WARWICK

ECONOMICS

Small Talk and Theory of Mind in Strategic Decision-Making

Neha Bose and Daniel Sgroi

(This paper also appears as CAGE Working paper 409)

April 2019 (Revised Aug 2019 & Aug 2020) No: 1191

Warwick Economics Research Papers

ISSN 2059-4283 (online)

ISSN 0083-7350 (print)

The Role of Theory of Mind and "Small Talk" Communication in Strategic Decision-Making*

Neha Bose† and Daniel Sgroi‡

Abstract

Humans routinely chat with each other about many things like the news, weather or sports. In important decision-making settings, informal communication of this sort (so-called "small talk") has been largely dismissed by social scientists as wasteful and strategically empty. We provide new evidence that this is far from true: after a 4-minute conversation, subjects developed a sense of the personality of others which in a pre-registered RCT resulted in significantly different behaviour in future interactions. They contributed more in public good games and found it more difficult to out-guess opponents they felt were like themselves. We explain this behaviour, and using text-analysis, measure the direct impact of differences in language: for example, talking more made subjects seem more pro-social, engendering pro-social behaviour in others.

JEL codes: D91, D83, C92.

Keywords: theory of mind, small talk, cheap talk, communication, level-k reasoning, public goods game, cooperation, extraversion, perceived similarity, self-projection bias, laboratory experiment, text analysis.

1 Introduction

Recent research has explored the role for communication to improve social outcomes. In particular there has been an explosion of work on "cheap talk" which allows individuals to provide a signal of future intent, albeit without any form of commitment (Krupka et al. (2017); Ostrom et al. (1992); Dawes et al. (1977); Charness and Dufwenberg (2006)). The role of communication in strategic settings of this sort initially provided something of a

*Funding for this project was provided by the ESRC Centre for Competitive Advantage in the Global Economy (CAGE), ESRC Grant Ref RES-626-28-0001. University of Warwick Econ. Dept. IRB approval obtained 2018-03-12. AEA RCT Registry entry https://www.socialscienceregistry.org/trials/2903. The authors declare no conflicts of interest.

†University of Warwick, email: n.bose@warwick.ac.uk

‡University of Warwick, ESRC CAGE Centre and IZA Bonn, email: daniel.sgroi@warwick.ac.uk

paradox: without commitment it was hard to envisage a role for verbal statements of intent, however research has suggested a variety of ways in which cheap talk can work absent commitment. Possibilities include establishing social norms (Kessler and Leider (2012)), guilt aversion (Charness and Dufwenberg (2006)) or lying aversion (Ellingsen and Johannesson (2004)). Parallel work exists that emphasizes the more general benefits of communication through increased social cohesion (Krupka et al. (2017); Dawes et al. (1977)). However, to date communication of this sort typically involves players being aware of what is to follow and having the opportunity to coordinate on future actions. In other words, individuals can make sensible statements about future behaviour: for instance offering to cooperate in the future.

In contrast there has been little work on more general forms of communication which does not involve strategic statements. The closest exception is Dawes et al. (1977) which explores the role of "irrelevant communication" on cooperation levels in a tragedy of the commons game, however the communication takes place *after* all subjects *are* informed that there will be strategic interaction to follow and the rules of that interaction. "Small talk", perhaps the most ubiquitous form of communication, typically does not involve any such knowledge, and consists of simple salutations, exchanges of functionally empty "news" and complementary statements. For instance, consider the following taken from subjects in our experiment: *"Hi", "Hello", "How are you?", "Haha, I'm good, you?", "Great"*. The word cloud presented in Figure 6 provides a summary of the text used by our subjects and should give a feel for the strategically empty nature of small talk communication, which reflects complete ignorance of the strategic interaction that is to follow. The existing modest literature on the role of small talk has focused on building solidarity and trust in work places (Pullin (2010)), the impact on small investors using stock message boards (Das and Chen (2007)) and on improving medical outcomes (Hudak and Maynard (2011)). Our study will instead focus on the role of small talk on unknown future strategic settings and in particular on the relationship with what is often called "theory of mind" (the mental modelling of other people (Coricelli and Nagel (2009); Fe and Gill (2018))) which in turn feeds into belief-formation: something which has yet to be assessed. Our focus is therefore on the mechanism that allows unstructured communication to alter behaviour and outcomes that are unknown at the time of communication.

