*Judgment and Decision Making* (2024), **Vol. 19**:e1 1–24
doi:10.1017/jdm.2023.38

EMPIRICAL ARTICLE

# Intragroup communication in social dilemmas: An artefactual public good field experiment in small-scale communities

Nils Christian Hoenow [1,2] and Adrian Pourviseh[2]

[1]RWI – Leibniz Institute for Economic Research, Essen, Germany and [2]School of Business and Economics, University of Marburg, Marburg, Germany

**Corresponding author:** Nils Christian Hoenow; Email: christian.hoenow@rwi-essen.de

**Received:** 25 April 2023; **Revised:** 14 September 2023; **Accepted:** 15 September 2023

**Keywords:** communication; cooperation; field experiment; public good; social ties

**Abstract**

Communication is well-known to increase cooperation rates in social dilemma situations, but the exact mechanisms behind this remain largely unclear. This study examines the impact of communication on public good provisioning in an artefactual field experiment conducted with 216 villagers from small, rural communities in northern Namibia. In line with previous experimental findings, we observe a strong increase in cooperation when face-to-face communication is allowed before decision-making. We additionally introduce a condition in which participants cannot discuss the dilemma but talk to their group members about an unrelated topic prior to learning about the public good game. It turns out that this condition already leads to higher cooperation rates, albeit not as high as in the condition in which discussions about the social dilemma are possible. The setting in small communities also allows investigating the effects of pre-existing social relationships between group members and their interaction with communication. We find that both types of communication are primarily effective among socially more distant group members, which suggests that communication and social ties work as substitutes in increasing cooperation. Further analyses rule out better comprehension of the game and increased mutual expectations of one's group members' contributions as drivers for the communication effect. Finally, we discuss the role of personal and injunctive norms to keep commitments made during discussions.

## 1. Introduction

Social dilemmas, also known as collective action problems, occur when individual and collective interests diverge, for example, due to externalities. Specifically, each individual is always better off by being selfish and not cooperating, whereas for the group as a whole, the best outcome can only be achieved if everyone cooperates. Tragically, though, selfish individuals can still benefit from their cooperative partners' efforts, a problem known as free-riding. As for real-world applications, there are environmental problems, for instance, pollution and the use of natural resources, as well as many other issues, ranging from high-stake political ones down to people working together in everyday life on tasks that require cooperation to achieve common goals. Economists and psychologists use prisoner's dilemmas, public good, and common-pool resource games to study decision-making in social dilemma situations, often with the aim of finding ways and policies that are able to promote cooperative behavior.

© The Author(s), 2024. Published by Cambridge University Press on behalf of Society for Judgment and Decision Making and European Association of Decision Making. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (https://creativecommons.org/licenses/by/4.0), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

One measure that has been identified as remarkably effective in increasing cooperation is giving participants in social dilemma situations the opportunity to talk to each other prior to making their decisions (Balliet, 2010; Dawes, 1980; Ostrom, 2010; Sally, 1995). Communication in the context of social dilemma problems and, in particular, in experimental settings, usually refers to unrestricted face-to-face discussions between participants (Bicchieri & Lev-On, 2007).[1] While communication was found to raise cooperation, it may, however, also be associated with costs, especially between people who are spatially or socially distant from each other. To make the best use of communication as a tool to promote cooperation, it is therefore helpful to understand how and in which contexts communication is beneficial.

In fact, there has been extensive research on the effect of communication on cooperation, yet the exact mechanisms behind it are subject to discussion and, to date, remain largely unclear (Koessler et al., 2020; Lopez & Villamayor-Tomas, 2017). A number of potential mechanisms to explain the conducive effect of communication on cooperation have been suggested and include (1) increased understanding of the dilemma problem and the consequences of individual decisions (Dawes et al., 1977; Kerr & Kaufman-Gilliland, 1994), (2) changes in individuals' relationship to each other, such as through the promotion of a group identity and decreases in social distance (Bicchieri, 2002; Bouas & Komorita, 1996; Dawes et al., 1990; He et al., 2017; Kerr & Kaufman-Gilliland, 1994; Orbell et al., 1988), and (3) finding consensus to cooperate, possibly including mutual reassurances, appeals, and even promises (Bouas & Komorita, 1996; Dawes et al., 1990; Kerr & Kaufman-Gilliland, 1994). Empirical evidence points toward consensus and commitments to cooperate as the most influential factor (Bouas & Komorita, 1996; Kerr & Kaufman-Gilliland, 1994; Kerr et al., 1997; Orbell et al., 1988).

Our study presents results from an artefactual public good field experiment that compares three conditions: 'no communication' as the control condition, an 'unrelated communication' treatment, and a 'dilemma-related communication' treatment. The crucial distinction between the two communication treatments lies in whether participants already know about the upcoming public good game when they talk to their group members. While the relationship between group members may be affected by either type of communication, explanations to improve understanding of the situation as well as finding consensus and making commitments to cooperate are only possible when communication is dilemma related. This design, therefore, allows us to disentangle potential effects associated with each type of communication.

The experiment was conducted in northern Namibia with 216 villagers from small, rural communities. This field setting does not only constitute a novel and more natural environment than lab experiments, especially so when it comes to people talking to each other, but further allows us to analyze how communication interacts with previously existing social ties between participants. Since we hypothesize that a part of the communication effect works through changes in social relations between group members, we are thereby able to measure such effects for different social contexts. On the one hand, a certain level of social closeness might be necessary to make communication and, in particular, commitments effective (Barbalet, 2009; Hardin, 2003; Hoffman et al., 1996; Ostrom & Walker, 1991; Simpson, 2007). On the other hand, social closeness might already raise cooperation to a high level so that communication does not result in any additional effects (Ghate et al., 2013). Further, since participants already know each other, a communication effect cannot be attributed to simply identifying and getting acquainted with one's group members, as would be the case in most lab settings (e.g., Dawes et al., 1977; He et al., 2017; Kerr & Kaufman-Gilliland, 1994). As another novelty, we measure if communication increases comprehension of the problem and whether this affects cooperation. Finally, we investigate if expectations of one's group members' contributions (also known

[1]Procedural standards in economic experiments further ensure the anonymity of individual decisions which allows all participants to reveal their true preferences without having to worry about retaliation by other participants during or after the experiment. Participants consequently only get to know their own and the group outcome but are unable to find out about the other group members' individual decisions (unless all group members unambiguously defect or cooperate, in which case, the others' behavior can be deducted from the group outcome). Real money is offered in economic experiments to make decisions salient.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

as 'beliefs') are affected by each communication treatment and how they contribute to understanding mechanisms behind the communication effect.

Results show that talking about an unrelated topic is already conducive to cooperation, but the effect is mostly present among socially distant group members. Being able to discuss the social dilemma results in even higher rates of cooperation, while also in this condition, the effect is strongest when group members are not yet socially close to each other. It can be concluded that pre-existing social ties and (either type of) communication work as substitutes in explaining cooperation. Our findings hence reassure the importance of dilemma-related elements, such as commitments, but also expose social relationships as a relevant mechanism in the effect that communication has on decisions to cooperate. We also show that dilemma-related discussions increase comprehension of the problem, but this cannot explain higher cooperation rates. Interestingly, expectations about one's group members' contributions remain virtually unaffected by communication, which hints toward the role of personal or injunctive norms of upholding commitments to cooperate made during discussions.

## 2. Discussion of the literature

Several previous experimental studies have tried to separate the dilemma-related elements of the communication effect from the unrelated ones. One approach is to minimize any unrelated communication while only leaving the option to coordinate by sending written messages, often anonymously, for example, on paper or in chats through computer terminals. Summing up findings, it turns out that while written communication does indeed increase cooperation, it is not as effective as unrestricted face-to-face communication (Balliet, 2010; Bicchieri & Lev-On, 2007; Bochet et al., 2006; Frohlich & Oppenheimer, 1998). In a meta study, Balliet (2010) observed the same across a large number of studies and point out the relevance of this finding: The mere content of a conversation can easily be exchanged by modern communication means like emails and telephone, yet, on many occasions in business, politics, and science, meetings in person remain important, even though they involve higher costs and consume more time for traveling to meet each other. Jensen et al. (2000) and Brosig et al. (2003) tested even finer nuances by comparing various communication modalities like written messages, phone calls, and video calls against face-to-face communication. It turns out that the broader or 'richer' a communication medium is, the better it is able to increase cooperation outcomes (Bicchieri & Lev-On, 2007). The missing pieces in written communication in comparison to face-to-face communication are commonly explained by body language, facial expressions, eye gaze, the tone of voice and possibly other, more subtle cues (Bicchieri & Lev-On, 2007; Kurzban, 2001; Roth, 1995).

However, even written messages may convey more than just the factual content. Visual and tonal cues are not available, but phrasing style and choice of words are still able to transmit information that go beyond the factual content and can affect the relationship between the conversation partners. Wilson and Sell (1997) went one step further and tested communication in a public good experiment over a computer terminal so players could say nothing verbally but only signal their intended contributions as numbers. Interestingly, they did not find an increase in contributions, but, on the contrary, (forced) signaling of one's intentions resulted in lower contributions than what a control group achieved without any communication.[2] Similarly, Chen and Komorita (1994) and Bochet et al. (2006) conducted experiments that allowed participants to state their intended contributions to a public good but did not find any positive effects on cooperation compared to conditions without any communication, either. Results from these studies indicate that non-binding commitments or stated intentions to cooperate alone are insufficient for raising cooperation.

In order to find out how other elements in communication may be affecting cooperation, attempts have also been made to test the effect of unrelated communication only, that is, without the possibility

[2]While, in the literature, this type of non-binding signaling is often termed as 'cheap talk', we do not use the term to avoid confusing 'cheap talk' with unrelated communication.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

of discussing the social dilemma. This can be understood as the counterpart to the studies previously mentioned, as the idea is not to eliminate the unrelated but the dilemma-related elements; hence, testing whether unrelated discussions already affect decisions to cooperate. Dawes et al. (1977) did so by asking groups of participants to estimate the population proportions of different income levels of a particular U.S. state as a communication task. Similarly, Bouas and Komorita (1996) hypothesized that finding consensus on any topic that was relevant to the participants could evoke a group identity after discussions. Both studies, however, find no effect of unrelated discussions. Higher cooperation rates in comparison to no communication were only achieved by groups that could actually discuss the dilemma. On the other hand, He et al. (2017) tested a communication condition in which participants were not allowed to make promises and found an effect on cooperation. Kurzban (2001) also found an increase in cooperation after allowing unrelated communication via computer messages, which indicates that there can still be some effect, even if the communication does not happen face-to-face, but leaves us with an inconclusive overall picture on the role of unrelated communication. Looking at trust games, there is also empirical evidence supporting a positive effect of unrelated communication (Buchan et al., 2006).

In conclusion, signaling one's (non-binding) intention alone, without free, unrestricted discussions, is not found to be effective in increasing cooperation, which highlights the importance of face-to-face communication and social relationships. At the same time, evidence for the effect of unrelated, social communication without the possibility to discuss the dilemma is, at best, mixed. The current state of the literature could hence imply that only communication that is both unrestricted and dilemma related is effective in increasing cooperation.

