Social distance in cooperation games: Examining the effect of conversation between players

Abstract: Although traditional economic game theory relies on the assumption that players are rational and strictly self-interested, research shows behavioral and social factors contribute to people's decision-making. This study investigates whether five minutes of conversation between two players who did not know each other prompts them to contribute more money to a shared account in a two-player cooperation game. In the game, public good is maximized if both players put everything in the shared account, but choosing to keep some money in a player's personal account often results in higher personal gains. We hypothesized that conversation time would lead to decreased social distance and greater shared account contributions, but our results did not show a significant difference in the group of players that conversed before playing. While five minutes of conversation might not be enough to decrease social distance and inspire greater shared account contributions, we suggest further study to observe the effects of other, already established relationships.

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Introduction

Traditional economic theories assume individuals are "rational," or completely self-interested — that is, they will act to maximize their own gain. Game theory is no exception. Designed to predict the behavior of multiple players with interconnected actions and outcomes, game theory often relies on the supposition that all players are rational. But recent studies show that real people do not behave rationally in the lab. For example, in games where one player offers a lump sum to another, subjects show concern for fairness rather than simply vying for maximum personal gain. [1, 2, 3, 4]

An example of this is the ultimatum game, where a proposer and a responder bargain over a sum of money. The proposer offers a portion of the total to the responder, and the responder chooses to accept or reject the offer. If the responder accepts, he receives the offer and the proposer receives the remainder. But if the responder rejects the offer, both players receive nothing.

To predict players' behavior in dynamic games, game theorists use subgame perfection, which involves working backward to solve the game. In an ultimatum game, the subgame perfect equilibrium occurs when the proposer offers the smallest amount possible and the responder accepts. [3] In this situation, both players act completely out of self-interest. In practice, though, proposers most often offer around 40 or 50 percent of the total, even with substantial amounts at stake. [4, 8] Also, about half of the time responders refuse offers of less than 20 percent. [4] Experimenters interpret these results as evidence that responders feel slighted when they are not offered a "fair" or close-to-half amount and will refuse in order to "get back" at the proposer. Proposers, in turn, seem to anticipate this and will offer close to half to increase the chance of an accepted offer.

In games with a public good consideration, researchers often explain human decisions through both private and social motivations. [7] Recent research also suggests that social,

behavioral and cognitive factors can contribute to an understanding of economic behavior that deviates from theory. [6]

These analyses show subjects do not behave rationally in the field. Thus, it is important to examine how people deviate from rational economic behavior and what brings changes in that behavior. Many insights have been made in recent years. How well players relate to each other, or the "social distance" between them, seems to play a role in their decision-making. When subjects in an ultimatum game know just the family name of the other player, their behavior changes little. [5] Personal communication and face-to-face bargaining between subjects, however, have both led to demonstrations of fairness. [2, 7] Besides the fairness component in bargaining decisions, people seem to take into account a social norm, gravitating toward this norm when making and accepting offers. [1]

In this experiment, we examine the effects of increasing personal communication between players of a cooperation game. Our control group did not converse at all before playing the game, while the treatment group had five minutes of free conversation time prior to the game. In the game, players could choose to potentially maximize the overall gain for both players by putting all of their initial endowment into a shared account, or they could choose to keep some money in a personal account to ensure they would walk away with at least a little cash. Some related literature has explored social distance between players, but we found little research focusing on the amount of time spent decreasing that distance. In addition, many conclusions regarding concern for social distance or fairness developed from analysis of data alone, and without talking with subjects about their motivations. Thus, this experiment includes a survey of subjects' reasoning to try and describe the *why* behind the behavior more accurately.

Cooperation games, like the one we tested, are good models for situations such as court and legislative collaborations. In both the games and real-life negotiations, parties must decide how they will balance their private interests with the opportunity to maximize the public good. For example, the findings in this experiment apply to negotiations where legislators are deciding what to keep or remove from a bill, or where opponents are

bargaining to settle in a court case. By learning about the role of social distance in cooperative bargaining, legislators and lawyers can determine how to maximize compromise and accepted offers.

Methods

Initially, we hoped to examine whether conversation would increase offers and acceptance rates in ultimatum games. To see how viable the experimental design would be, we ran control games with volunteer subjects from the University of Minnesota student community. After several games, however, each proposer had offered exactly half of the total $10 pot, and it was clear that there would likely not be enough variation in the control group to determine whether there was a difference in the treatment group. Although in this paper we do not offer any conclusive explanation for why the 50-50 split occurred in all pretesting cases, some of our participants suggested the outcome could be the result of a "Minnesota nice" factor or a consequence of both participants playing the game in the same room. We then decided to try the same conversation treatment but instead use a cooperation game with a public good component. The new game, we thought, would provide more variation in responses.