Our research strategy is to consider free-form communication which is devoid of strategic content: subjects in our pre-registered randomised control trial were not aware that they would eventually face each other in strategic settings and had no inkling of the rules of the games to follow. Nevertheless in the treatment setting they were given the opportunity to communicate with each other: an opportunity not made available to those in the control setting, who instead produced text in an unrelated placebo task. Subjects were

asked to complete both a standard personality test (the Big Five Inventory or BFI (John and Srivastava (1999))) and attempt to guess how their partner might have answered the questions in this test. This enabled us to measure the role of communication in developing a cohesive "theory of mind" about their partner. Similarly, subjects were asked to take an IQ test and try to predict how their partners might have performed in the same test. Subjects were also asked to take the "Eyes Test" (Baron-Cohen et al. (2001)), which served as a direct measure of theory of mind, compared to the indirect measure offered by belief elicitation about partner's personality and IQ. Both the direct and indirect approaches are incentivised as there are measurable correct answers. In this paper, the key explanatory variable is the indirect measure of theory of mind through which we imply the mental model or beliefs which players form about their partners' personalities and cognitive abilities, after having engaged in small talk with them.

Subjects then engaged in two archetypal and well-understood games: the two-person public goods game and the 11-20 money request game. While the former examines social preferences and free-riding, the 11-20 money request game (Arad and Rubinstein (2012)) is a simple two player game which triggers level-k reasoning (Costa-Gomes et al. (2001)) and tests cognitive ability in a competitive environment (Fe and Gill (2018)). The public goods game requires players to specify how much they are willing to contribute to a communal pot (Fehr and Gaechter (2002); Herrmann et al. (2008)). While both players benefit from contributions, the individually rational choice is to contribute nothing, hoping to free-ride on the other player's contributions. The 11-20 game grants players payment equal to their numerical choice but with a high bonus if they pick a number one below that of their rival. The game is normally modelled using level-k reasoning: if level 0 (L0) involves the non-strategic choice of 20, then L1 (defined as the best response to L0) would be to pick 19. More generally LK, best responding to LK-1 necessitates a choice of 20-K, enabling us to infer the cognitive level of a player through their numerical choice. To omit learning effects the experiment is restricted to one-shot games. Just prior to playing these games, players were asked to predict how their partners might play which was again incentivised: giving us an insight into belief formation. In this way we form a direct link from communication through theory of mind, belief formation and then to behaviour in two distinct settings. In order to do this we will draw on *personality theory*.

Within the psychological sciences, personality is often categorised into 5 traits, commonly called the "Big Five"[1] and measured using the Big Five Inventory or BFI (John and Srivastava (1999)). Of the Big Five traits, our paper will focus on the two broadest, most fundamental and pervasive traits: extraversion and neuroticism (Costa and McCrae

[1]The Big Five personality traits are extraversion, neuroticism, agreeableness, conscientiousness and openness

(1980)). These two traits were the original "Big Two" personality dimensions (Eysenck (1947)). Extraversion and neuroticism, have garnered much attention in the literature owing to their well-established association with positive and negative affect, respectively (Costa and McCrae (1980); Canli (2004); Watson et al. (1999); Watson and Clark (1992)). These two traits have the greatest chance to be detected in a short bout of communication. Extraverts by their nature stand out and even in a few minutes it may become clear that you are dealing with someone who is characterised by sociability, enthusiasm, tempo and vigour, features observed among high trait extraversion individuals and linked to high positive affect. On the other hand, the temperamental traits of high emotion, fearfulness, hostility and impulsivity, are associated with the neuroticism trait, and are related to high negative affect, which might also be detectable in a brief conversation. However, a brief small talk conversation seems insufficient to form beliefs about the partner's remaining three Big Five traits. This is because while a brief chat is sufficient to form an overall positive (*extraversion*) or negative (*neuroticism*) view about someone, in our results we observe that it is not adequate to convey any usable information about whether the opponent is trusting (an aspect of trait *agreeableness*) or lazy (an aspect of trait *conscientiousness*) or imaginative (an aspect of trait *openness*).

Together with the data drawn from each stage in the experiment we also have the text data generated by subjects during the communication (or placebo) phase. A final key part of our research strategy is to measure how this text data interacts with the personality of the communicator as well as a direct text analysis of the communication itself.

