games

Article

Intention or Request: The Impact of Message Structures

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Abstract: This paper investigates how different message structures impact communication strategy as well as sender and receiver behavior. Specifically, we focus on comparing communication games with messages stating an intention versus a request. Our experimental results show that when a game includes self-signaling or self-committing messages, the two message structures yield negligibly different results. However, when the messages of the game are neither self-signaling nor self-committing, we find that more subjects send messages suggesting cooperation with request than intention. Interestingly, subjects also deviate from their suggested actions more frequently with request than intention. We surmise lying aversion plays a prominent role in contributing to the differences in games where messages lack the self-committing property.

Keywords: communication; cheap talk; experiment; lying aversion

JEL Classification: C71; C92; D83

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1. Introduction

Farrell [1] suggested that the richness of messages should play a more prominent role in game theory. Mounting empirical evidence supports this view. In relation to restricted intention signaling, research suggests that economic outcomes may vary when players can communicate using rich free-form language (see [2–6]). However, between intention-signaling and free-form communication, many other forms of message structure exist, with each possibly having differing impacts on economic outcomes. This paper examines the effect of switching from intention-signaling to request-signaling on decision-making in three 2-by-2 symmetric games.

We consider a group of two-stage games in which a player sends a non-binding cheap talk message in the first stage and both players take simultaneous actions in the second stage. We investigate how the message structure affects a player's communication strategy in the first stage and the subsequent action of each player in the second stage. Existing experimental studies typically structured the messages in the form of "I plan to choose", or "I will choose". What would happen if players communicate with requests instead of intentions? To answer this query, this study uses a treatment with messages stating "I want you to choose" in addition to a treatment with the standard message "I plan to choose".

Lying typically requires greater mental effort than telling the truth, e.g., [7,8] show that aversion to lying appears to be impacted by intuitive reasoning. When communicating with a request, the message states a sender's suggestion of the receiver's behavior, rather than giving a promise regarding her own intended action. Consequently, this subtle change of message structure might motivate intuitive reasoning to change and likely prevents lying aversion from influencing the sender's selection of action. While previous experiments (e.g., [9]) demonstrate that people have a preference for keeping their promises, as pointed out by psychology literature (e.g., [10]), most of the lies people tell are not clear-cut.

Using the assumption of lying aversion, Ellingsen and Östling [11] built a level-k model on communication and fully characterized its effects in various environments. In their analysis, the messages state the intention of the sender. They assume players have a lexicographic preference for truth-telling; therefore, indifferent players send truthful messages. The assumption reflects the notion that people are somewhat averse to lying, without incurring the notational burden of explicit lying costs. However, removing this assumption eliminates the ability for players to effectively communicate in their model. Towards the end of the paper, the authors ask "what would happen if players communicated with requests instead?". Instead of relying on the lying aversion of the sender to facilitate effective communication, request based communication depends on a preference for the receiver to follow a recommendation, i.e., an indifferent receiver selects the requested action. We find that in games where players have an incentive to follow through with the requested or intended action, for example in Mixed Motive games and coordination games such as the Stag Hunt game, both request and intention signaling leads to similar communication strategy and sender and receiver behavior. However, in games with little or no incentive to select the action in a message, such as the Prisoner's Dilemma, players are less likely to send messages of cooperation with intention based messaging compared to request based messaging. Moreover, in these games players also deviate from their words more frequently with request than intention. Messages communicated implicitly are presumably less subject to costs from lying aversion, so players in the request treatment are more likely to send a message counter to their intent.

2. Literature Review

Early work by Farrell [12,13] and Rabin [14] pioneered the study of intention-signaling in simple games with complete information. In these games, an underlying game is preceded by a communication stage in which players make costless, nonbinding announcements about intended moves. Farrell argued that cheap talk could make equilibrium focal and should not be ignored. Rabin [14] extended the analysis of Farrell [13] by having players make repeated, simultaneous statements about their intended moves before a coordination game, in contrast to Farrell where players made announcements sequentially. This study has a structure more in line with Farrell [13] as only one player sends a message. In the model of Rabin [14], behaviorally motivated restrictions on beliefs and unbounded rounds of simultaneous communication lead to play on one of the Pareto-efficient equilibria. The research of Farrel and Rabin led to the explosion of both experimental and theoretical research on communication over the past thirty years.

Theory and empirical evidence reveals that the effectiveness of signaling in improving economic outcomes depends on the payoff structure of the underlying game, as well as the structure of the communication protocol (e.g., [15–23]). For instance, Clark, Kay, and Sefton [19] tested Aumann's conjecture with two-way communication and found that informative signaling does not necessarily lead to Pareto-efficient outcomes. Blume and Ortmann [23] studied median and minimum games, where multiple players simultaneously sent numerical messages to signal which of the options they intended to choose in the experiment. Their data indicated that cheap talk facilitates coordination in games with a unique Pareto optimal equilibrium.