With this study, we set up a novel experimental approach that varies the time at which group members talk to each other rather than externally restricting the topics of conversation. For our unrelated communication treatment, we ask the participating groups to discuss a given but not dilemma-related topic with their group members before introducing them to the public good game. The advantage is that even though a discussion topic was specified to homogenize conversations, the content was not externally restricted and, possibly more importantly, not perceived as restricted by the participants. In contrast, previous studies prohibited talking about the dilemma problem while participants were already aware of the upcoming game (Bouas & Komorita, 1996; Dawes et al., 1977; He et al., 2017; Kurzban, 2001). In our view, this could have unclear and detrimental behavioral side effects.

We further choose a field setting for the experiment, which allows a more natural environment with a heterogeneous pool of participants. Effects of communication can be expected to be different in field settings, where participants come from small communities, face cooperative dilemmas in their real lives, and to some extent, already know each other. Since social relations are partly pre-defined, the setting in village communities allows measuring social ties and thereby makes it possible to analyze in more detail the role of social relations between participants regarding the effect of communication on cooperation. Specifically, we test for interactions between our experimental communication conditions and pre-existing social relations. Indeed, previous evidence on the communication effect from ('lab-in-the') field experiments is more heterogeneous than results from the lab: While positive effects of communication on cooperation were also regularly observed (e.g., Cárdenas & Ostrom, 2004; Cardenas et al., 2004; Velez et al., 2010), this was not always the case (Ghate et al., 2013; Velez et al., 2012). Ghate et al. (2013) even argue that communication is not necessary to increase cooperation if participants already show a high level of trust. Finally, potential communication effects as found in our study are not primarily attributable to simply identifying and getting to know each other.

## 3. Development of hypotheses

In this section, we will introduce the underlying theories and develop a set of hypotheses to be tested by our experiment: We firstly aim to find out if unrelated communication is already able to increase cooperation. Since unrelated communication does not allow any exchange of information about the

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

social dilemma, any potential communication effect on cooperation of this type of communication can, as a key assumption, only be attributed to changes in the relationships between group members. Unrelated communication includes topics like greeting each other, introducing oneself or others, and any type of small talk that is not about the social dilemma and the upcoming decision. It can also be on a specific, possibly externally specified, but unrelated topic. In particular, such group discussions are expected to decrease social distance between group members or even create or strengthen the feeling of belonging to the group. Social distance describes the relationship and closeness between groups or individuals, not spatially but in the degree of understanding and intimacy in their personal as well as social relationships to each other (Park, 1924). Group identity, on the other hand, is understood as the perception of being part of a social group (Spears, 2011; Tajfel et al., 1971; Turner, 1982). According to theories of social identity and self-categorization, a stronger identification with the group shifts the focus of attention away from the individual toward the collective target, which means that members of a group with a strong perceived group identity are more likely to seek maximizing the group benefit instead of their own, individual one (Brewer & Kramer, 1986; Dawes et al., 1990; Kerr & Kaufman-Gilliland, 1994; Kramer & Brewer, 1984; Orbell et al., 1988; Tajfel & Turner 1979; Turner, 1975, 1982). From a less abstract perspective, decreases in social distance or the creation of a group identity may make one's group members appear more relatable so empathy and concern for their welfare rises (Kerr & Kaufman-Gilliland, 1994; Schelling et al., 1968; Bohnet & Frey, 1999; Bouas & Komorita, 1996). Indeed, several studies have observed higher cooperation rates and willingness to help each other with socially closer individuals (Apicella et al., 2012; Boone et al., 2008; Bowles & Gintis, 2004; Castro, 2008; Chuah et al., 2014; Essock-Vitale & McGuire, 1985; Goette et al., 2006; Haan et al., 2006; Kollock, 1998; Peters et al., 2004; Ruffle & Sosis, 2006; Thompson et al., 1998; Yamagishi & Sato, 1986). Similar preferences have also been found regarding trust and altruism (Binzel & Fehr, 2013; Buchan & Croson, 2004; Cadsby et al., 2008; Candelo et al., 2018; Etang et al., 2011; Glaeser et al., 2000; Goeree et al., 2010; Rachlin & Jones, 2008) and can even be explained with evolutionary theories and kin selection (Caporael et al., 1989; Hamilton, 1964). Generally, in-group favoritism is a fairly well-established finding in social psychology (Akerlof, 1997; Buchan et al., 2006; Tajfel & Turner 1979). We hence expect pre-existing social relations, measured by the number of friends and family members in one's group, to positively affect contributions but do not formulate it as one of our hypotheses as it seems confirmatory rather than novel and is, to begin with, understood as a direct effect independent of communication.

As the first hypothesis to be tested with our experiment, we expect that unrelated communication increases cooperation compared with a control condition without any communication. Since unrelated communication does not entail discussing elements and behaviors specific to the social dilemma, such an effect must be attributed to changes in social relationships between participants or the creation of group identities (Bicchieri, 2002; Bouas & Komorita, 1996; Dawes et al., 1990; He et al., 2017; Kerr & Kaufman-Gilliland, 1994; Orbell et al., 1988).[3]

*H1: Communication unrelated to the social dilemma increases cooperation in comparison to no communication.*

Next, it is investigated if dilemma-related communication can, as found in previous studies, increase cooperation and if it is different from unrelated communication (e.g., Bouas & Komorita, 1996; Dawes et al., 1977; He et al., 2017; see also Balliet, 2010; Sally, 1995). While dilemma-related conservation content may also affect the group members' relationships to each other, we expect that additional elements only present in dilemma-related communication, such as explanations, appeals, and commitments, contribute to increases in cooperation even beyond the level achieved by unrelated

[3]In theory, however, communication could also have a negative effect on cooperation if participants only learn through communicating with each other that they do not like their group members or do not find them trustworthy.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

communication (Bouas & Komorita, 1996; Dawes et al., 1977, 1990; Kerr & Kaufman-Gilliland, 1994; Kerr et al., 1997). Hypotheses 2.1 and 2.2 are therefore formulated as:

*H2.1: Dilemma-related communication (also) increases cooperation in comparison to no communication.*

*H2.2: Dilemma-related communication increases cooperation more than unrelated communication.*

The setting and design of the experiment allow us to explore a number of potential factors that may contribute to explaining the mechanisms behind the communication effect on cooperation and, if applicable, why effects of dilemma-related communication would be different from those of unrelated communication.

### *3.1. Interactions of the communication conditions with pre-existing social ties*

Considering that the effect of communication on cooperation is hypothesized to work, at least partly, through changes in social relationships between group members, it seems reasonable to investigate how communication interacts with already existing social ties between participants.

It can be hypothesized that communication is ineffective if social ties between group members are already strong as such groups may show high levels of cooperation even without talking to each other (Ghate et al., 2013). This would imply that pre-existing social ties and communication work as substitutes, which should then show in negative interaction effects. If, however, social ties and communication are both positively and independently associated with cooperation, their effects would simply add up (more or less) linearly. Finally, communication might also result in stronger increases of cooperation among socially close group members, that is, communication and social closeness could work as complements. This seems particularly plausible for dilemma-related communication as certain levels of closeness and trust might be needed to make appeals and commitments effective (Barbalet, 2009; Hardin, 2003; Hoffman et al., 1996; Ostrom & Walker, 1991; Simpson, 2007).

### *3.2. Comprehension*

As a mechanism that is only potentially effective in dilemma-related communication, we investigate if talking about the public good problem increases comprehension of the situation. If some participants have not entirely understood the nature of the social dilemma, dilemma-related discussions may help clarifying the rules and game mechanics (Dawes et al., 1977; Kerr & Kaufman-Gilliland, 1994). It is, however, not ex-ante clear what effect increased comprehension might have on cooperation. Understanding how cooperation is in everyone's best interest could establish it as the preferable option. On the other hand, better comprehension of the social dilemma could also make individuals realize that defection always leads to higher individual payoffs and consequently to switch from an intuitive intention to cooperate to a deliberate decision to free ride (Kahneman, 2011). Specifically, we firstly examine if dilemma-related communication increases comprehension. If it does, then we further investigate if increased comprehension affects cooperation. Unrelated communication should not be able to affect comprehension of the dilemma.

### *3.3. Expectations of others' contributions, norms, and trust*

To learn more about the motivations behind individual decisions to cooperate, we measure our participants' expectations (also known as 'beliefs') about their group members' cooperative behavior. First, we anticipate that pre-existing social ties have a direct and positive effect on expectations. Regarding the communication treatments, both unrelated and dilemma-related discussions may affect

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

expectations through changes in social relationships. Dilemma-related communication, however, may entail additional elements that could be relevant to building mutual expectations: During discussions about the dilemma, consensus between group members to cooperate can be found, appeals to cooperate can be made as well as pledges about one's own good intentions, all of which may increase mutual expectations and even promote social norms to cooperate (Bicchieri, 2002; Bicchieri & Lev-On, 2007; Dawes et al., 1977; Orbell et al., 1988).

Making pledges or even promises to cooperate in front of group members about one's intentions to cooperate is known as 'commitment' and has indeed repeatedly been suggested as the main driver behind the conducive effect that communication has on cooperation (Bicchieri, 2002; Kerr & Kaufman-Gilliland, 1994; Orbell et al., 1988; Ostrom et al., 1992). Such commitments made in discussions are, however, not necessarily binding and plausible as the actual, individual decisions can, depending on the setting, not be enforced or monitored.[4] A cunning free rider might even deliberately lie about their intention to cooperate. Keeping promises and not lying to people are, nonetheless, considered strong and rather universal social norms. In other words, the effectiveness of non-binding commitment may be based on the premise that lying and deliberately breaking promises are violations of norms far worse than a decision not to cooperate (Orbell et al., 1988). Indeed, Kerr and Kaufman-Gilliland (1994) and Bicchieri (2002) argue that the communication effect on cooperation is based on the norm of promise keeping rather than on a general norm to cooperate, which may emerge after finding consensus to do so. Breaking norms may result in the feeling of guilt, which can be interpreted as an intrinsic cost that individuals try to avert (Charness & Dufwenberg, 2006; Kessler & Leider, 2012; Ostrom, 2000; Posner & Rasmusen, 1999).