Our results indicate that small talk can influence decisions made in outcome interdependent games and the mechanism is indeed the formation of beliefs about others' types. However, the manner in which beliefs about types influence decision-making depends on the nature of the game. In the level-k reasoning task, where the objective is to out-think your partner, what matters is the perceived difference between the player and their partner's type. In particular, the level chosen in the 11-20 money request game is influenced by the perceived similarity (or difference) between the player and their partner's extraversion. The smaller the perceived difference, the higher the level chosen. This result is consistent with the *perceived similarity hypothesis* (Thomas et al. (2014)). The hypothesis posits that individuals believe those perceived as similar to themselves will think and act like them when faced with the same situation. When the perceived difference between the player and the partner's personality is small, the player chooses a higher level, believing that the partner will reason likewise and choose a higher level themselves. This makes it harder for a player to best respond to the distribution of level-k beliefs when the perceived difference between the player and the partner is small, as it becomes harder to out-think the opponent. In contrast, choices made in the social preferences game are influenced by

the absolute value of the perceived type of the partner. We find that cooperation in the public goods game increases when the partner is believed to be extraverted. This is in line with the known association of trait extraversion with pro-social behaviours like cooperation (Carlo et al. (2005); Burke and Hall (1986)). Moreover, we find that *beliefs* about partner's type has a greater effect on the decision to cooperate relative to *own* type.

Since small talk communication is the only means that players have to build a coherent theory of mind and the opportunity to communicate is the only difference between the control and treatment sessions in the experiment, it is important to understand how small talk can transmit information about a partner's type. A direct examination of the text used during small talk indicates that partners who use a higher number of words, words which evoke more arousal and dominance, and words which are more humorous in nature are believed to be extraverted. On the other hand, partners who use words with lower valence, arousal and dominance content, words that are abstract rather than concrete, and words which are less humorous are associated with higher levels of neuroticism. The number of words used is especially helpful as a mechanism for detecting extraverts, providing a reasonable forecast of type, but there remains a persistent own-type bias, in particular, extraverts are prone to *complimentary self projection bias* which makes them more likely to overstate the extraversion in their partners.

To the best of our knowledge, this is one of the few papers to address small talk extensively within Economics or related disciplines. This paper also touches on a variety of related work in the study of theory of mind, strategic sophistication, communication and the relationship between language and personality. Our work contributes to each of these literatures in very different ways. The first branch of literature analyses the impact of theory of mind on strategic decision making (Fe and Gill (2018); Yoshida et al. (2008); Coricelli and Nagel (2009)). Such studies measure theory of mind using existing psychometric tests such as the "Imposing Memory Task" (Fe and Gill (2018)), Heider-Simmel test (Bruguier et al. (2010)) and "Eyes Test" (De Martino et al. (2013)). Our paper adds to this literature by providing a new and indirect approach to measuring theory of mind. This indirect method is concerned with capturing the mental model or beliefs one forms about others' type while interacting with them, directly through belief-elicitation.

Our paper also contributes to the literature on strategic sophistication which finds that individuals adjust strategies given the information they have about the opponents (Fe and Gill (2018); Georganas et al. (2015); Gill and Prowse (2014); Agranov et al. (2012)). The existing literature finds that people adjust strategies based on *exogenous* information provided, or information learnt through repeated play and feedback. For example, Fe and Gill (2018) conduct an experiment where children are told whether their opponent has above or below median cognitive ability. The authors find that older children are more likely