Many theories use the assumption of lying aversion to explain the effectiveness of communication, just like the Ellingsen and Östling [11] paper discussed in the introduction. Demichelis and Weibull [24] introduced a small cost for lying to cheap talk model. They found that the lexicographic communication game is evolutionarily stable when it results in a unique Pareto-efficient outcome. Kartik [25] embeds a continuous lying cost function for the sender in the classic model of Crawford and Sobel [26]. Unsurprisingly, Kartik [25] finds that higher lying cost lead to more effective communication. He cites three reasons for lying costs: penalties for misreporting (e.g., IRS audits), cost to misreporting (e.g., cooking the books), and finally a psychological cost to lying. Cox and Stoddard [27] use Kartik's model as a behavioral alternative to standard theory as a motivation to explain why cheap talk may improve contributions in an experiment with a common-value binary public good game where each player receives a signal about the value of the public good, high or low. Consistent with lying aversion, they find that players often truthfully report, contrary to standard theory, including in a treatment with random players that lacks repeated game effects. After running two other treatments with stronger incentives to misreport by reducing the accuracy of player's signals and decreasing the distance between the marginal per capita return between the high and low states, they still find largely truthful reporting, though players misreport significantly more relative to their initial treatment with cheap talk.

Prior experiments show that many people experience a psychological cost of misrepresenting the truth and suggest that promises increase the credibility of communication (e.g., [2,28,29]). Gneezy [9] carried out a test of lying aversion using a sender-receiver game where lies increase the payoffs to the sender and hurt the receiver. The results indicated that lying is psychologically costly and sender's inclination to lie increases the more they stand to gain and decreases the more receivers lose. Later, López-Pérez and Spiegelman [30] ran an experiment to test pure lying aversion, controlling for other factors such as guilt-aversion and altruism, and found evidence that a significant portion of subjects have a preference for honesty. Because lying cost likely plays a role in effective communication, some formats of communication where the sender states an intended action, a type (in a game of incomplete information), or an explicit promise may lead to better communication compared to other formats such as making a request that the other player select a specific action, a concept this experiment puts to the test.

In addition to fixed form messages of intention signaling, economists have explored the effects of other forms of communication in economic environments. For example, Charness and Dufwenberg [2,3] studied the impact of communication on trust and trustworthiness. In their experiment, one can send a message stating "I promise to choose Roll" (which they call "bare promises"), or leave a blank message. They find communication promotes trust and trustworthiness, and its impact is stronger with a less restricted message structure. Our experiment uses fixed form messaging as it allows messages clearly defined as either a request or intention, while free form messages may include both intentions and requests, neither intentions nor requests, or even an unclear meaning.

Finally, two recent studies examine the effect of the structure of communication on play in games. Blume, Lai, and Lim [31] designed an experiment that compares direct communication to mediated talk in a two type "cheap talk" sender-receiver game where only mediated talk theoretically allows for meaningful communication by garbling messages in one of the states. Moreover, they also compared the different structures of communication: whether using the type ("declarative") or recommendation ("directive") to communicate impacts subjects behavior in both mediated and direct talk. In the some of the mediated talk sessions, they used a case where senders report types and receivers observe recommendations ("mediated direct mechanism"). Unsurprisingly, communication is more effective with mediation, as predicted by theory; however, the format of the messages, whether "directive" or "declarative", appears to have no effect on behavior in the mediated talk sessions but "does matter for equilibrium selection under direct talk. "Agranov and Schotter [32] studied a three player game with an announcer and two players who simultaneously choose actions after the announcer makes an announcement, with four states, labeled one to four, with each state being either a coordination or Battle of the Sexes game. Because of the asymmetry of payoffs in Battle of the Sexes, communication that pools states helps players select an efficient equilibrium. The researchers used both human and computer announcers and compare vague (the state is "low" or "high") to ambiguous communication (where some of the states are pooled, 1–3 vs. 4 in their game), and they found that both of these communication structures perform better than a communication structure that allows only revealing the state though ambiguous communication performs better than vague communication.[1]

[1] We thank a referee for providing us these two references that also vary the format of language in their experiments.

3. The Games

In order to clearly identify how the two different language structures impact economic outcomes in all typical environments, we adopted the Mixed Motive, Stag Hunt, and Prisoner's Dilemma games from each of the categories of symmetric 2×2 economic games. Suppose we have a generic matrix as below:

$$\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$$

We can always transform the matrix to the following format:

$$\begin{pmatrix} a_{11} - a_{21} & 0 \\ 0 & a_{22} - a_{12} \end{pmatrix}$$

Next, we classify all generic and symmetric 2×2 game into four categories shown in Figure 1. This classification is based on [33] and [11].