Commitments made during group discussions might therefore raise expectations of high cooperation, even if they are not binding. According to the concepts of reciprocity and conditional cooperation, which are widely acknowledged in economic literature, individuals may condition their decision to cooperate on (the expectation of) their group members' behavior (Axelrod & Hamilton, 1981; Chaudhuri, 2011; Croson, 2007; Fischbacher & Gächter, 2010; Fischbacher et al., 2001; Kocher et al., 2008; Orbell et al., 1988). In conclusion, there may be a double effect of making commitments in dilemma-related discussions: First, based on mutual trust in such commitments, expectations about the other group members' intentions to cooperate increase, which, due to effects of reciprocity, boosts cooperation. Second, individuals might feel bound to fulfill their own promises due to social, and, possibly, personal norms. In contrast to social norms, which reflect someone's perception of how they are expected to behave or of what is considered as 'normal' behavior, a personal norm describes what one believes to be the right thing to do according to their own, personal standards (Ajzen, 1991; Cialdini et al., 1991; Schwartz, 1973, 1977). Similarly, Cialdini et al. (1990) distinguish social norms into what is believed to be the normal (descriptive norms) and what is believed to be the appropriate behavior (injunctive norms).[5] Beliefs about what is normal should consequently be reflected in one's expectations of other people's behavior, whereas this is not necessarily the case for personal or injunctive norms. In our context, expectations can hence be interpreted as a measurable manifestation of social norms.

Additionally, we elicit, in the post-experimental survey, a measure of trust in one's group members and hypothesize that, analogously to expectations, trust may be affected by social ties and either type of communication.

[4]The actual decisions as well as the final payments to each participant are generally kept anonymous in economic experiments. Free riders do therefore not need to fear social sanctions or reputational effects. This might be different in real situations where monitoring and enforcement are possible and, sometimes, economic experiments also allow (costly) punishment of deviators within the mechanics of the game. Such alterations of the dilemma situation would then likely also play a role in the respective conversation. Similarly, if decisions are to be made over several rounds, reciprocal effects are possible and would likely affect decisions as well as the content of the conversations.

[5]Also, Ajzen (1991), Smith and McSweeney (2007), Rivis et al. (2009), Schram and Charness (2015), and Mittelman and Rojas-Méndez (2018) distinguish between social and moral norms.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

## 4. Method

### *4.1. Research setting and participants*

The experiment was conducted as part of the SASSCAL research project from April to June 2017 in 12 randomly selected rural villages in the Kapako district (Kavango West) and in the Ndiyona district (Kavango East). For the selection, villages that had formerly been visited for similar research projects were left out. Further preconditions were that there were more than 80 inhabitants, and the selected villages were not more than a day's drive away from the nearest tar road. The names and the positions of all villages are shown in the Section A.1 of the Supplementary Material. The total sample size is 216 participants, 72 in each of the three experimental conditions. One participant from the control condition left earlier, so he could not complete the post-experimental survey. Table 1 presents some information on the variables included in the analysis and summarizes the socioeconomic characteristics of the sample.

Table 2 compares socioeconomic characteristics across the three experimental conditions and tests for equality in the subsamples. It turns out that most, but not all, variables are equally distributed. It is therefore reasonable to add these as additional variables in the regression models.

The majority of the rural population in Kavango is engaged in agriculture with crop farming as the primary component of their livelihood and cattle farming taking the second most relevant role (Namibian Ministry of Lands and Resettlements, 2015). Farming is often on subsistence level and only partly integrated into markets. The Kavango region is further characterized by a young and growing population, most of whom enjoyed some years of school education. Villages are small in population size (with a mean of 642 and a median of 313 inhabitants) and villagers usually live in the same place for many years or even a lifetime, which means that the majority of the participants have known each other before the experimental workshops. In addition, there are village meetings as well as social and religious gatherings held regularly, and some households work together in agricultural tasks. Kinship relations are also present across many households.

In preparation of the experimental workshops, each village's headperson was visited several days ahead to arrange an appointment for a village meeting so that all villagers could be informed and invited in time. It was made clear beforehand that some monetary compensation would be offered for participating but also that only a certain number of participants would be able to take part in the workshops. At the beginning of each village meeting, 24 participants were randomly drawn by

***Table 1.*** *Summary statistics and variable description.*

| variable | N | mean | std. dev. | min. | max. | variable info. |
|---|---|---|---|---|---|---|
| Contribution | 216 | 4.30 | 3.36 | 0 | 10 | Contribution to public good |
| Expectation | 216 | 5.97 | 2.72 | 0 | 10 | Exp. of others' avg. contribution |
| Trust | 171[a] | 3.50 | 0.83 | 1 | 4 | Trust in group members (survey) |
| Control q. wrong | 216 | 0.20 | – | 0 | 1 | Control questions wrong answer |
| #FdsFam | 215 | 1.96 | 1.19 | 0 | 3 | Number of friends and relatives in group |
| Age | 215 | 36.95 | 15.45 | 18 | 87 | Age of participant |
| Female | 216 | 0.60 | – | 0 | 1 | Gender (1 for female) |
| Schooling years | 215 | 6.60 | 3.97 | 0 | 17 | Years of schooling |
| Hectares | 215 | 2.51 | 2.05 | 0 | 15 | Hectares currently cultivated |
| Bags yield | 215 | 6.52 | 10.41 | 0 | 100 | Crop yield last season |
| Farmer | 215 | 0.87 | – | 0 | 1 | Profession farmer |
| Migrant | 215 | 0.18 | – | 0 | 1 | Moved to village (<10 years ago) |

[a]The elicitation of trust was conducted as part of the post-experimental survey. However, the question was initially asked by some enumerators in an unclear manner. It was not explained whether the question was about trust in the other three players or in all other participants of the experimental workshop. This was only corrected after the first few villages had been visited. Invalid observations have hence been removed and the variable is not used in the main regression models.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

***Table 2.*** *Split sample by experimental conditions.*

| Exp. condition: Communication: | Control None | Treatment 1 Unrelated | Treatment 2 Dilemma-rel. | Test for equality |
|---|---|---|---|---|
| | Mean | Mean | Mean | *p*-Value |
| #FdsFam | 2.20 | 2.10 | 1.58 | 0.002** |
| Age | 36.89 | 35.77 | 38.19 | 0.645 |
| Female | 0.51 | 0.64 | 0.65 | 0.197 |
| Schooling years | 6.70 | 6.71 | 6.39 | 0.860 |
| Hectares | 2.27 | 3.03 | 2.21 | 0.026* |
| Bags yield | 6.74 | 7.26 | 5.57 | 0.610 |
| Farmer | 0.85 | 0.94 | 0.83 | 0.077 |
| Migrant | 0.23 | 0.14 | 0.18 | 0.407 |
| N | 71 | 72 | 72 | |

*Note*: *p*-value for one-way ANOVA or Fisher's exact test in case variable is dichotomous.
Abbreviation: #FdsFam, number of friends and family members (in one's group).
Significance levels: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

lot among those who expressed willingness to participate. This selection procedure was considered fair by almost everybody. The same lots also determined the allocation to one of two experimental conditions per village. These experimental conditions of 12 players each were then spatially separated, and we explained to them the procedure of the workshop as well as the instructions of the public good game according to the respective experimental condition. For the public good game, the 12 persons per experimental condition were later again split into three groups of four players. We relied on a random allocation and did not externally stratify the group composition. Each experimental condition was supervised by one experimenter and one local research assistant for interpretation. Local assistants were recruited in the town of Rundu and remained the same team over all visited villages. The allocation of assistants and experimenters to experimental conditions was randomized for each village. Experimental protocols and game instructions in English language can be found in in the Section B of the Supplementary Material. Protocols and instructions were priorly translated by the local assistants from English into the respective local languages.

### *4.2. The public good game*

For the experiment, an unframed, single-round, standard public good game was chosen. Participants could earn real Namibian Dollars (N$) according to their own and their group members' decisions. There were always four players in a group playing the game together. Each player received a private endowment of 10 experimental coins and had to decide how much to keep and how much to contribute to a group account. The conversation rate was 1 to 5 (1 coin = 5N$). The game was framed neutrally with coins to be allocated to a private and to a group account, so as to avoid associations with any particular, real-world applications. It was possible to contribute any discrete number of coins between 0 and 10. After all players had made their decision, contributions to the group account got doubled and then distributed equally among all four players. The socially optimal outcome was reached when everyone decided to contribute all of their endowment, that is, 10 coins. Individually, however, one could always reach a higher payoff by not contributing at all (Nash equilibrium). Since the public good game was one-shot and anonymous, no reciprocity effects over rounds were possible and contributions supposedly measured the participants' pristine preferences (Rand & Nowak, 2013). A formalized description of the public good game can be found in the Section A.2 of the Supplementary Material.

The rules of the public good game were explained to the participants with the help of posters and by giving examples for different outcomes (Sections A.3 and B.4 of the Supplementary Material). Special attention was paid to making clear that the game was not a 'zero sum' situation about dividing

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

the money, but that cooperating actually increased the total benefit for the group as a whole. To counterbalance, it was pointed out that not contributing always led to higher individual earnings. The assistants gave additional explanations, answered questions to the group if necessary and gave instructions to those who did not understand the game procedures right away. Even though studying the effect of comprehension after communication is part of this study's objectives, we did at no point deliberately aim for a certain share of player to misunderstand the rules of the game. As in all economic experiments, we tried to make all explanations as easily understandable as possible.

In the next step, participants were asked one after another to come forward to a secluded place (e.g., behind a building) to meet a research assistant that asked them two control questions for understanding. If one or both control questions were answered wrongly, the player would at this point no longer receive any additional explanation of the game but nonetheless participate in the experiment and receive their payment. The research assistant also asked the participant about their expectation of their other group members' average contribution. Correctly stated expectations were incentivized with an additional 20N$ reward in the final payments.

The decision about the contributions to the public good was then made in another secluded place individually and anonymously. Plastic coins were used as the experimental currency and could be put into two differently colored envelopes, one of which represented the individual and the other one the group account. Players then put their sealed envelopes that contained their contributions to the group account into a basket. By doing so, contributions were kept anonymous and could afterward only be attributed to the players' ID numbers, guaranteeing some degree of anonymity in decision-making not only toward the group members but also toward the experimenters. Participants' names were never asked and can therefore not be linked to their ID numbers in the game. A research assistant stayed with the remaining group members to make sure they did not talk or communicate in any way while waiting for their turn. After making their decisions, players proceeded to the snack area for a break and were then interviewed individually. Survey questions can be found in the Section C of the Supplementary Material and include, among others, questions about socioeconomic characteristics and the relationship with their group members. Following Bogardus (1925), pre-existing social relationships were measured in four categories, as 'family (or member of the same household)', 'friend', 'acquaintance', and 'stranger'. However, to avoid collinearity in the analysis, we only count the number of friends and family members as a single measurement for socially close group members versus acquaintances and strangers as the counterfactual for socially more distant group members. Further, it turned out that there were hardly any 'strangers' among the villagers so that this subgroup would have been very small. A detailed table on all reported social ties is shown in the Section A.4 of the Supplementary Material. The relation to group members was only reported 15 times as 'strangers', compared to 209 times as 'acquaintances', 152 times as 'friends', and 269 times as 'family'.

Payments according to the participants' and their group members' decisions were done in the very end individually and in private. The whole workshop took about 4 h in each village. Payoffs averaged at 97N$ (= 7.32US$) per participant, which was more than an average local wage for a day's work. The possible range of earnings was between 25 and 145N$ (≈ 2 and 11US$), including the bonus payment for correctly stated expectations. Payoffs were set after pre-testing for calibration and allowing a reasonable final compensation for participating. An experimental currency was used to keep the number of coins used in the game low and with a range of possible contributions between 0 and 10 it can easily be compared with similar studies. For convenience, final payoffs were rounded to the next higher whole Namibian Dollar if the distribution of payoffs from the public good to each player resulted in a fractional number. In such cases, half of a Namibian Dollar was added, so that payments could be done entirely in banknotes.