to adjust behaviour in a level-k reasoning game, based on the exogenous information about their opponent's cognitive ability. We add to this literature through a novel examination of how individuals adjust their behaviour in the light of *endogenous* belief-formation about the opponent. Our work is also related to the literature on communication before strategic decision making, which has focused on communication with prior knowledge of what's about to follow (Krupka et al. (2017); Bochet et al. (2006); Dawes et al. (1977)). Cheap talk before strategic interaction has been observed to have a profound effect on behaviour. For example, communication can increase the frequency with which people choose joint income-maximising strategies (Krupka et al. (2017); Ostrom et al. (1992); Bochet et al. (2006)) in social dilemmas, and the efficient equilibrium strategy in coordination games (Kriss et al. (2016); Blume and Ortmann (2007); Cooper et al. (1992)). Communication has also been known to affect behaviour in dictator games (Andreoni and Rao (2011)) and trust games (Charness and Dufwenberg (2006)). A common feature of these studies is that the nature of the imminent strategic decision was known to all parties involved *before* communication. Under such a scenario, communication before playing outcome-interdependent games can lead to the formation of non-binding informal agreements. Although, non-binding there may be a cost incurred while breaking such agreements. Studies have suggested different rationales for this cost such as social norms (Kessler and Leider (2012)), guilt aversion (Charness and Dufwenberg (2006)) and lying aversion (Ellingsen and Johannesson (2004)). In stark contrast to the literature on cheap talk, our paper studies how communication between players can affect behaviour even if the nature of the decision to be made (or "rules of the game") is unknown to the players which makes it difficult to incorporate strategic content into communication.

The study also adds to the literature on examining the role of personality theory in strategic decision making. Several studies have highlighted the role of own-personality on decision making, especially cooperation decisions (Proto and Rustichini (2014); Johnson et al. (2009); Hirsh and Peterson (2009)). Our innovation is to expand on the role of personality by adding beliefs about a partner's personality generated via communication. The final strand of related literature shows that language is a powerful indicator of personality (Pennebaker and King (1999); Furnham (1990); Weintraub (1989)). This study contributes to this field by proposing that language used by an individual is the tool through which beliefs can be formulated about them by others who engage them in small talk communication.

The rest of the paper is structured as follows. Section 2 details the experiment design used to test the hypotheses formulated by the authors. Section 3 presents the results obtained from analysing the experimental data. Section 4 analyses the language used by the players during pre-game communication. Section 5 concludes.

2 Experiment Design

The experiment was conducted between May and November 2018. Subjects were recruited through the SONA online recruitment system at the University of Warwick in the UK. The participants were undergraduate, postgraduate and staff members at the University. The experiment was implemented using Z-tree (Fischbacher (2007)). In total 338 subjects took part in the study, with 170 subjects in the control condition and 168 in the treatment group. There were 17 sessions conducted, 20 subjects per session on average. An experimental session lasted for approximately 75 minutes. The average earnings from the study was £13.20 (roughly $17), including a show-up fee of £4. The design was registered with the AEA RCT registry before conducting the experiment.

At the onset of the experiment each subject was asked to take the Big Five Inventory personality test or BFI (John and Srivastava (1999)), followed by an incentivised cognitive ability test (the Raven Progressive Matrices test). The raven test is a set of 30 visual puzzles designed to measure one's cognitive ability. After the Raven test the subjects were asked their beliefs about their own performance in the test which was also incentivised. Each subject was then randomly allocated to one of two groups and randomly paired with a partner from the same group. The two groups were:

Control. Players were not allowed to communicate with their partners in this condition. Subjects were asked to take part in a placebo task for 4 minutes (full experiment instructions are provided in Appendix C). Then the players were asked their beliefs about their partner's non-cognitive and cognitive abilities. For the former, beliefs were elicited using an 11 item short version of the BFI questionnaire modified to allow subjects to indicate how they felt their partners would answer the questions (Rammstedt and John (2007)). We could then form personality beliefs directly from the answers they provided. For the latter, subjects were asked how they felt their partner's performed in the Raven task. After answering the questions related to beliefs, subjects were told the rules of the first game. They were asked for their beliefs about their partner's strategy followed by their own decision in the game. After completing the first game they were told the rules of the second game. As with game 1, they were asked their beliefs about the partner's strategy and their own decision in the game. The partner remained the same for both games. The outcomes of both games were announced at the end of the experiment. All questions about beliefs - beliefs about the partner's cognitive and non-cognitive abilities and beliefs about their strategies - were incentivised.

Treatment. The procedure in the treatment group was the same as the control except, instead of the placebo task, subjects were allowed to electronically communicate with their partners through a chat box on their screens. Note that crucially communication occurred before the nature of future decisions were apparent which makes it difficult to incorporate

strategic content into communication. The communication time was limited to 4 minutes. Following communication, the players were asked to answer the same belief questions as the control group. After answering the questions, the subjects were told the rules of the first game and asked to play the game. The process was repeated with the second game, as with the control condition.