In the game we chose, two players each begin with a $7 endowment. Each player must choose how much of that endowment to allocate to a personal account and how much to put into an account that is shared with the other player. After the players make the allocations without consulting each other, the experimenter increases the shared account by half. To calculate final earnings, each player gets half of the final shared account balance added to their personal account.

If the players each decided to put all $7 into the shared account, they would maximize overall earnings. In that scenario, each player earns $10.50 and total earnings between the two players would be $21.

To maximize Player 1's earnings, Player 1 would have to put $7 into her own account while Player 2 chose to put $7 into the shared account. In this scenario, Player 1 would earn $12.25, Player 2 would earn $5.25, and total earnings between the two players would be $17.50 — substantially less than the previous example.

For the cooperation game, subjects were again chosen on a volunteer basis from the University of Minnesota student community. To recruit participants, we used the Department of Psychology's Research Experience Program, which allows students to earn extra credit in psychology classes for participating in research. Subjects earned two percentage points of extra credit for participating. Subjects also knew they could earn up to $12 based on the choices that they and another participant would make during the cooperation game. On average, subjects earned $9.14 during the half-hour experiment.

Twenty pairs of subjects played the game, with varying amounts of free conversation time before the game to potentially decrease the social distance between players. A control group of ten pairs had no interaction before playing the game, and an experimental group of ten pairs had five minutes to interact before the game. Subjects in the treatment experiments were given a list of potential icebreaker questions to use during conversation time, including questions like, "What year in school are you?" and "What are you studying? Why?" Subjects were told they could discuss any topic.

After conversation time, we explained the game to subjects, took questions and asked them to choose how much of their $7 they would allocate to each account. When they were finished, we wrote their choices on the board and calculated the shared account total and final earnings.

Finally, all players completed a short survey after the game. The survey asked participants to rate how well they knew the other player before playing the game, explain how they made their decisions and share what they thought the other player was thinking. I hypothesized that the amount of money put into the shared account would increase with conversation time, because social distance between subjects would have decreased.

Results

We found that treatment group subjects contributed $0.19 more to the shared account than the control group, on average. Based on the two groups' standard deviations, the contributions from the treatment group were also less varied than those of the control group. But the median amount allocated to the shared account was exactly the same for the two groups. See Table 1 for a more complete description of the data, and Figure 1 for histograms.

In our analysis, we first conducted a two-sample Kolmogorov-Smirnov test. The null hypothesis in this test stated that the treatment and control group data were drawn from the same distribution, while the alternative hypothesis stated that the treatment group data came from a distribution greater than that of the control group data. We found that there was not enough evidence to conclude that the data came from different distributions (p-value=0.95).

	Control	Treatment
Minimum	0.00	2.50
First quartile	3.00	3.00
Median	3.75	3.75
Third quartile	5.13	5.00
Maximum	7.00	7.00
Mean	4.10	4.29
Standard Deviation	1.89	1.40

Table 1: Summary statistics

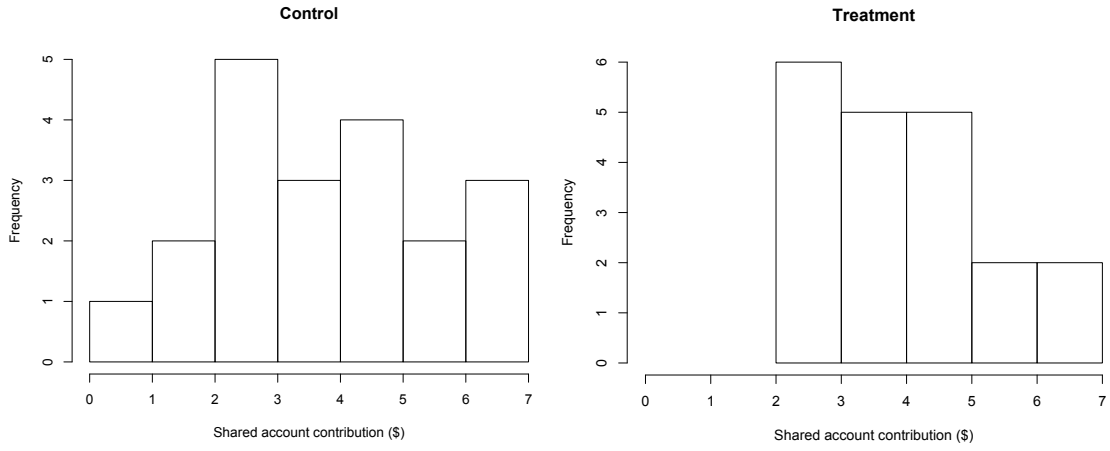

Figure 1: Histograms showing the distribution of shared account contributions in the control and treatment groups. Participants in the treatment group gave no shared account contributions lower than $2.50.