### *4.3. The experimental conditions*

Table 3 summarizes the control and the two communication treatment conditions. In order to keep everything except the communication conditions comparable, participants in the control condition could

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

***Table 3.*** *Experimental conditions.*

| Control condition: No communication |
|---|
| *Participants are not allowed to talk to each other, but they can see who their group members are.* In the control condition, participants play the public good game with revealed identities of their group members. The participants are allocated in groups of four according to the numbers on their ID cards. They are, however, not allowed to communicate with each other. Before decision-making starts, a statement is made by a research assistant that the groups are playing the game together as allocated. |
| **Treatment 1: Unrelated communication** |
| *Participants talk to their group members about an unrelated topic (climate change and farming) before learning about the public good game.* In the unrelated communication treatment, participants are asked to discuss a given but unrelated topic for 5 min in their group before learning about the public good game. They are allocated into groups of four according to the numbers on their ID cards and asked to discuss how different rainfall conditions and changes in climate affects agricultural outputs and how adaptation measures could be taken. No further communication is allowed after learning about the game rules. |
| **Treatment 2: Dilemma-related communication** |
| *Participants first learn the rules of the public good game and then talk to their group members before making the decision.* In the dilemma-related communication condition, participants learn about the rules of the public good game first and are then allowed to talk to their group members for 5 min before making their decisions. Hence, players have the opportunity to discuss the social dilemma and coordinate their actions. Decisions are still made in private. |

visually identify their group members and were given a few moments of time before making their decisions to allow for silent deliberations about the explained social dilemma situation. While the first treatment only allows unrelated discussions, the second treatment can be considered as what is usually understood as communication in cooperation experiments.

Discussions were never listened to or even recorded. In fact, for both communication treatment conditions, experimenters and research assistants deliberately moved out of hearing distance from the groups so that they could talk freely. Groups were spatially divided for the discussions so that other groups could not be listened to and influence the content of discussions or the outcome. It should be noted that the communication conditions are to be understood as an 'intention to treat', which means that participants were given the opportunity to communicate but were not forced to do so. As a measure of compliance to the intended treatment conditions, we ex post asked participants in the survey about the content of their discussions. While this elicitation method might not be perfectly precise, it still turned out that 85% in the unrelated communication treatment complied with their task of discussing agriculture and 54% of participants in the dilemma-related communication treatment answered that they coordinated decisions with their group members, even though in this treatment no specific discussion topic was suggested by the experimenters. For privacy reasons, we did not ask more detailed questions about the content of discussion, such as whether agreements or promises were made. As post-experimental interviews were conducted in person by our research assistants, it seems improbable that such questions would have resulted in credible and truthful answers.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

## 5. Results

Comparing the three conditions, average contributions to the public good were 3.31 coins in the control condition without communication, 4.14 coins after talking about an unrelated topic, and 5.46 coins after discussing the public good game (Figure 1 and Table 4).

Unrelated communication hence raises cooperation by 0.83 coins, which amounts to 39% of the average effect of 2.15 coins achieved by dilemma-related communication. While the differences according to simple *t*-tests (Table 4) are significant between the dilemma-related communication and the control condition as well as between dilemma-related and unrelated communication, the difference between the unrelated communication and the control condition is not significant at the 5% level.[6] Within-group variations of contributions were much smaller in the dilemma-related communication condition, that is, behavior was more homogeneous in those groups, which is likely a result of agreements on certain amounts to contribute (Table 4).

For the construction of the regression models (Table 5), we use Tobit estimations as contributions must be considered to be censored at both the minimum (0 coins) and maximum (10 coins) possible choices that can be made in the public good game. The distributions of contributions for each condition are depicted in the Section A.5 of the Supplementary Material and confirm the presence of censoring at both endpoints. The basic model 1 only includes dummy variables for each communication treatment, whereas the number of friends and family members in one's group, individual expectations about one's

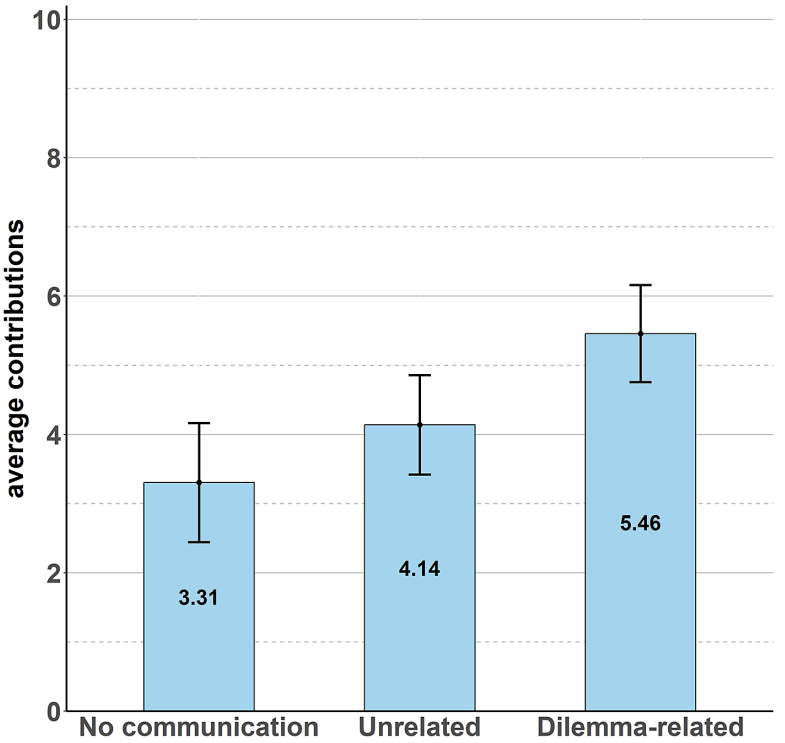


***Figure 1.*** *Average contributions to public good by experimental condition.*

[6]For a power calculation, we draw on standard deviations found in a public good lab experiment similar to our design by Fehr and Gächter (2000) and find that at 80% power ($1 - \beta$) and 5% type I error rate ($\alpha$) a sample size of 72 per condition allows detecting an average 1.5 coins pairwise-difference in contributions in a two-sided *t*-test. Indeed, we observe a similar standard deviation as Fehr and Gächter (2000), which corresponds to ~3 coins. However, the effect of unrelated communication is smaller than 1.5 coins difference so that it does not turn out as significant at the 5% level in a direct comparison (*p*-value *t*-test: 0.14). It does, however, become significant in some of the regression models (Tables 5 and 6).

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

***Table 4.*** *Comparisons between experimental conditions and tests.*

| Experimental condition: | Control | Treatment 1 | Treatment 2 | Differences | | |
|---|---|---|---|---|---|---|
| Communication: | None | Unrelated | Dilemma-rel. | T1 – C | T2 – C | T2 – T1 |
| | Mean *(std. dev.)* | Mean *(std. dev.)* | Mean *(std. dev.)* | **Δ** *(std. err.)* | **Δ** *(std. err.)* | **Δ** *(std. err.)* |
| Contribution | 3.31 *(3.66)* | 4.14 *(3.06)* | 5.46 *(2.99)* | 0.83 *(0.56)* | 2.15*** *(0.56)* | 1.32** *(0.50)* |
| Contribution if control question correct[a] | 2.92 (3.51) | 3.85 (2.60) | 5.31 (2.91) | 0.93 (0.59) | 2.38*** (0.59) | 1.45** (0.51) |
| Contribution if control question wrong[a] | 4.37 *(3.99)* | 5.06 *(4.19)* | 6.86 *(3.58)* | 0.69 *(1.36)* | 2.49 *(1.71)* | 1.80 *(1.81)* |
| Variability of contributions[b] | 2.45 *(1.50)* | 2.59 *(1.44)* | 1.54 *(1.21)* | 0.14 *(0.49)* | −0.90 *(0.45)* | −1.04* *(0.44)* |
| Expectation | 5.96 *(2.80)* | 5.74 *(2.85)* | 6.22 *(2.69)* | 0.22 *(0.47)* | 0.26 *(0.46)* | 0.49 *(0.46)* |
| Variability of expectations[b] | 2.01 *(0.90)* | 2.27 *(1.25)* | 1.70 *(1.43)* | 0.26 *(0.37)* | −0.31 *(0.41)* | −0.57 *(0.46)* |
| Correctly stated expectations[c] | 33% | 38% | 56% | 8% | 27%** | 19%* |
| Trust[d] | 3.46 *(0.85)* | 3.50 *(0.81)* | 3.56 *(0.84)* | 0.04 *(0.15)* | 0.10 *(0.16)* | 0.05 *(0.15)* |
| N | 72 | 72 | 72 | – | – | – |

*Note*: Test results according to Student's *t*-tests if not otherwise specified. All test results are two-sided.

[a]Control questions for understanding of the public good game. The number of participants who correctly answered the control questions for understanding are 51 in the control condition, 55 in the unrelated communication condition, and 65 in the dilemma-related communication condition.

[b]Measured as mean of within-group standard deviation of contributions (18 observations per experimental condition).

[c]Chi-squared tests for comparing shares of correctly stated expectations.

[d]Trust in group based on reduced sample of $n = 171$ (57/60/54).