Subjects were asked to play two games - the public goods game and the 11-20 money request game. In the *public goods game* each subject was allocated 20 Experimental Pounds (EP) and, along with their partner, were asked to choose (simultaneously) how much to contribute (c_i) to a joint project. c_i was restricted to be an integer between 0 and 20. Payoffs were determined as: $\pi_i = (20 - c_i) + \frac{3}{4}(c_i + c_j)$ where i and j were the two players. Higher contributions while more costly, were more socially beneficial. In the public goods game, the selfish equilibrium is 0 and the mutually cooperative response is 20. In the *11-20 money request game* participants were asked to play the basic version of the game (Arad and Rubinstein (2012)). Each player was randomly matched with another player. They were both asked to request an amount of money (an integer between 11 and 20 EP). Each player received the amount she requested. A player received an additional amount of 20 EP if she asked for exactly one less than the other player. This game has been used to study cognitive hierarchy and in particular level-k thinking. In level-k heirarchy models (Nagel (1995); Stahl and Wilson (1995, 1994)) players' levels or types are heterogeneous but they are assumed to be drawn from the same distribution. Peoples' beliefs are based on naive initial assessment of others' likely response called level-0 (or L0) and then beliefs are modified via iterated best response. So level 1 (L1) best responds to L0, L2 to L1 and so on. Following Arad and Rubinstein (2012) 20 is considered the salient and L0 choice since it requires no strategic thinking about the other player's choice. This implies that a choice of 19 is the L1 choice as it best responds to the L0 strategy and in general the level-X choice is to request 20-X. In the level-k model, the level chosen by a subject is a measure of their strategic sophistication or *type* or rather a measure of the player's beliefs about the partner's strategic sophistication or type (Georganas et al. (2015)). The game has no pure Nash equilibrium.

The order of the two games was randomised across sessions. Out of the 170 control group subjects, 110 subjects played the public goods game first, followed by the 11-20 money request game and 60 subjects playing in reverse order. Out of 168 treatment group subjects, 106 played the public goods game first and 62 played the 11-20 money request game first. Following the two games, subjects were asked to take the *Eyes Test* (Baron-Cohen et al. (2001)). For this test, subjects were shown 36 close-up photographs of the eyes and surrounding areas of the face of celebrities and were provided with 4 response options (such as playful, terrified, joking etc.), per photograph. The participants were

asked to pick the option which most closely described the mental state of the person in the photograph. Subjects were then asked to answer a list of 30 questions about their risk attitude, the Domain Specific Risk Taking Scale or DOSPERT (Blais and Weber (2006)). Each subject was then asked a series of demographic questions.

The final payoff for subjects in the experiment was made up of several components. Firstly, there was a show-up fee of £4 for the experiment. Second, the players received payoffs based on performance in either the public goods game or 11-20 money request game (selected randomly). The payoffs for the games were in experimental pounds with the exchange rate as 5 EP = £1. Third, 2 questions out of the 36 questions of the Eyes Test and 2 puzzles of the 30 puzzles of the Raven test were randomly selected with correct answers accruing a further £1. Lastly, belief questions (own-cognitive ability, partner's personality and cognitive ability and beliefs about partner's decisions in the two tasks) were also incentivised. For the personality beliefs, 1 out of 11 questions was randomly picked and if the answer matched that of the partner, then the subject was awarded £1. For the other 4 belief questions, subject was awarded £1 for each correct answer. The overall payoffs ranged between £6.2 and £20.8 (roughly $8 to $27). The demographic questions which included questions on age, gender, native language, nationality and self-reported life satisfaction (on a 7-point Likert Scale) were not incentivised.

3 Results

Overall, the results imply that small talk affects strategic decision making through the formation of beliefs. But the way in which beliefs about others' types affect choices varies across games. While the absolute value of the opponent's perceived type matters most for the public goods game, it was the perceived difference between own and opponent's type which most affected decision making in the 11-20 money request game. The results are classified into 3 categories - results from belief formation, results from the 11-20 money request game and results from the public goods game. All regressions reported were run with standardized variables with standard errors clustered at the pair level. A separate text analysis of the small talk from the treatment sessions is carried out in Section 4.