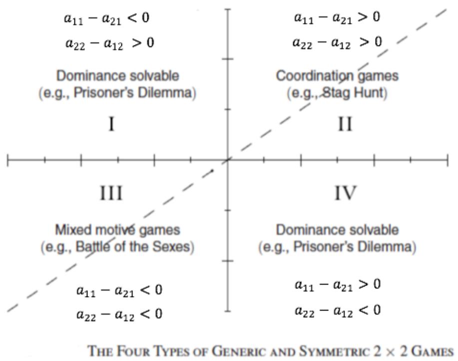

Figure 1. The Four Types of Generic and Symmetric 2×2 Games.

In particular, Figure 2 displays the payoff matrices of the games in our study: Mixed Motive, Stag Hunt, and Prisoner's Dilemma. In the experiment, players send one-way messages before playing each game. After the message is sent, each player simultaneously chooses an action, and the combination of actions chosen by the players determines a payoff for each player.

Column Player; *Row Player*

Mixed Motive

	Square	Triangle
Square	0, 0	150, 50
Triangle	50, 150	0, 0

Stag Hunt

	Square	Triangle
Square	100, 100	20, 90
Triangle	90, 20	50, 50

Prisoner's Dilemma

	Square	Triangle
Square	50, 50	0, 150
Triangle	150, 0	20, 20

Figure 2. Payoff Matrices.

Following Rabin [14], we assume players' messages consist of proposals to play Pareto-efficient equilibria in the Mixed Motive game. Rabin [14] referred this type of communication as "Pareto talk". This is considered as one of the important examples of negotiating language, where the purpose of communication is to improve from Pareto-dominated equilibria to Pareto-efficient equilibria. With a one-way signal, players may be able to coordinate on one of the two Nash equilibria, (Square, Triangle) or (Triangle, Square), in the Mixed Motive game. Each equilibria favors a different player, so the outcome of the game likely depends on who sends the signal with the signaling player receiving the more favorable payoff. Charness [18] defines a message as self-signaling if the signaler wishes to convey information if and only if it is true.[2] With a common understanding

[2] With request based messages, we consider a truthful message as one which a sender prefers the receiver to follow.

regarding language and sensible beliefs (e.g., players interpret a Square message as Square), the sequential equilibrium has a message with the sender's preferred outcome, with both players selecting said outcome. Clearly, the sender has an incentive to follow through with the given message, and the receiver finds the message credible. However, even in the bizarre case a sender uses the message suggesting the equilibrium favorable to the receiver, the receiver still has an incentive to play the recommended action (or play the best-response to the sender's action). Thus, the signaler in a game only has an incentive to send honest messages in the game, i.e., what action they plan to choose or what they want the receiver to select, regardless of intentions. Messages in the game, therefore, have the self-signaling property, and, hence, the two separate message structures likely minimally differ in regard to outcomes in this game.

Farrell and Rabin [34] define a message as self-committing if it creates incentives for the signaler to fulfill it, when the other player considers the message credible. In our Stag Hunt game, Square represents the "Stag" option, where both selecting Stag is the Pareto-efficient outcome. When the sender states an intention to play Square (or requests it of the receiver), the sender earns more from following through with selecting Square when believing the receiver also chooses Square. Triangle represents the "Hare" option which minimizes risk for players since it guarantees players a higher minimum payoff compared to the Square option (50 vs. 20). Similar to the Square message, if the sender uses the Triangle message, the sender earns more from following through with the Triangle message when believing the receiver picks Triangle. Thus, both messages possess the self-committing property making the likelihood of effective communication high.

Though the messages contain the self-committing property in our Stag Hunt game, the Square message contains the "self-serving" property, originally defined by Aumann [35], as players who intend to choose Triangle also should send the Square message. Thus, the Square message lacks the self-signaling property of Charness [18] since players should send Square regardless of their intentions. The messages, therefore, may impact the decision-making less relative to the Mixed Motive game which has the stronger self-signaling property.

In the Prisoner's Dilemma game, the Pareto efficient message, Square, neither possesses the self-signaling nor self-committing property, because regardless of the decision of the other player, each player receives a higher payoff by choosing Triangle, representing the defect strategy of the Prisoner's Dilemma. Players may try to achieve the Pareto efficient outcome by sending the Square message. Whether players send the Triangle or Square messages, both the sender and receiver have an incentive to choose Triangle, even if the receiver believes the sender will choose Square. Theoretically, communication has no effect in this game, so both forms of communication likely impact behavior in this game the least.