Significance levels: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

group members' contributions as well as socioeconomic variables are added in model 2 (Table 5). The selection of these socioeconomic variables aims to capture potentially relevant socioeconomic characteristics including age, gender, and years of schooling. Information on regular incomes was difficult to obtain due to irregular seasonal flows over the year. We therefore include how many hectares of fields a household cultivates and how many bags of crop yields they produced in the last season. We further add whether the respective participant's main profession is farming and whether they have migrated to the village less than 10 years before. The full regression models, showing all socioeconomic variables can be found in the Section A.6 of the Supplementary Material. The same model specifications are repeated for models 3 and 4 but focus on the subsample of participants who have correctly answered both control questions for understanding of the public good game. While an intuitive understanding of the situation might still be present, wrongly answering the control questions is potentially associated with random, unclear decision behavior, thereby leading to less precise observed results. Indeed, the standard deviations of contributions are much larger for the subsample of participants who misunderstood the public good game (Table 4). Coefficients according to Tobit

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

***Table 5.*** *Basic Tobit regression models for contributions to public good.*

| Dep. var.: contribution<br>Models without interaction terms | Model 1<br>Coefficient<br>*(std. err.)* | Model 2<br>Coefficient<br>*(std. err.)* | Model 3<br>Coefficient<br>*(std. err.)* | Model 4<br>Coefficient<br>*(std. err.)* |
|---|---|---|---|---|
| T1: Unrelated | 1.331 | 1.647 | 1.474 | 1.906* |
| | *(1.15)* | *(0.97)* | *(1.06)* | *(0.91)* |
| T2: Dilemma-related | 3.129* | 2.851** | 3.372** | 3.216** |
| | *(1.28)* | *(1.06)* | *(1.20)* | *(0.99)* |
| #FdsFam | | −0.081 | | 0.003 |
| | | *(0.27)* | | *(0.24)* |
| Expectation | | 0.540*** | | 0.497*** |
| | | *(0.15)* | | *(0.15)* |
| Constant | 2.635** | 2.028 | 2.175* | 1.375 |
| | *(0.99)* | *(2.07)* | *(0.92)* | *(1.70)* |
| *Socioeconomics* | *No* | *Yes* | *No* | *Yes* |
| *Exclude misunderstood* | *No* | *No* | *Yes* | *Yes* |
| var(e.contribution) | 19.814*** | 15.027*** | 14.958*** | 11.738*** |
| | *(3.59)* | *(2.58)* | (3.10) | (2.30) |
| *N* | 216 | 215 | 173 | 172 |

*Note*: Tobit regression models with standard errors clustered on group ($n = 4$) level, censoring at the lower (0) and upper (10) endpoint for contributions. Socioeconomic covariates as shown in Table 2. Full regression models in Section A.6.1 of the Supplementary Material.
Abbreviations: #FdsFam, number of friends and family members (in one's group); expectation, one's expectations ('beliefs') of the other three group members' contributions.
Significance levels: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

estimations reflect the slope of the latent variables rather than the observed outcome. In line with results from *t*-tests in Table 4, we find positive and significant effects of dilemma-related communication (T2) on contributions in all regression model specifications (Table 5).

Coefficients for unrelated communication are smaller than the coefficients for dilemma-related communication, making up, depending on the model, between 42% and 59% of the latter. Unrelated communication (T1) further only reaches significance at the 5% level in model 4, after the inclusion of socioeconomic variables and when focusing on the sample of participants who correctly answered the control questions. The same regression models using ordinary least squares estimations can be found in the Section A.7 of the Supplementary Material and confirm the results found using Tobit models.

### *5.1. Interactions of the communication conditions with pre-existing social ties*

To obtain further insights about the effects of our two communication treatments, we next look at the role of pre-existing social ties and how they interact with each communication treatment (Table 6). The models with interaction terms consider social ties in two different ways: models 5 and 7 treat social ties ('FdsFam') as continuous variables whereas models 6 and 8 treat them as factor variables with a dummy for each possible value (1, 2 and 3) other than zero, which works as the counterfactual.

In all models that include interaction terms, the number of friends and family members in one's group shows a positive association with contributions, which, however, only describes the effect in the control condition. This positive association is also visible in Figure 2. A complementary, more detailed table can be found in the Section A.8 of the Supplementary Material.[7] For the two communication

[7]Social ties, measured as friends and family members, are not perfectly balanced across the treatment conditions as visible in the Section A.8 of the Supplementary Material. The simple comparison of means for values of 'FdsFam' in Figure 2 may therefore give a slightly biased picture.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

***Table 6.*** *Tobit regression models for contributions to public good with interaction effects.*

| Dep. var: contribution<br>Models with<br>interaction terms | Model 5<br>Coefficient<br>*(std. err.)* | Model 6<br>Coefficient<br>*(std. err.)* | Model 7<br>Coefficient<br>*(std. err.)* | Model 8<br>Coefficient<br>*(std. err.)* |
|---|---|---|---|---|
| T1: Unrelated | 5.567** | 6.741** | 5.633*** | 6.992*** |
| | *(1.96)* | *(2.36)* | *(1.41)* | *(1.84)* |
| T1 × [#FdsFam] | −1.791* | | −1.694** | |
| | *(0.71)* | | *(0.59)* | |
| T1 × [FdsFam = 1] | | −4.905* | | −5.244* |
| | | *(2.38)* | | *(2.09)* |
| T1 × [FdsFam = 2] | | −4.168 | | −6.125* |
| | | *(3.07)* | | *(2.36)* |
| T1 × [FdsFam = 3] | | −6.487** | | −6.127** |
| | | *(2.28)* | | *(1.89)* |
| T2: Dilemma-related | 6.530*** | 6.873** | 7.274*** | 8.103*** |
| | *(1.94)* | *(2.28)* | *(1.59)* | *(2.08)* |
| T2 × [#FdsFam] | −1.784** | | −1.988*** | |
| | *(0.67)* | | *(0.57)* | |
| T2 × [FdsFam = 1] | | −2.720 | | −4.060 |
| | | *(2.56)* | | *(2.41)* |
| T2 × [FdsFam = 2] | | −3.586 | | −5.445* |
| | | *(2.87)* | | *(2.50)* |
| T2 × [FdsFam = 3] | | −5.713* | | −6.619** |
| | | *(2.26)* | | *(2.06)* |
| #FdsFam | 1.181* | | 1.370** | |
| | *(0.57)* | | *(0.46)* | |
| [FdsFam = 1] | | 2.962 | | 4.195* |
| | | *(2.22)* | | *(2.05)* |
| [FdsFam = 2] | | 2.390 | | 3.942 |
| | | *(2.74)* | | *(2.34)* |
| [FdsFam = 3] | | 4.083* | | 4.929** |
| | | *(1.94)* | | *(1.67)* |
| Expectation | 0.521*** | 0.522*** | 0.456** | 0.469** |
| | *(0.15)* | *(0.16)* | *(0.14)* | *(0.15)* |
| Constant | −0.643 | −1.244 | −1.437 | −2.594 |
| | *(2.31)* | *(2.55)* | *(1.95)* | *(2.30)* |
| *Socioeconomics* | *Yes* | *Yes* | *Yes* | *Yes* |
| *Exclude misunderstood* | *No* | *No* | *Yes* | *Yes* |
| var(e.contribution) | 14.332*** | 14.144*** | 10.964*** | 10.751*** |
| | *(2.43)* | *(2.44)* | *(2.04)* | *(2.05)* |
| *N* | 215 | 215 | 172 | 172 |

*Note*: Tobit regression models with standard errors clustered on group ($n = 4$) level, censoring at the lower (0) and upper (10) endpoint for contributions. Socioeconomic covariates as shown in Table 2. Full regression model in Section A.6.2 of the Supplementary Material. Abbreviations: #FdsFam, number of friends and family members (in one's group); expectation, one's expectations ('beliefs') of the other three group members' contributions.
Significance levels: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

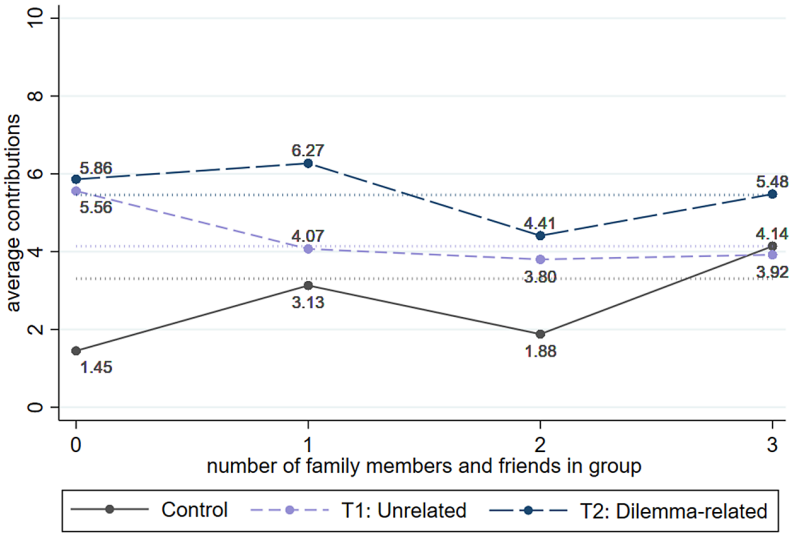


***Figure 2.*** *Contributions by treatment conditions and social contexts.*

treatments, no apparent relation between social ties and contributions stands out (Figure 2). For this reason, the coefficients for the number of friends and family members do not become significant in any of the basic models without interaction terms, either (Table 5).

In all models of Table 6, the addition of interaction terms between the communication condition dummies and pre-existing social ties leads to much larger and highly significant regression coefficients for both types of communication. They denote the effect at zero friends or family members in the group. The interaction terms between social ties and the communication treatments assume negative and, mostly, significant values. This implies that both unrelated and dilemma-related communication are most effective among socially distant people, while there is only a reduced effect among already close group members. The same can be seen more clearly in Table 7, which shows the marginal effects of the Tobit estimations including interaction terms at each possible value of friends and family members: the strongest and most significant effect of communication is found at low counts of friends and family members in one's group. Indeed, for the highest value of social ties ('FdsFam' = 3), that is, groups consisting entirely of friends and family members, communication has no significant effect anymore. This implies that pre-existing social ties and communication work as substitutes. Finally, Table 7 also includes average marginal effects of the treatment conditions based on the Tobit models with interaction terms. Both types of communication conditions show significant and positive effects on cooperation in all four models. Across all model specifications and values for 'FdsFam', the effect on cooperation is distinctly larger for dilemma-related as compared with unrelated communication.

### *5.2. Comprehension*

Next, we investigate if comprehension works as a mechanism in dilemma-related communication and may hence be able to explain why dilemma-related discussions result in even more cooperation than unrelated communication. It turns out that indeed more participants answered both control questions correctly after dilemma-related discussions (90%) as compared with the control condition (74%) and the unrelated discussions (76%). The differences are significant and show that talking with one's group members about the social dilemma increases comprehension (for details, see Sections A.9.1 and A.9.2 of the Supplementary Material).