3.1 Belief Formation

We begin by looking at the factors that might affect the beliefs which players develop about their partners' personality traits. Table 1 reports the results of an OLS regression model. The dependent variable is the belief reported by the player about their partner's fundamental personality traits i.e. extraversion and neuroticism. The beliefs were elicited using the 11-item short version of the BFI as proposed by Rammstedt and John (2007).

[2] The independent variables in columns 1 and 3 are the player's own personality scores, the partner's true personality score, as reported by the partner (using the BFI), and their interactions with the treatment dummy which equals 1 if the player was in the small talk condition and 0 otherwise. Columns 2 and 4 also control for the subject's IQ, Eyes Test score, age, a dummy variable for being female, and risk aversion (along with their interactions with the treatment dummy). Column 2 shows that in the treatment group, an increase in the *player's own extraversion* by 1 standard deviation increases the beliefs about *partner's extraversion* by 0.3 standard deviations more than in the control group (p-value $< .05$). Furthermore, an increase in 1 standard deviation in partner's true extraversion increases player's beliefs about partner's extraversion by 0.4 standard deviations more in the treatment group than in the control group (p-value < 0.01). Also, column 4 shows that in the treatment group, an increase in the player's extraversion by 1 standard deviation decreases the beliefs about partner's neuroticism by 0.1 standard deviations more than in the control group, although the differential effect is statistically insignificant. The relation between own extraversion and beliefs about partner's extraversion is depicted in Figure 1. Related to this, we also observe that overestimation of partner's extraversion increases with the player's own extraversion (A.3). This overestimation is significantly more pronounced in the treatment group, compared to the control group.

To summarize, extraverts tend to believe that their partners are also extraverted (and less neurotic). This effect is significantly stronger in the treatment group than in the control. This links closely with the psychological literature on extraversion: an extraverted person, who is subject to positive emotions, fosters a positive social environment (Eaton and Funder (2003)) and judges neutral events more positively (Uziel (2006)); they are prone to *complimentary self projection bias* which causes them to project their positivity onto people they interact with and overlook their negativity. In our results, this projection is significantly stronger in the treatment group where the players engage in small talk with their partner. No such projection was observed for neuroticism.[3] With regards to beliefs about partners' cognitive abilities, it was observed that players project beliefs about their own IQ onto beliefs about partners' IQ, irrespective of whether they are in the control or treatment group (A.4).

[2]In essence, players were asked to retake the BFI but rather than considering how they would answer each question, they were instead asked how his or her partner would answer. This allows us to form a belief in much the same way as we formed implied trait values. The 11-item questionnaire consists of 2 items each for the traits extraversion, conscientiousness, openness and neuroticism and 3 items for the agreeableness trait. An average score was computed for each trait and the trait scores were then standardized (so that each trait distribution had mean 0 and standard deviation 1).

[3]This is contradictory to the theory of *neurotic projection* which is a form of defence mechanism through which people tend to project negative feelings, motives or behaviours they might possess and are uncomfortable with, onto others. This can be attributed to the negative connotations of the trait neuroticism. People are less keen to project trait neuroticism as it's likely to draw attention to their own neuroticism.

3.2 11-20 Money Request Game

Next we look at the data derived from performance in the 11-20 money request game which attempts to measure level-k reasoning (or cognitive hierarchy). L2 is the most frequently played strategy in both conditions: where 20.6% players choose L2 in the control condition, over 26% do so in the treatment condition (Figure 2). The Kolmogorov-Smirnov test revealed that there is no statistical difference between the distribution of levels of the 2 groups. Table 2 reports the results of an OLS regression. In columns 1-3 the dependent variable is the player's beliefs about the level-k strategy chosen by the partner and in columns 4-6 the dependent variable is the level-k strategy chosen by the player. The independent variables are perceived differences between player's own personality and the partner's personality (and their interaction with the treatment dummy). The perceived differences are computed by taking the standardised absolute difference between the player's own personality trait scores and the player's beliefs about the partner's personality trait scores. Columns 2 and 4 control for the player's extraversion, IQ, eyes test score, gender, the player's beliefs about partner's IQ and the order of play of the two games, which is a dummy that equals 1 when the 11-20 game is played first and 0 when the PGG is played first (along with the the variables interacted with the treatment dummy). Columns 2 and 4 also include the control variables - player's age and risk aversion, along with their interactions with the treatment dummy. Column 2 shows that an increase in 1 standard deviation in perceived difference in extraversion decreases the player's beliefs about partner's level choice by 0.5 more in the treatment group than in the control group (p-value < 0.10). Column 4 shows that an increase in 1 standard deviation in perceived difference in extraversion decreases the player's own level-k strategy by 0.6 more in the treatment group than in the control group (p-value < 0.05). Thus, there is an inverse relationship between the perceived difference in extraversion between the players and the player's level-k strategy, as well as the player's beliefs about their partner's level-k strategy choice. Hence, the smaller the perceived difference between the two players the greater the beliefs about partner's level choice and the greater the level chosen by the player. This result supports the *perceived similarity hypothesis* which posits that people project their own thinking and decision-making process to predict how their partners might think and act when individuals believe their partners to possess attributes similar to their own (Thomas et al. (2014)). Thus, when players believe their partners to be similar to themselves, they believe their partners will reason more and choose a higher level (lower number). This in turn makes the player choose a higher level. Note however that similar results were not observed for perceived difference between player's own IQ and partner's IQ.