In the Kolmogorov-Smirnov test, it is impossible to compute an exact p-value when the data sets include some equal values, like ours do. But since the p-value was quite high, we do not feel that this affected our conclusion.

We then performed a two-sample t-test, which assumes that the two samples come from normal distributions, to see whether the difference in the two groups' means was statistically significant. We found that it was not (p-value=0.36).

During the experiments, participants answered a survey question that asked them to rate how well they knew the other participant just before playing the cooperation game. The scale was 1 for "not at all" and 10 for "very well." In the control group, all 16 responses were 1s (for four participants, these data were not collected). Responses in the treatment group ranged from 1 to 8, with an average of 3.2 and a median of 3.

To further test what effect social distance might have on shared account contributions, we fitted a simple linear regression model with contribution as the response variable and the 1-10 rating as the predictor. The multiple R-squared of 0.0015 does suggest a negligible positive correlation, but there is not enough evidence to conclude that the coefficient on rating is nonzero (p-value=0.83). Figure 2 shows a plot of contribution versus rating and the linear regression we fitted.

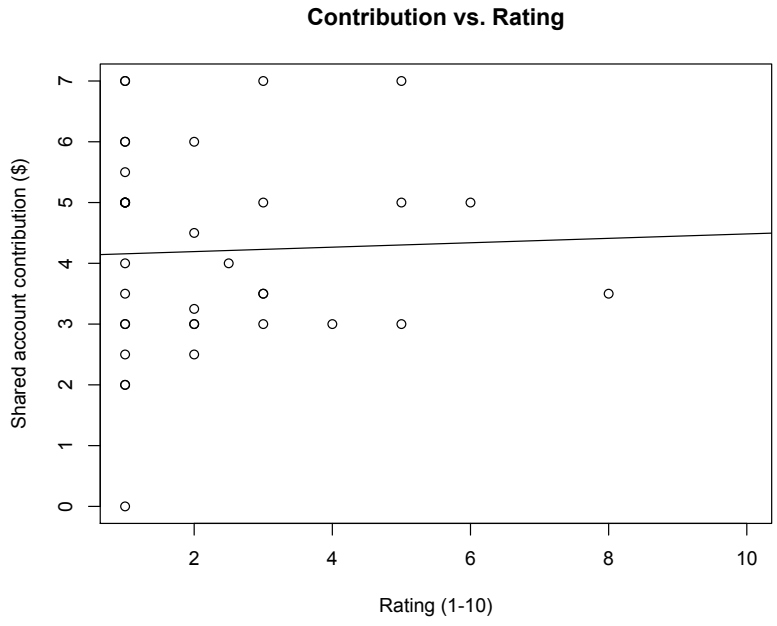

Figure 2: A plot of shared account contribution and rating data. The line shows the simple linear regression.

Finally, a review of the survey responses suggested that most participants made their allocations based on a consideration of the best strategy to maximize their profit. Considerations for fairness and social distance were present, but they were few compared to those motivated by economic strategy. The results were similar for what players thought motivated their counterparts during the game. Most thought the other player made decisions based on a concern for what would maximize personal gain.

Discussion

The data we collected did not support our hypothesis that shared account contributions would increase with conversation time. However, we are not convinced that social distance plays no role in motivating a participant to willingly cooperate for the good of the group. While the treatment- and control-group means were not significantly different for conventional levels of significance, this could be attributable to several features of our experiment that could be improved in future work.

Firstly, this study examined twenty games, and twenty subjects in each of the data pools. This is a rather small data set, and it is possible that we would see statistically significant differences between groups if more participants were observed. Secondly, $7 is not an especially large sum to allocate. A difference between groups could appear if participants received a higher endowment to heighten the stakes.

Finally, it is likely that five minutes of conversation time is not sufficient to decrease social distance to the point that each player trusts the other to put a large sum in the shared account. Perhaps, though, stronger relationships would affect those decisions. A future study could examine the decisions roommates make while playing the game, compared with the decisions of strangers.

Although the samples studied here were small and from a specific population, our results suggest that quick, haphazard relationships are not strong enough to inspire cooperation.

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