However, comparing contributions between those, who have answered both control questions correctly, and those, who have not, shows that contributions from the latter were higher in all experimental

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

***Table 7.*** *Marginal effects for Tobit estimations with interaction effects.*

| Marginal effects<br>Models with<br>interaction terms | For model 5<br>Coefficient<br>*(std. err.)* | For model 6<br>Coefficient<br>*(std. err.)* | For model 7<br>Coefficient<br>*(std. err.)* | For model 8<br>Coefficient<br>*(std. err.)* |
|---|---|---|---|---|
| Marginal effects for given values of 'FdsFam' | | | | |
| T1: Unrelated | | | | |
| [FdsFam = 0] | 5.567** | 6.741** | 5.633*** | 6.992*** |
| | *(1.96)* | *(2.36)* | *(1.41)* | *(1.84)* |
| [FdsFam = 1] | 3.775** | 1.835 | 3.340*** | 1.748 |
| | *(1.38)* | *(2.03)* | *(1.02)* | *(1.30)* |
| [FdsFam = 2] | 1.984* | 2.583 | 2.246* | 0.867 |
| | *(0.99)* | *(1.84)* | *(0.88)* | *(1.13)* |
| [FdsFam = 3] | 0.192 | 0.254 | 0.553 | 0.865 |
| | *(1.01)* | *(1.10)* | *(1.09)* | *(1.24)* |
| T2: Dilemma-related | | | | |
| [FdsFam = 0] | 6.530*** | 6.873** | 7.274*** | 8.103*** |
| | *(1.94)* | *(2.28)* | *(1.59)* | *(2.08)* |
| [FdsFam = 1] | 4.746*** | 4.153 | 5.286*** | 4.044** |
| | *(1.41)* | *(2.16)* | *(1.17)* | *(1.53)* |
| [FdsFam = 2] | 2.961** | 3.289 | 3.300*** | 2.659* |
| | *(1.05)* | *(1.70)* | *(0.93)* | *(1.08)* |
| [FdsFam = 3] | 1.177 | 1.16 | 1.311 | 1.485 |
| | *(1.05)* | *(1.15)* | *(1.01)* | *(1.13)* |
| Average marginal effects | | | | |
| T1: Unrelated | 2.059* | 2.111* | 2.453** | 2.322** |
| | *(1.00)* | *(1.01)* | *(0.88)* | *(0.83)* |
| T2: Dilemma-related | 3.036** | 3.055** | 3.54*** | 3.501*** |
| | *(1.06)* | *(1.04)* | *(0.94)* | *(0.85)* |

Abbreviation: #FdsFam, number of friends and family members (in one's group).
Significance levels: $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

conditions (Table 4 and Section A.9.1 of the Supplementary Material). Increased comprehension can therefore be ruled out as the relevant mechanism for higher contributions after dilemma-related communication. Also, the effects of the communication treatments on cooperation follow the same pattern across both subgroups (Table 4 and Section A.9.3 of the Supplementary Material). Additional regression models using comprehension as the dependent variable can be found in the Section A.9.4 of the Supplementary Material. They also reveal a positive and significant correlation between the dilemma-related communication condition and correctly answering the control questions and show that education, measured in years of schooling, increase comprehension of the social dilemma problem (Section A.9.5 of the Supplementary Material).

### *5.3. Expectations of others' contributions and trust*

It turns out that neither the unrelated nor the dilemma-related communication condition has any effect on the expectations of one's group members' behavior in the public good game. As evident in Table 4, there are only very small and insignificant differences in average expectations across all three

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

experimental conditions and they do not follow a specific pattern that suggests any association with the communication treatments (see also Section A.10.1 of the Supplementary Material). We also conduct regression analyses using expectations as the dependent variable and find no significant correlations with the treatment conditions, either (Sections A.10.2 and A.10.3 of the Supplementary Material). The variability of expectations, measured as means of standard deviations within groups, is slightly, but not significantly, lower after dilemma-related communication (Table 4).

We further measure the correctness of stated expectations: After dilemma-related discussion more than half of the participants (56%) correctly guessed the average contribution of their group members compared with 33% and 38% for the control condition and the unrelated communication, respectively (Table 4). It stands out, however, that average contributions are lower than average expectations of the other players' contributions, especially in the control and the unrelated treatment conditions, which means that, on average, players deliberately contributed less than what they expected their group members to contribute.

Individual expectations were also added as an explanatory variable in most of the main regression models on contributions (Tables 5 and 6). This is possible because, as it has just been shown, the treatment conditions do not affect expectations.[8] On individual level, expectations show a positive and significant correlation with contributions in almost all models, which reassures the concept of conditional cooperation and, vice versa, our elicitation of expectations.

In addition to expectations, we measure trust in one's group members in the post-experimental survey (Table 4 and Section A.11.1 of the Supplementary Material). Trust was elicited on a four-level scale from 1 (do not trust at all) to 4 (trust completely). It turns out that, similar to results found regarding expectations, trust is not significantly affected by the communication treatments. Univariate regression analyses find a positive, significant correlation between trust and expectations but not so between trust and contributions (Section A.11.2 of the Supplementary Material). While we do not find any associations of pre-existing social ties with expectations, there is a positive correlation with trust. This means participants trust their group members more if they consist of friends and family members, but do not have higher expectations of their contributions.

## 6. Discussion

With this study, we aim to learn more about the mechanisms through which talking to one's group members before decision-making can raise cooperation in social dilemma situations. Specifically, we hypothesize that changes in group members' relationship with each other are part of the effect. To test this, we introduce an unrelated communication condition that does not allow discussing the social dilemma. We further conduct our experiment in a natural field setting and take into account effects of pre-existing social ties between participants.

Results show that unrelated communication is indeed able to increase cooperation, but the effect is mostly present among socially distant group members. As unrelated talk does not allow discussing the dilemma, which includes explanations, appeals or making commitments, increases in cooperation must be the result of changes in group members' relationship with each other, such as through decreases in social distance or the promotion of a group identity. For dilemma-related communication, we find even larger effects on cooperation than for unrelated communication, which are, similarly, strongest among group members who are not already socially close to each other. Conversely, either type of communication has only a reduced or no additional effect on cooperation if group members already show a high level of cooperativeness due to their pre-existing social ties. Pre-existing social ties and communication, even on unrelated topics, hence work as substitutes in explaining cooperation.

[8]The same regression models as in Tables 5 and 6 without expectations as an explanatory variable can be found in the Section A.7 of the Supplementary Material. Results on the effect of the communication treatments as well as their interactions with social ties remain virtually the same.

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

Technically, it can also be interpreted that social ties become irrelevant once communication is possible, but this view seems less intuitive.

Notably, dilemma-related communication results in even higher rates of cooperation than discussions about an unrelated topic. Concerning potential reasons for this difference, we are firstly able to rule out better comprehension after dilemma-related communication: While comprehension is increased by dilemma-related discussions, it cannot be associated with higher contributions. We further find that expectations of the other group members' contributions are not affected by either communication condition. Raised expectations are therefore not part of the mechanisms behind the effect of communication on cooperation which seems at odds with the literature's consensus on commitments as the main driver behind the communication effect (Bicchieri & Lev-On, 2007; Bornstein & Rapoport, 1988; Kerr & Kaufman-Gilliland, 1994; Kerr et al., 1997; Orbell et al., 1988). If commitments worked through trust in each others' pledges, reciprocity, or even the creation of social norms, they should be reflected in higher average expectations (Bicchieri & Lev-On, 2007; Bornstein & Rapoport, 1988). An explanation for higher cooperation after dilemma-related than after unrelated communication, that is still in accordance with commitments as the major driver, can, however, be found in personal or injunctive norms. In this context, the relevant personal or injunctive norm would be the one to fulfill one's own appeals and promises to contribute made during discussion, even despite not necessarily believing in one's group members' pledges to do the same. In other words, individuals may feel bound to stick to their commitments due to their own standards and norms of appropriate conduct rather than due to the need to fulfill social contracts or the expectations of others. Also, Vanberg (2008) found that promises were kept due to the personal feeling of being obliged to do so and not as to avoid disappointing others.

Supportive of this line of argumentation, we did not only find zero effects of either communication condition on expectations (and nonetheless communication led to higher cooperation rates) but also observed a preference to cooperate more with socially close group members without any links to raised expectations. This means that rather than following a social norm or a feeling of having to meet certain expectations, contributing more in the presence of socially close group members is, in a similar manner, one's very own preference. It can be explained by in-group favoritism, and also finds support in evolutionary theories on kin selection (Candelo et al., 2018; Caporael et al., 1989; Hamilton, 1964; Peters et al., 2004; Tajfel et al., 1971; Tajfel & Turner 1979).

As an alternative explanation, it could be hypothesized that it is not the deliberate adherence to a personal norm of keeping promises but an intuitive, and possibly irrational, stickiness to commitments made during discussions (Kahneman, 2011; Kerr et al., 1997; Orbell et al., 1988). However, previous experimental studies have found no effect of signaling one's (non-binding) intentions without the possibility to freely discuss the dilemma, which speaks against this theory (Bochet et al., 2006; Chen & Komorita, 1994; Dawes et al., 1977; Wilson & Sell, 1997).

Based on our results, we can also not rule out the possibility that finding agreement on an important, relevant topic, such as the mutual consensus to cooperate, could affect social relations even further than just talking about unrelated issues, and hence even the additional effect of dilemma-related communication could work primarily through altered social relationships between participants (Dawes et al., 1988; Kerr & Kaufman-Gilliland, 1994; Orbell et al., 1988; Bicchieri, 2002; Bouas & Komorita, 1996; Spears, 2011). Spears (2011), for example, points out that group identity can become salient depending on the content of the conversation in discussions. It could be an interesting aspect for future research to investigate if talking about something controversial like politics or religion leads to disputes and consequently a decrease in cooperation. Researchers could further try to analyze in more detail how group discussions affect social relationships by eliciting an empirical measurement for group identity (or the perception thereof). Also, more sophisticated measurements of norms could be implemented, especially with a distinction between social and personal norms. Finally, one could re-run similar experiments with different participants in additional settings, such as with strangers rather than community members. Our results show that the effect of communication on cooperation is largest among socially distant individuals and speak against the theory that social closeness is a prerequisite

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

for effective communication (Barbalet, 2009; Hardin, 2003; Hoffman et al., 1996; Simpson, 2007). It should be kept in mind that, within the setting of our study, participants all came from the same village and hence even those who did not identify each other as friends or family members, were not real strangers but do, mostly, at least know each other, which one could interpret as 'weak' social ties. It could be investigated if communication effects are even stronger between actual strangers, who have never met each other. Given that social ties and communication work as substitutes, our setting would then also explain why we find a relatively small effect of dilemma-related face-to-face communication as compared with experiments conducted in the lab (e.g., Bochet et al., 2006). On the other hand, the effect of communication on cooperation might also be non-linear and concave in social ties if communication is less effective again among very distant individuals.

Concerning policy relevance, our results show that communication promotes cooperative behavior, even if it is about unrelated topics and especially between socially distant group members. For socially close group members, on the other hand, cooperation is already high, and communication has less of an additional effect on cooperation. As another relevant insight, our findings on the effect on comprehension imply that increasing education and understanding of the social dilemma problem must not necessarily help in solving it. Indeed, in our setting, participants who had trouble to correctly answer our control questions contributed, on average, more to the public good. On a more abstract level, our results suggest investigating the potential of personal and injunctive norms and their application. Personal norms might work in certain situations independently from social norms and expectations about others' compliance, which could find use as a tool to further promote prosocial and cooperative behavior.

To conclude, we may recall and consider that average contributions were below the average expectations about one's group members' contributions in all experimental conditions. The effect of communication on cooperation could therefore also be worded differently. Individuals behave less selfishly after communication.

**Supplementary material.** The supplementary material for this article can be found at https://doi.org/10.1017/jdm.2023.38.

**Acknowledgments.** Special thanks go to all participating village communities in the Kavangos for their hospitality and to all research assistants for their excellent work, in particular, Anastasia, Blondy, Cypriaan, James, and Moses. We would further like to thank Mark Andor, Manuel Frondel, Lukas Tomberg, Tobias Vorlaufer, Eva Yang, and Michael Kirk.