Columns 3 and 6 of Table 2 examine if high levels of extraversion or introversion generate a differential impact on the dependant variables. For this, the regression incorporates

interaction effects of the player's extraversion with a categorical variable equalling the quartile in which the player's extraversion score lies. The results remain similar.

Being female enhances beliefs about partner's level-k choice, as well as player's own level-k choice, in both control and treatment conditions.[4] Further, an increase in the eyes test score by 1 standard deviation increases level belief and level chosen both by 0.5 more in the treatment than in the control group. This supports the finding (Fe and Gill (2018); Georganas et al. (2015)) that greater engagement in theory of mind is associated with superior level-k reasoning, though in this study the effect is significantly stronger in the treatment group when the players are able to engage in small talk with their partners, compared to the control group. Furthermore, Table 2 shows that in the control group, order of the tasks has a negative effect on the level-k belief and their own level-k action, whereas in the treatment group it has a positive effect. [5]

Next, the paper looks at the distribution of the players' beliefs about the level-k strategy chosen by their partners (Figure 3). The distribution is presented in Table 3, along with the unique mixed strategy Nash equilibrium distribution for risk-neutral players. The distributions of beliefs observed in both treatment and control groups are different from the equilibrium distribution. In both groups, L1 (i.e choosing 19) is the most frequently believed level-k choice by partners. Table 4 calculates the expected payoffs based on the distribution of level-k beliefs observed. For both control and treatment groups, L2 (i.e choosing 18) has the highest associated expected payoffs. [6]

Table 5 uses a probit model to examine the effect of perceived differences in the player's and their partner's personalities on the probability of best responding to the distribution of level-k beliefs, in the control and treatment groups separately. The dependent variable is the probability of choosing the best response to the distribution of beliefs which in this case is L2 for both control and treatment groups. Column 4 shows that the probability of best responding increases significantly (at the 1% level) by 10 percentage points with a 1 standard deviation increase in the perceived difference in extraversion in the treatment group. The effect is negative and insignificant in the control group. Hence, greater the perceived difference in extraversion, higher the chances of best responding by the player in the treatment group. Alternatively, this implies that greater the *perceived similarity*

[4] Nettle and Liddle (2008) and Stiller and Dunbar (2007) have found that women score higher on the social-cognitive element of theory of mind, indicating greater ability to reason about others' mental states. This could explain why women choose higher levels.

[5] This implies that playing the 11-20 game first increases level-k belief and their own level-k action when the player gets to engage in small talk communication with their partner, but the reverse happens when there is no small talk.

[6] It should be noted that the number of people who best-responded to their own belief about their partner's level choice i.e. chose to request an amount which was exactly 1 lower than what they believed their partner would chose was 184 out of 334 (94 in the control group and 90 in the treatment group) i.e. 54.4%. The low proportion of people best-responding to their own belief suggests that rather than having an exact belief about their partner's level choice, they may have formed a distribution of beliefs.

between the player and their partner, lower are the chances of the player best responding in the treatment group. This result is consistent with Table 2 which supported the perceived similarity hypothesis. When the perceived difference in extraversion is small, the player believes that their partner will act similar to themselves. This makes it harder to out-think or out-reason the opponent, thus reducing the probability of best responding. This result holds only when the players engage in small talk as otherwise the players have nothing on which to base their personality beliefs and so absent small talk, their beliefs are unlikely to affect decision making. The results hold even after controlling for the player's IQ and eyes test score, the player's beliefs about partner's IQ and other controls - player's age, gender, risk aversion and the order of games played. In the control group, increase in the player's IQ by 1 standard deviation increases the probability of best responding by 6 percentage points. The relationship between level choice and perceived difference in extraversion is depicted in Figure 4. Table 5 is replicated using a logit model, showing similar results and is presented in Appendix A.5.