With an explicit cost of lying, communication may impact the messaging and/or behavior in the game. If a player sends a Square message (representing cooperate), lying aversion may prevent a deviation to the more profitable Triangle decision (representing defect). Whether a receiver feels compelled to follow a Square request as an explicit cost, however, is an open question. Lying aversion likely also affects the relative frequency of the Square message in each treatment. Given many senders will intend to choose the dominant action, Triangle, they will probably send more Square messages in the request treatment where lying plays less of a role than the intention treatment. Thus, different frequencies of messages might occur between the communication treatments in the Prisoner's Dilemma game relative to the other two games, even if the message itself lacks any impact on the game. Other social preferences, such as guilt aversion (e.g., [36]) where a player wants to avoid letting another down by selecting an action that decreases the other player's payoff, could potentially affect behavior in this game in addition to lying cost. However, such social preferences can't explain the differences between Intention and Request treatments. As long as the message is suggesting the same action, the guilty level should remain constant regardless of the message structure.

4. Experimental Design

Subjects play the games discussed in last section under three conditions: baseline, intention message, request message.

In baseline, the game proceeds as follows. At the beginning of each game, we randomly assign subjects to pairs. Then the subjects read the instructions regarding how the payoff is determined. Next, the paired players independently choose a shape.

To avoid menu effects (e.g., coordinating on the first listed option), the visual presentation of the game lacked a default "first option." More precisely, subjects viewed square payoff tables (see Figure 3) before playing the game, specifically designed to eliminate the salience of any particular option.

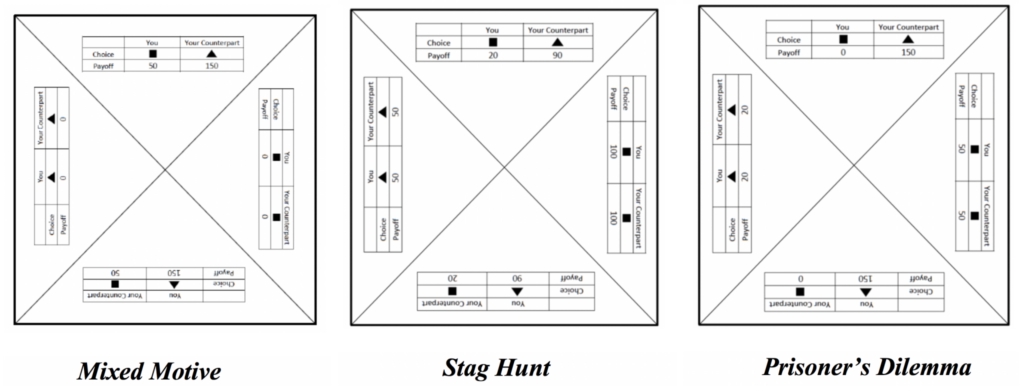

Figure 3. Payoff Tables.

4.1. Treatments

The two treatments with communication proceeded just as in the baseline, with the two exceptions. First, every subject constructed a single restricted form message before she chooses a shape. Second, after both subjects constructed their message, each subject selected a shape as sender. Then, each subject received the message of the other player, and, finally, each subject choose a shape as receiver. Subjects were clearly informed that only one person in each pair would be randomly selected as sender and only one as the receiver; moreover, players knew only the choices they made in their randomly selected roles determined their payoff. This design doubled the amount of messages and choices collected in each session of the communication treatments.

In the intention treatment, subjects could choose one message from the following two to communicate with their counterparts: "I plan to choose Square" or "I plan to choose Triangle." In the request treatment, subjects could choose one message from the following two to communicate with their counterparts: "I want you to choose Square" or "I want you to choose Triangle". Many prior studies demonstrate that adding communication in games generally increases welfare of subjects (e.g., [15,16,18,23]). As expected, both intention and request structures of communication made players better off relative to no communication in our experiment. Since our goal is to determine the differences between the two language structures, we focus on differences between intention and request in our analysis.

Table 1 lists the number of subjects per each treatment. This study used a between-subject design, where each subject experienced exactly one treatment. In all treatments, each subject played three different games in a random order and faced different counterparts every game. At the beginning of each game, subjects were randomly and anonymously paired. Between each of the games, subjects did not receive any feedback regarding the outcome of a previously played game. At the end of the experiment, a random selection of one the played outcomes from the three games determined the payoffs of the subjects.

Table 1. Design of Treatments.

	Baseline	Intention	Request
Total No. of Subjects	42	42	46

During the experiment, subjects were seated at separated cubicles. They read the experimental instructions (see the screenshots in Appendix A), sent messages, and made decisions on a computer. The investigator also read the instructions aloud to ensure subjects understood that the information contained in them was common knowledge.

