing subgroup did not communicate than when it did. We found some evidence in Study 1 and strong support in Study 2 for the novel effect of asymmetric subgroup communication causing greater subgroup cooperation (by members of the communicating subgroup) than symmetric subgroup communication.

Social contexts are fraught with asymmetric subgroup communication. Consider a subgroup of employees in a company or department who telecommute, while those in another subgroup work out of the home office. Opportunities for face-to-face communication would be substantially lower for the telecommuting subgroup, although phone and electronic means of communication may exist. Nevertheless, a dispersed subgroup may not be able to communicate as quickly or efficiently as a subgroup whose members are in close physical proximity. Perhaps as important, members of each subgroup might perceive that the other subgroup does not face the same communication opportunities, heightening the perceived differences and the salience of the

boundary between the subgroups. An interesting research question concerns the effects of different forms of communication, and asymmetries between subgroups regarding the form of communication each employs, on subgroup members' propensity to cooperate in dilemmatic situations.

More generally, the results of these studies raise the possibility that asymmetries along a variety of dimensions may affect cooperation, most likely via a social categorization mechanism. For example, Polzer, Stewart, and Simmons (1998) found that subjects in a nested social dilemma allocated less to the collective when the frame, or initial location (i.e., in either the personal, subgroup, or collective account), of the money to be allocated was different, rather than identical, between subgroups. They argued that a social categorization mechanism provided a better explanation for this effect than a variety of alternative explanations that have been proposed for framing effects in social dilemmas. Although their study did not involve communication, it was similar to the current studies in that an asymmetry between the subgroups affected allocations, shifting attention and resources away from the collective and toward the subgroup. Subgroups within the same social system can also differ in their relative resource endowments (Mannix, 1993), control over outcomes (Gruenfeld, Kim & Preston, 1998), and status positions (Jost & Banaji, 1994). Moreover, subgroups may differ in the cultures, norms and behavioral standards that govern their collaborative processes (Levine & Moreland, 1991; Trice & Beyer, 1993).

By including in our design a third round of allocation decisions that was not known to subjects at the time of their discussion, we were able to provide evidence of the lingering effects of communication beyond the decision that was the focal point of the discussion. We suggest this also provides evidence that specific commitments were not the critical mechanism linking

communication to cooperation. If a dilemma is unforeseen, it would be difficult for group members to specify during discussion the choice to which each person is committing, if group members undertook the task of discussing unforeseen decisions in the first place. Group identification may provide a more plausible explanation for this carryover effect. Once enhanced by discussion, group identification may not expire simply because a particular decision has been made, instead remaining intact to affect future decisions.

An interesting problem for future research is to isolate the mechanisms that explain why asymmetric subgroup communication causes greater subgroup cooperation than symmetric communication. Although the data from the current studies do not resolve this issue, it seems unlikely that the condition of one subgroup would affect the extent to which promises are made in the other subgroup. Instead, it seems more likely that the condition of one subgroup would affect the social categorization processes of members of the other subgroup because the condition of the first subgroup determines whether the two subgroups are similar or different along the dimension in question. Relative differences or similarities between subgroups affects which boundary (e.g., the collective or subgroup boundary) members of the subgroups are likely to use to categorize the social aggregate (Turner, 1987). While this reasoning formed the conceptual basis of the asymmetric communication hypothesis, future research should attempt to provide more direct evidence of the specific mechanisms that cause asymmetries between subgroups to affect cooperation. The nested social dilemma paradigm (Wit & Kerr, 1994) employed in these studies is ideal for studying dilemmas involving hierarchically-ordered multiple group boundaries, and especially the intergroup dynamics that take place between subgroups in such dilemmas.

The results of these studies demonstrate that the presence versus absence of

communication in a dilemmatic context has effects that reach beyond the particular group in which the communication occurs, and that the effects of discussion on the communicating group are moderated by the circumstances of other groups to which the communicating group is connected. This is a particularly important direction for future research given the multitude of group boundaries that individuals use to organize the social world. By looking beyond the confines of a single group, we may piece together a more complete understanding of how group members resolve the many dilemmas they face.

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Table 1
Differences in Mean Allocations Between Rounds in Study 1

Dependent variable	Communication Condition: No commun.	Single subgroup without commun.	Single subgroup with commun.	Commun. in both subgroups	Commun. in Collective
Round 2 minus Round 1 allocation to:					
Collective account	-0.86_{a}	-0.69_{a}	0.16_{a}	0.00_{a}	2.36_{b}
Subgroup account	0.18_{ab}	0.17_{ab}	0.84_{a}	0.47_{ab}	-0.69_{b}
Private account	0.69_{a}	0.53_{a}	-1.00_{bc}	-0.47_{b}	-1.67_{c}
Round 3 minus Round 1 allocation to:					
Collective account	-0.84_{a}	-0.06_{ab}	0.59_{b}	0.29_{ab}	1.90_{c}
Subgroup account	0.11_{ab}	-0.11_{ab}	0.41_{a}	0.05_{ab}	-0.98_{b}
Private account	0.73_{a}	0.17_{ab}	-1.00_{c}	-0.33_{bc}	-0.93_{c}

Note: Means within each row not sharing a common subscript differ significantly at the .05 level by Newman-Keuls post hoc pairwise comparisons.

Table 2
Differences Between Rounds in Mean Allocations in Study 2

	Own Subgroup Condition			
	No Communication		With Communication	
	Other subgroup condition		*Other subgroup condition*	
Dependent variable	No Commun.	With Commun.	No Commun.	With Commun.
Round 2 minus Round 1 allocation to:				
Collective account	-0.67_a	-0.33_a	-0.44_a	0.57_a
Subgroup account	-0.29_a	0.33_a	1.72_b	0.37_a
Private account	0.96_a	0.00_b	-1.28_c	-0.93_c
Round 3 minus Round 1 allocation to:				
Collective account	-0.12_a	-0.27_a	-0.67_a	0.50_a
Subgroup account	0.08_a	0.27_a	1.33_a	0.10_a
Private account	0.04_a	0.00_a	-0.67_a	-0.60_a

Note: Means within each row not sharing a common subscript differ significantly at the .05 level by Newman-Keuls post hoc pairwise comparisons.