**Data availability statement.** Link to Data and Code https://zenodo.org/records/10402160.

**Funding statement.** This study was funded by the Southern African Science Service Center for Climate Change and Adaptive Land-Use Management (SASSCAL) through the German Federal Ministry for Education and Research (Grant No. 01LG1201B).

**Competing interest.** The authors declare that there is no conflict of financial, general, or institutional competing interests.

## References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Akerlof, G. A. (1997). Social distance and social decisions. *Econometrica*, *65*(5), 1005–1027. https://doi.org/10.2307/2171877

Apicella, C. L., Marlowe, F. W., Fowler, J. H., & Christakis, N. A. (2012). Social networks and cooperation in hunter-gatherers. *Nature*, *481*(7382), 497–501. https://doi.org/10.1038/nature10736

Axelrod, R., & Hamilton, W. D. (1981). The evolution of cooperation. *Science*, *211*(4489), 1390–1396. https://doi.org/10.1126/science.7466396

Balliet, D. (2010). Communication and cooperation in social dilemmas: A meta-analytic review. *Journal of Conflict Resolution*, *54*(1), 39–57. https://doi.org/10.1177/0022002709352443

Barbalet, J. (2009). A characterization of trust, and its consequences. *Theory and Society*, *38*(4), 367–382.

Bicchieri, C. (2002). Covenants without swords: group identity, norms, and communication in social dilemmas. *Rationality and Society*, *14*(2), 192–228. https://doi.org/10.1177/1043463102014002003

Bicchieri, C., & Lev-On, A. (2007). Computer-mediated communication and cooperation in social dilemmas: An experimental analysis. *Politics, Philosophy & Economics*, *6*(2), 139–168. https://doi.org/10.1177/1470594X07077267

Binzel, C., & Fehr, D. (2013). Social distance and trust: Experimental evidence from a slum in Cairo. *Journal of Development Economics*, *103*, 99–106. https://doi.org/10.1016/j.jdeveco.2013.01.009

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

Bochet, O., Page, T., & Putterman, L. (2006). Communication and punishment in voluntary contribution experiments. *Journal of Economic Behavior & Organization*, *60*(1), 11–26. https://doi.org/10.1016/j.jebo.2003.06.006

Bogardus, E. S. (1925). Measuring social distance. *Journal of Applied Sociology*, *9*, 299–308.

Bohnet, I., & Frey, B. S. (1999). The sound of silence in prisoner's dilemma and dictator games. *Journal of Economic Behavior & Organization*, *38*(1), 43–57. https://doi.org/10.1016/S0167-2681(98)00121-8

Boone, C., Declerck, C. H., & Suetens, S. (2008). Subtle social cues, explicit incentives and cooperation in social dilemmas. *Evolution and Human Behavior*, *29*(3), 179–188. https://doi.org/10.1016/j.evolhumbehav.2007.12.005

Bornstein, G., & Rapoport, A. (1988). Intergroup competition for the provision of step-level public goods: Effects of preplay communication. *European Journal of Social Psychology*, *18*(2), 125–142. https://doi.org/10.1002/ejsp.2420180205

Bouas, K. S., & Komorita, S. S. (1996). Group discussion and cooperation in social dilemmas. *Personality and Social Psychology Bulletin*, *22*(11), 1144–1150. https://doi.org/10.1177/01461672962211005

Bowles, S., & Gintis, H. (2004). Persistent parochialism: Trust and exclusion in ethnic networks. *Journal of Economic Behavior & Organization*, *55*(1), 1–23. https://doi.org/10.1016/j.jebo.2003.06.005

Brewer, M. B., & Kramer, R. M. (1986). Choice behavior in social dilemmas: Effects of social identity, group size, and decision framing. *Journal of Personality and Social Psychology*, *50*(3), 543–549. https://doi.org/10.1037/0022-3514.50.3.543

Brosig, J., Weimann, J., & Ockenfels, A. (2003). The effect of communication media on cooperation. *German Economic Review*, *4*(2), 217–241. https://doi.org/10.1111/1468-0475.00080

Buchan, N., & Croson, R. (2004). The boundaries of trust: Own and others' actions in the US and China. *Journal of Economic Behavior & Organization*, *55*(4), 485–504. https://doi.org/10.1016/j.jebo.2003.11.005

Buchan, N. R., Johnson, E. J., & Croson, R. T. A. (2006). Let's get personal: An international examination of the influence of communication, culture and social distance on other regarding preferences. *Journal of Economic Behavior & Organization*, *60*(3), 373–398. https://doi.org/10.1016/j.jebo.2004.03.017

Cadsby, C. B., Song, F., & Bi, Y. (2008). Trust, reciprocity and social distance in China: An experimental investigation. In *Working Papers* (No. 0809; Working Papers). University of Guelph, Department of Economics and Finance. https://ideas.repec.org/p/gue/guelph/2008-9.html

Candelo, N., Eckel, C., & Johnson, C. (2018). Social distance matters in dictator games: Evidence from 11 Mexican villages. *Games*, *9*(4), 77. https://doi.org/10.3390/g9040077

Caporael, L. R., Dawes, R. M., Orbell, J. M., & Van de Kragt, A. J. (1989). Selfishness examined: Cooperation in the absence of egoistic incentives. *Behavioral and Brain Sciences*, *12*(4), 683–739. https://doi.org/10.1017/S0140525X00025292

Cardenas, J.-C., Ahn, T. K., & Ostrom, E. (2004). Communication and co-operation in a common-pool resource dilemma: A field experiment. In S. Huck (Ed.), *Advances in understanding strategic behaviour: Game theory, experiments and bounded rationality* (pp. 258–286). London: Palgrave Macmillan. https://doi.org/10.1057/9780230523371_12

Cárdenas, J.-C., & Ostrom, E. (2004). What do people bring into the game? Experiments in the field about cooperation in the commons. *Agricultural Systems*, *82*(3), 307–326. https://doi.org/10.1016/j.agsy.2004.07.008

Castro, M. F. (2008). Where are you from? Cultural differences in public good experiments. *Journal of Socio-Economics*, *37*(6), 2319–2329. https://doi.org/10.1016/j.socec.2008.04.002

Charness, G., & Dufwenberg, M. (2006). Promises and partnership. *Econometrica*, *74*(6), 1579–1601. https://doi.org/10.1111/j.1468-0262.2006.00719.x

Chaudhuri, A. (2011). Sustaining cooperation in laboratory public goods experiments: A selective survey of the literature. *Experimental Economics*, *14*(1), 47–83. https://doi.org/10.1007/s10683-010-9257-1

Chen, X., & Komorita, S. S. (1994). The effects of communication and commitment in a public goods social dilemma. *Organizational Behavior and Human Decision Processes*, *60*(3), 367–386. https://doi.org/10.1006/obhd.1994.1090

Chuah, S.-H., Hoffmann, R., Ramasamy, B., & Tan, J. H. W. (2014). Religion, ethnicity and cooperation: An experimental study. *Journal of Economic Psychology*, *45*, 33–43. https://doi.org/10.1016/j.joep.2014.07.002

Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (vol. 24, pp. 201–234). San Diego New York Boston London Sydney Tokyo Toronto Academic Press. https://doi.org/10.1016/S0065-2601(08)60330-5

Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, *58*(6), 1015–1026. https://doi.org/10.1037/0022-3514.58.6.1015

Croson, R. T. A. (2007). Theories of commitment, altruism and reciprocity: Evidence from linear public goods games. *Economic Inquiry*, *45*(2), 199–216. https://doi.org/10.1111/j.1465-7295.2006.00006.x

Dawes, R. M. (1980). Social dilemmas. *Annual Review of Psychology*, *31*(1), 169–193. https://doi.org/10.1146/annurev.ps.31.020180.001125

Dawes, R. M., McTavish, J., & Shaklee, H. (1977). Behavior, communication, and assumptions about other people's behavior in a commons dilemma situation. *Journal of Personality and Social Psychology*, *35*(1), 1–11. https://doi.org/10.1037/0022-3514.35.1.1

Dawes, R. M., Van De Kragt, A. J. C., & Orbell, J. M. (1988). Not me or thee but we: The importance of group identity in eliciting cooperation in dilemma situations: Experimental manipulations. *Acta Psychologica*, *68*(1), 83–97. https://doi.org/10.1016/0001-6918(88)90047-9