4.2. Details and Procedures

We conducted the experiments with 130 undergraduate students at a large public university located in the Midwestern United States in March and September 2019. Subjects were recruited through the ORSEE system [37] and the games, quizzes and post-questionnaires were programmed through oTree [38]. We ran 9 sessions, with 3 sessions for each treatment. In each session, 12–18 people were recruited through the experimental economics laboratory subjects pool. Subjects were paid $5 for showing up, and earned $16.98 on average. The experiment lasted about 50 min, and the average payoff was designed to be slightly above the local hourly wage for subjects from the subject pool.

5. Results

5.1. Communication Strategy

Result 1. *In games with self-signaling or self-committing messages, the communication strategies are not significantly different between intention and request treatments. In games with neither self-signaling nor self-committing messages, slightly and significantly more players suggest cooperation with request than with intention.*

In the Mixed Motive game, the two NEs are (S, T) and (T, S). Since we assume players only do Pareto talk, when a player states "I want you to choose Triangle", she suggests the counterpart to choose Triangle, and directly signals her own intention to choose Square. Analogously, when a player states "I want you to choose Square", she suggests the counterpart to choose Square, and indirectly signals her intention to choose Triangle. For ease of comparison, we define the message (S, T), "I plan to choose Square" in the treatment of intention and "I want you to choose Triangle" in the treatment of request, as self-interested Pareto talk messages. Panel A of Figure 4 shows the percentages of players who choose to send messages suggesting the equilibrium more favorable to themselves in the Mixed Motive Game, denoted by the (S, T) message. Specifically, 11.7% more senders suggest the equilibrium favorable to themselves, the (S, T) outcome, in the intention treatment relative to the request treatment though it is not significantly different (Mann–Whitney U test, $Z = 1.093$, p-value = 0.275, $n_1 = 42, n_2 = 46$)[3].

In the Stag Hunt game, (S, S) is the Pareto-efficient NE. We assume that both "I plan to choose Square" and "I want you to choose Square" are suggesting this NE. Panel B of Figure 4 shows the percentages of players who send Square messages in the Stag Hunt game. The vast majority in both treatments, 88.1% and 93.5% of players with intention and request respectively, send Square. The behavior is nearly identical and, unsurprisingly, not significantly different between the two treatments (Mann–Whitney U test, $Z = -0.872$, p-value = 0.383, $n_1 = 42, n_2 = 46$).

[3] We reported the results from Mann-Whitney U test simply because it is widely adopted in experimental economics. We used two-sided tests and consider 0.1 as the significance level given the sample size. The results documented in this section are also confirmed by Fisher's Exact tests.

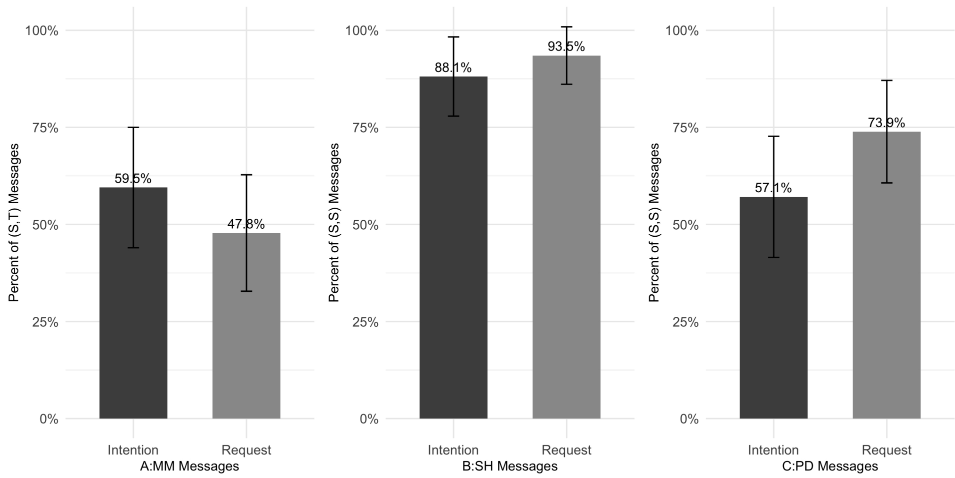

Figure 4. Communication Strategy.

In the Prisoner's Dilemma game, (T, T) is the only NE and selecting T is a dominant strategy. Through communication players might be able to coordinate on (S, S), a Pareto improvement over (T, T). However, as discussed in Section 3, the Square message in this game is neither self-signaling nor self-committing. A Square message lacks these properties because a player earns more by choosing Triangle, regardless of the decision of the other player. We assume that both "I plan to choose Square" and "I want you to choose Square" are suggesting (S, S). Figure 4 shows the percentages of Square messages in the Prisoner's Dilemma game. The error bars represent the 95% confidence interval. 57.1% and 73.9% of players send Square with intention and request respectively. More players, roughly 17%, send Square with request than with intention with significance at the 0.1 level (Mann–Whitney U test, $Z = -1.648$, p-value = 0.099, $n_1 = 42, n_2 = 46$).

5.2. Sender Behavior

Result 2. *In games with self-signaling or self-committing messages, the sender behavior is not significantly different between intention and request treatments. In games with neither self-signaling nor self-committing messages, players significantly deviate from their suggested actions more frequently with request than with intention.*

As shown in the Panel A of Figure 5, in the Mixed Motive game players rarely deviate from their words in either communication treatment and deviate at roughly the same rate (16.7% after an intention and 17.4% after a request). There is no significant difference between the treatments (Mann–Whitney U test, $Z = -0.090$, p-value = 0.929, n_1 = 42, n_2 = 46).

In the Stag Hunt game, we find that almost the exact same percentage of players, 14.8% and 15.2%, deviate from their words and choose Triangle with an intention and a request respectively (See Panel B of Figure 5). The difference between two treatments is not significant (Mann–Whitney U test, $Z = -0.122$, p-value = 0.903, $n_1 = 42, n_2 = 46$).

As shown in Panel C of Figure 5, in the Prisoner's Dilemma game, 50.0% and 69.6% of senders deviate from their suggested actions, a 19.6% difference that is significant. (Mann–Whitney U test, $Z = -1.862$, p-value = 0.062, $n_1 = 42, n_2 = 46$). Senders deviate from their suggested actions more with request than intention.

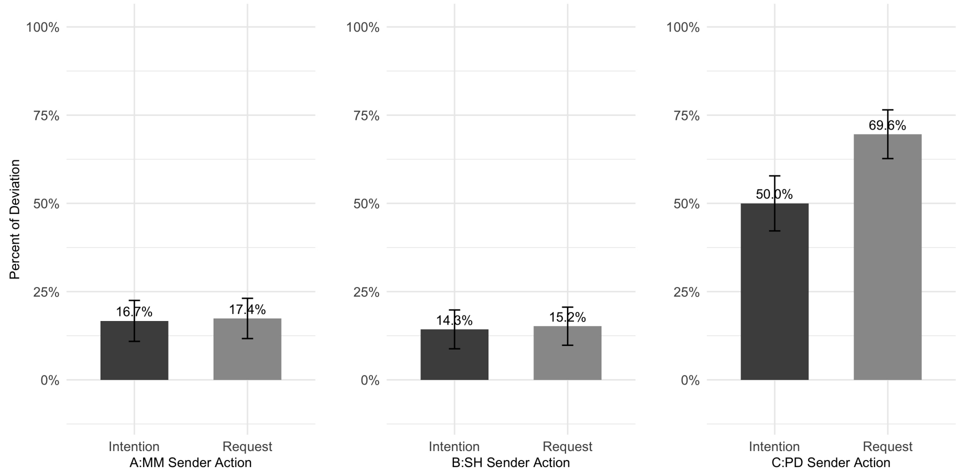

Figure 5. Percent of Deviation from Suggested Action.

5.3. Receiver Behavior

Result 3. *The receiver behavior is not significantly different between the intention and request treatments in each of the three games.*

The ability to send messages creates an advantage in the Mixed Motive game. Receivers likely believe messages in this treatment most, given they possess the self-signaling property discussed earlier. Hence, they have a strong incentive to adhere to the desires of the sender. In this game, when one receives a self-interested Pareto talk message (S, T), we define that a receiver follows the message if she chooses Triangle. Analogously, when one receives an altruistic Pareto talk message (T, S), we define that a receiver follows the message if she chooses Square. As shown in Panel A of Figure 6, 76.2% and 82.6% of receivers follow the messages. The 6.4% difference between the treatments is not significant (Mann–Whitney U tests, $Z = -0.741$, p-value = 0.458, $n_1 = 42, n_2 = 46$).