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

Dawes, R. M., van de Kragt, A. J. C., & Orbell, J. M. (1990). *Cooperation for the benefit of us—Not me, or my conscience* (p. 110). Chicago: University of Chicago Press.
Essock-Vitale, S. M., & McGuire, M. T. (1985). Women's lives viewed from an evolutionary perspective. II. Patterns of helping. *Ethology and Sociobiology*, *6*(3), 155–173. https://doi.org/10.1016/0162-3095(85)90028-7
Etang, A., Fielding, D., & Knowles, S. (2011). Does trust extend beyond the village? Experimental trust and social distance in Cameroon. *Experimental Economics*, *14*(1), 15–35.
Fehr, E., & Gächter, S. (2000). Cooperation and punishment in public goods experiments. *American Economic Review*, *90*(4), 980–994. https://www.aeaweb.org/articles?id=10.1257/aer.90.4.980
Fischbacher, U., & Gächter, S. (2010). Social preferences, beliefs, and the dynamics of free riding in public goods experiments. *American Economic Review*, *100*(1), 541–556. https://doi.org/10.1257/aer.100.1.541
Fischbacher, U., Gächter, S., & Fehr, E. (2001). Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters*, *71*(3), 397–404. https://doi.org/10.1016/S0165-1765(01)00394-9
Frohlich, N., & Oppenheimer, J. (1998). Some consequences of e-mail vs. face-to-face communication in experiment. *Journal of Economic Behavior & Organization*, *35*(3), 389–403. https://doi.org/10.1016/S0167-2681(98)00044-4
Ghate, R., Ghate, S., & Ostrom, E. (2013). Cultural norms, cooperation, and communication: Taking experiments to the field in indigenous communities. *International Journal of the Commons*, *7*(2), 498–520. https://doi.org/10.18352/ijc.376
Glaeser, E. L., Laibson, D. I., Scheinkman, J. A., & Soutter, C. L. (2000). Measuring Trust. *Quarterly Journal of Economics*, *115*(3), 811–846. https://doi.org/10.1162/003355300554926
Goeree, J. K., McConnell, M. A., Mitchell, T., Tromp, T., & Yariv, L. (2010). The 1/d law of giving. *American Economic Journal: Microeconomics*, *2*(1), 183–203. https://doi.org/10.1257/mic.2.1.183
Goette, L., Huffman, D., & Meier, S. (2006). The impact of group membership on cooperation and norm enforcement: Evidence using random assignment to real social groups. *American Economic Review*, *96*(2), 212–216. https://doi.org/10.1257/000282806777211658
Haan, M. A., Kooreman, P., & Riemersma, T. (2006). *Friendship in a public good experiment* (SSRN Scholarly Paper ID 900825). Social Science Research Network. https://papers.ssrn.com/abstract=900825
Hamilton, W. D. (1964). The genetical evolution of social behaviour. II. *Journal of Theoretical Biology*, *7*(1), 17–52. https://doi.org/10.1016/0022-5193(64)90039-6
Hardin, R. (2003). Gaming trust. In E. Ostrom & J. Walker (Eds.), *Trust and reciprocity* (pp. 80–102). New York: Russell Sage Foundation. https://www.jstor.org/stable/10.7758/9781610444347.7
He, S., Offerman, T., & van de Ven, J. (2017). The sources of the communication gap. *Management Science*, *63*(9), 2832–2846. https://doi.org/10.1287/mnsc.2016.2518
Hoffman, E., McCabe, K., & Smith, V. (1996). Social distance and other-regarding behavior in dictator games. *American Economic Review*, *86*(3), 653–660.
Jensen, C., Farnham, S. D., Drucker, S. M., & Kollock, P. (2000). The effect of communication modality on cooperation in online environments. *Proceedings of the SIGCHI conference on human factors in computing systems*, 470–477. https://doi.org/10.1145/332040.332478
Kahneman, D. (2011). *Thinking fast and slow* (Illustrated Edition). New York: Macmillan USA.
Kerr, N. L., Garst, J., Lewandowski, D. A., & Harris, S. E. (1997). That still, small voice: Commitment to cooperate as an internalized versus a social norm. *Personality and Social Psychology Bulletin*, *23*(12), 1300–1311. https://doi.org/10.1177/01461672972312007
Kerr, N. L., & Kaufman-Gilliland, C. M. (1994). Communication, commitment, and cooperation in social dilemma. *Journal of Personality and Social Psychology*, *66*(3), 513–529. https://doi.org/10.1037/0022-3514.66.3.513
Kessler, J. B., & Leider, S. (2012). Norms and contracting. *Management Science*, *58*(1), 62–77.
Kocher, M. G., Cherry, T., Kroll, S., Netzer, R. J., & Sutter, M. (2008). Conditional cooperation on three continents. *Economics Letters*, *101*(3), 175–178. https://doi.org/10.1016/j.econlet.2008.07.015
Koessler, A.-K., Ortiz Riomalo, J. F., Janke, M., & Engel, S. (2020). *Structuring communication effectively for environmental cooperation* (SSRN Scholarly Paper ID 3533910). Social Science Research Network. https://doi.org/10.2139/ssrn.3533910
Kollock, P. (1998). Social dilemmas: The anatomy of cooperation. *Annual Review of Sociology*, *24*(1), 183–214. https://doi.org/10.1146/annurev.soc.24.1.183
Kramer, Roderick M., & Brewer, M. B. (1984). Effects of group identity on resource use in a simulated commons dilemma. *Journal of Personality and Social Psychology*, *46*(5), 1044–1057. https://doi.org/10.1037/0022-3514.46.5.1044
Kurzban, R. (2001). The social psychophysics of cooperation: Nonverbal communication in a public goods game. *Journal of Nonverbal Behavior*, *25*(4), 241–259. https://doi.org/10.1023/A:1012563421824
Lopez, M. C., & Villamayor-Tomas, S. (2017). Understanding the black box of communication in a common-pool resource field experiment. *Environmental Science & Policy*, *68*, 69–79. https://doi.org/10.1016/j.envsci.2016.12.002
Mittelman, R., & Rojas-Méndez, J. (2018). Why Canadians give to charity: An extended theory of planned behaviour model. *International Review on Public and Nonprofit Marketing*, *15*(2), 189–204. https://doi.org/10.1007/s12208-018-0197-3
Namibian Ministry of Lands and Resettlements. (2015). *Integrated regional land use plan for the Kavango East Region Baseline Report (Volume 1)*. Ministry of Lands and Resettlements, Government of Namibia. http://www.mlr.gov.na/documents/20541/497602/Kavango+East+Volume+1+March+2015.pdf/911cdfb1-bc85-4e8f-ad20-7895b7c35244

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

Orbell, J. M., Van de Kragt, A. J., & Dawes, R. M. (1988). Explaining discussion-induced cooperation. *Journal of Personality and Social Psychology*, *54*(5), 811–819. https://doi.org/10.1037/0022-3514.54.5.811

Ostrom, E. (2000). Collective action and the evolution of social norms. *Journal of Economic Perspectives*, *14*(3), 137–158. https://doi.org/10.1257/jep.14.3.137

Ostrom, E. (2010). Beyond markets and states: Polycentric governance of complex economic systems. *American Economic Review*, *100*(3), 641–672. https://doi.org/10.1257/aer.100.3.641

Ostrom, E., & Walker, J. (1991). Communication in a commons: Cooperation without external enforcement. In *Laboratory research in political economy*, 287–322.

Ostrom, E., Walker, J., & Gardner, R. (1992). Covenants with and without a sword: Self-governance is possible. *American Political Science Review*, *86*(2), 404–417. https://doi.org/10.2307/1964229

Park, R. E. (1924). The concept of social distance as applied to the study of racial attitudes and racial relations. *Journal of Applied Sociology*, *8*, 339–344.

Peters, H. E., Ünür, A. S., Clark, J., & Schulze, W. D. (2004). Free-riding and the provision of public goods in the family: A laboratory experiment*. *International Economic Review*, *45*(1), 283–299. https://doi.org/10.1111/j.1468-2354.2004.00126.x

Posner, R. A., & Rasmusen, E. B. (1999). Creating and enforcing norms, with special reference to sanctions. *International Review of Law and Economics*, *19*(3), 369–382. https://doi.org/10.1016/S0144-8188(99)00013-7

Rachlin, H., & Jones, B. A. (2008). Altruism among relatives and non-relatives. *Behavioural Processes*, *79*(2), 120–123. https://doi.org/10.1016/j.beproc.2008.06.002

Rand, D. G., & Nowak, M. A. (2013). Human cooperation. *Trends in Cognitive Sciences*, *17*(8), 413–425. https://doi.org/10.1016/j.tics.2013.06.003

Rivis, A., Sheeran, P., & Armitage, C. J. (2009). Expanding the affective and normative components of the theory of planned behavior: A meta-analysis of anticipated affect and moral norms. *Journal of Applied Social Psychology*, *39*(12), 2985–3019. https://doi.org/10.1111/j.1559-1816.2009.00558.x

Roth, A. E. (1995). *Bargaining experiments*. https://www.hbs.edu/faculty/Pages/item.aspx?num=625

Ruffle, B. J., & Sosis, R. (2006). Cooperation and the in-group-out-group bias: A field test on Israeli kibbutz members and city residents. *Journal of Economic Behavior & Organization*, *60*(2), 147–163. https://doi.org/10.1016/j.jebo.2004.07.007

Sally, D. (1995). Conversation and cooperation in social dilemmas: A meta-analysis of experiments from 1958 to 1992. *Rationality and Society*, *7*(1), 58–92. https://doi.org/10.1177/1043463195007001004

Schelling, T. C., Bailey, M. J., & Fromm, G. (1968). The life you save may be your own. *Problems in public expenditure analysis*: Papers presented at a conference of experts held september 15–16, 1966 [This was the *Second Brookings Conference on Government Expenditures*].

Schram, A., & Charness, G. (2015). Inducing social norms in laboratory allocation choices. *Management Science*, *61*(7), 1531–1546. https://doi.org/10.1287/mnsc.2014.2073

Schwartz, S. H. (1973). Normative explanations of helping behavior: A critique, proposal, and empirical test. *Journal of Experimental Social Psychology*, *9*(4), 349–364. https://doi.org/10.1016/0022-1031(73)90071-1

Schwartz, S. H. (1977). Normative influences on altruism. *Advances in Experimental Social Psychology*, *10* (1), 221–279.

Simpson, J. A. (2007). Psychological foundations of trust. *Current Directions in Psychological Science*, *16*(5), 264–268. https://doi.org/10.1111/j.1467-8721.2007.00517.x

Smith, J. R., & McSweeney, A. (2007). Charitable giving: The effectiveness of a revised theory of planned behaviour model in predicting donating intentions and behaviour. *Journal of Community & Applied Social Psychology*, *17*(5), 363–386. https://doi.org/10.1002/casp.906

Spears, R. (2011). Group identities: The social identity perspective. In S. J. Schwartz, K. Luyckx, & V. L. Vignoles (Eds.), *Handbook of identity theory and research* (pp. 201–224). New York, NY: Springer. https://doi.org/10.1007/978-1-4419-7988-9_9

Tajfel, H., Billig, M. G., Bundy, R. P., & Flament, C. (1971). Social categorization and intergroup behaviour. *European Journal of Social Psychology*, *1*(2), 149–178. https://doi.org/10.1002/ejsp.2420010202

Tajfel, H., & Turner, J. C. (1979). *An integrative theory of intergroup conflict*. In Hatch, M. J. & Schultz, M. (Eds.), Organizational identity: A reader, (pp. 56–65). New York: Oxford University Press.

Thompson, L., Kray, L. J., & Lind, E. A. (1998). Cohesion and respect: An examination of group decision making in social and escalation dilemmas. *Journal of Experimental Social Psychology*, *34*(3), 289–311. https://doi.org/10.1006/jesp.1998.1351

Turner, J. C. (1975). Social comparison and social identity: Some prospects for intergroup behaviour. *European Journal of Social Psychology*, *5*(1), 1–34. https://doi.org/10.1002/ejsp.2420050102

Turner, J. C. (1982). Towards a cognitive redefinition of the social group. *Social Identity and Intergroup Relations*, *1* (2), 15–40.

Vanberg, C. (2008). Why do people keep their promises? An experimental test of two explanations1. *Econometrica*, *76*(6), 1467–1480. https://doi.org/10.3982/ECTA7673

Velez, M. A., Murphy, J. J., & Stranlund, J. K. (2010). Centralized and decentralized management of local common pool resources in the developing world: Experimental evidence from fishing communities in Colombia. *Economic Inquiry*, *48*(2), 254–265. https://doi.org/10.1111/j.1465-7295.2008.00125.x

Velez, M. A., Stranlund, J. K., & Murphy, J. J. (2012). Preferences for government enforcement of a common pool harvest quota: Theory and experimental evidence from fishing communities in Colombia. *Ecological Economics*, *77*, 185–192. https://doi.org/10.1016/j.ecolecon.2012.02.030

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press

Wilson, R. K., & Sell, J. (1997). "Liar, Liar. . . ": Cheap talk and reputation in repeated public goods settings. *Journal of Conflict Resolution*, *41*(5), 695–717. https://doi.org/10.1177/0022002797041005005

Yamagishi, T., & Sato, K. (1986). Motivational bases of the public goods problem. *Journal of Personality and Social Psychology*, *50*(1), 67–73. https://doi.org/10.1037/0022-3514.50.1.67

**Cite this article:** Hoenow, N. C. and Pourviseh, A. (2024). Intragroup communication in social dilemmas: An artefactual public good field experiment in small-scale communities. *Judgment and Decision Making*, e1. https://doi.org/10.1017/jdm.2023.38

https://doi.org/10.1017/jdm.2023.38 Published online by Cambridge University Press