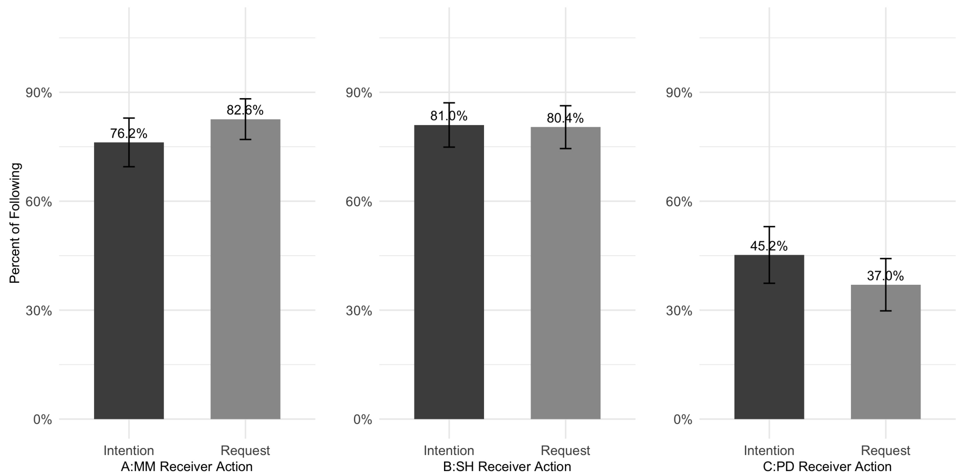

Figure 6. Percent of Following Suggested Action.

In the Stag Hunt game, we find that high and nearly identical percentages of receivers, 81.0% and 80.4%, follow suggested actions with an intention and a request respectively (see Panel B of Figure 6). The difference is not significant (Mann–Whitney U test, $Z = 0.061$, p-value = 0.951, $n_1 = 42, n_2 = 46$).

As shown in Panel C of Figure 6, in the Prisoner's Dilemma game, only about 8% more of the receivers follow recommendations in the intention treatment than the request treatment, which is not significant (Mann–Whitney U test, $Z = 0.785$, p-value = 0.433, $n_1 = 42, n_2 = 46$).

6. Summary

This study compares the effect of communication from two message structures: intention-signaling and request-signaling. In a Mixed Motive game with self-signaling messages, where players have an incentive to send a truthful signal regardless of intentions, subjects behave roughly identical in the treatments. Similar results are found in a Stag Hunt game, where players have an incentive to follow through with the action if the other player believes the message. However, in a dominant strategy game, where communication theoretically lacks any impact on behavior with most models, subjects in the intention treatment suggest equilibrium play more often than those in the request treatment. Lying aversion likely drives this result as players in the request treatment who recommend the other player to choose a dominated action feel limited or no remorse for making the suggestion. In the intention treatment, players want to avoid breaking their word and send an honest intention.

The complexities of human language compared to most other species allows people to coordinate and accomplish amazing feats. However, understanding the underlying theory of why humans developed such a complex language unlike most other species remains a mystery. Several theorists have attributed the efficiency of communication to some sort of lying cost. Ellingsen and Östling [11] suggests that the assumption a weak preference for honesty, stating one's true intention, is what drives credible communication. The authors themselves question whether changing the structure of communication would alter the effectiveness of communication. In games where the theory of Ellingsen and Östling [11] predicts improved coordination with intention based communication, our study shows a request based format performs equally effectively as intention based communication, suggesting that a preference for truthfulness may not be the underlying reason humans communicate so effectively. We find that in games where communication lacks the property of self-commitment, the structure of messages leads to different communication strategies and sender behavior, as lying aversion may affect the behavior of players in the intention treatment but not in the request treatment. Future theoretical and experimental research could continue to explore how different formats of communication impact choices in other dominant strategy games, such as collective action games.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Screenshots of Instructions

Welcome to Our Experiment!

In addition to $5 for showing up on time, you can earn additional money based on your decisions and the decisions of your randomly matched counterparts. All payments will be made to you in cash privately at the end of the study today. For every **10 points** you have at the end of the experiment you will be paid $1 in cash.

No communication with other participants is allowed during this experiment. If you have any questions please raise your hand, and the experimenter will assist you.

Your anonymity in this study is assured. Your name will never be connected to any decision you make here today.

Next

Figure A1. Welcome Page.

You will play **three games** with three different randomly matched counterparts. At the end of the experiment, only one game will be randomly selected to determine your payoff.

Please notice:
(1) You are matched with a **different** counterpart every game;

(2) You will **not** know your counterparts' decisions until the end of the experiment;

(3) Every game has a **1/3 chance** of being chosen as the payoff round. So, it is in your best interest to treat each game as if it is the one that determines your payoff.

(4) The three games are similar except the **payoff structures**. That is, your choice might lead to very different outcomes in different games. So, please pay extra attention to the payoff structure of each game.

Next

Figure A2. Three Games and Payoffs.

There are two steps in this game. Below we first describe the second step so that you know what decisions you will be making and how your earnings will be determined, and then we describe the first step in which you can send a message to your counterpart.

Second Step

In the second step, you and your randomly matched counterpart will separately and independently choose a shape. Both of you have two shapes to choose from: **Square** or **Triangle**.

There are four possible situations:

• If both of you choose **Square**, then both of you will earn **0 point**

• If both of you choose **Triangle**, then both of you will earn **0 point**

• If you choose **Triangle** while your counterpart chooses **Square**, then you get **150 points** and your counterpart gets **50 points**

• If you choose **Square** while your counterpart chooses **Triangle**, then you get **50 points** and your counterpart gets **150 points**

First Step

In the first step, you and your counterpart will separately and independently select a message to send. In the message you indicate which shape you request your counterpart to choose.

The message is in the following format: **"I want you to choose______."** You can select one of shapes to fill in the blank line.

While both you and your counterpart are asked to select a message, **only one person's message will be delivered.**

If you are randomly selected as **Message Sender** for this game, your message will be delivered. Otherwise, if you are randomly selected as **Message Receiver** for this game, your message won't be delivered, but you will receive your counterpart's message. Your role of message sender or receiver varies across the games. You will not be informed with your role until you have selected your message for each game.

Notice that if your message is delivered, your counterpart will see your message before making a second step choice about which shape to choose. Your counterpart doesn't have to choose according to what you say in the message. Similarly if your counterpart's message is delivered, you will see your counterpart's message before making a second step choice about which shape to choose. You don't have to choose according to what your counterpart says in his or her message.

Figure A3. Instructions of Mixed Motive Game.

There are two steps in this game. Below we first describe the second step so that you know what decisions you will be making and how your earnings will be determined, and then we describe the first step in which you can send a message to your counterpart.

Second Step

In the second step, you and your randomly matched counterpart will separately and independently choose a shape. Both of you have two shapes to choose from: **Square** or **Triangle**.

There are four possible situations:

• If both of you choose **Square**, then both of you will earn **100 points**.

• If both of you choose **Triangle**, then both of you will earn **50 points**.

• If you choose **Triangle** while your counterpart chooses **Square**, then you get **90 points** and your counterpart gets **20 points**.

• If you choose **Square** while your counterpart chooses **Triangle**, then you get **20 points** and your counterpart gets **90 points**.

First Step

In the first step, you and your counterpart will separately and independently select a message to send. In the message you indicate which shape you request your counterpart to choose.

The message is in the following format: **"I want you to choose______."** You can select one of shapes to fill in the blank line.

While both you and your counterpart are asked to select a message, **only one person's message will be delivered**.

If you are randomly selected as **Message Sender** for this game, your message will be delivered. Otherwise, if you are randomly selected as **Message Receiver** for this game, your message won't be delivered, but you will receive your counterpart's message. Your role of message sender or receiver varies across the games. You will not be informed of your role until you have selected your message for each game.

Notice that if your message is delivered, your counterpart will see your message before making a second step choice about which shape to choose. Your counterpart doesn't have to choose according to what you say in the message. Similarly if your counterpart's message is delivered, you will see your counterpart's message before making a second step choice about which shape to choose. You don't have to choose according to what your counterpart says in his or her message.

Figure A4. Instructions of Stag Hunt Game.

There are two steps in this game. Below we first describe the second step so that you know what decisions you will be making and how your earnings will be determined, and then we describe the first step in which you can send a message to your counterpart.

Second Step

In the second step, you and your randomly matched counterpart will separately and independently choose a shape. Both of you have two shapes to choose from: **Square** or **Triangle**.

There are four possible situations:

• If both of you choose **Square**, then both of you will earn **50 points**

• If both of you choose **Triangle**, then both of you will earn **20 points**

• If you choose **Triangle** while your counterpart chooses **Square**, then you get **150 points** and your counterpart gets **0 point**

• If you choose **Square** while your counterpart chooses **Triangle**, then you get **0 point** and your counterpart gets **150 point**

First Step

In the first step, you and your counterpart will separately and independently select a message to send. In the message you indicate which shape you request your counterpart to choose.

The message is in the following format: **"I want you to choose______."** You can select one of shapes to fill in the blank line.

While both you and your counterpart are asked to select a message, **only one person's message will be delivered**.

If you are randomly selected as **Message Sender** for this game, your message will be delivered. Otherwise, if you are randomly selected as **Message Receiver** for this game, your message won't be delivered, but you will receive your counterpart's message. Your role of message sender or receiver varies across the games. You will not be informed of your role until you have selected your message for each game.

Notice that if your message is delivered, your counterpart will see your message before making a second step choice about which shape to choose. Your counterpart doesn't have to choose according to what you say in the message. Similarly if your counterpart's message is delivered, you will see your counterpart's message before making a second step choice about which shape to choose. You don't have to choose according to what your counterpart says in his or her message.

Figure A5. Instructions of Prisoner's Dillema Game.

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