To summarise, this subsection shows that the perceived similarity or difference between the player's and their partner's personalities influences decision making in level-k reasoning games. In level-k reasoning games a player's strategy is reflective of the player's beliefs about the opponent's type. The player then best responds to these beliefs, attempting to out-reason or out-think the opponent. Hence, in level-k games, the perceived similarity or differences between the player and their partner's types plays a crucial role in deciding strategy choice. When the player believes the partner's type is similar to their own, it becomes harder for them to out-reason the partner. This is due to the *perceived similarity hypothesis* which states that when a player believes they are faced by a similar opponent, they believe the opponent will think and act in ways similar to themselves. This makes the player believe that the opponent, undergoing the same thinking process, will reason harder and pick a higher level which in turn should make the player choose a high level as well. Consequently, when the player believes their partner's type is similar to their own, the probability of them best responding to the distribution of level-k beliefs falls. This result holds only when the players engage in small talk.

3.3 Public Goods Game

Next we look at the results from the public goods game. The average contribution belief in the treatment group was 13 experimental pounds (EP), where as in the control group it was 10.3 EP. This difference is statistically significant with p-value < 0.01 and a t-statistic of -3.640. The average contribution in the treatment group was 12.6 EP, whereas in the control group it was 9.8 EP. This difference is statistically significant with p-value < 0.01 and a t-statistic of -3.525 (Figure 5). The Kolmogorov-Smirnov tests for equality

of distributions of own contribution as well as beliefs about partner's contribution between the treatment and control groups were rejected with p-value < 0.01 for both. This is consistent with the existing literature which finds that pre-game communication of any form increases cooperation rates (Dawes et al. (1977); Krupka et al. (2017)). The analysis for the public goods game only considered the observations in which the subjects played the public goods game before the level-k reasoning game. The rationale for this is that playing the level-k game first seems to trigger level-k reasoning (Georganas et al. (2015)), thus biasing decision-making in the social preferences task. On the other hand, since the level-k game strictly requires level-k reasoning, without invoking any social preferences (Arad and Rubinstein (2012)), the results of the 11-20 game are not biased by playing the public goods game first. Further, treated subjects contribute significantly more on average compared to control group subjects, only when the public goods game is played first, where as the difference is insignificant when the public goods game is played second (Figure A.2). The results from the public goods game, for those who played the 11-20 game first are presented in Figure A.3 and Table A.7.

Comparing extraversion to neuroticism, it is extraversion that is most associated with pro-social traits ((Carlo et al. (2005); Burke and Hall (1986))).[7] Hence, it is hypothesised that players who believe their partner's are extraverted, will believe that their partners will cooperate more and then they in turn will cooperate more themselves. This hypothesis is examined using equation 1. $Choice_i$ is player i's choice (or contribution) in the public goods game, $pers_i$ is player i's personality, $E_i(pers_j)$ is player i's beliefs about partner j's personality, z_i are individual characteristics of i and ε_i is an idiosyncratic error term.

$$Choice_i = \beta_1 pers_i + \beta_2 E_i(pers_j) + \gamma z_i + \varepsilon_i \tag{1}$$

$$E_i(pers_j) = \lambda_1 pers_j + \lambda_2 pers_i + \rho z_i + \epsilon_i \tag{2}$$

Players' tendency to project their own extraversion onto their partners creates an endogeneity issue and estimation of equation 1 requires valid instruments. Beliefs about partner's extraversion depend on two components - the player's own extraversion and the partner's true extraversion, as discussed earlier. These two components are independent as the two players are randomly matched. Therefore, beliefs about partner's extraversion can be instrumented with the partner's true extraversion. Equation 2 is the first stage. $pers_j$ is the partner j's true personality.

The first stage results presented in Table 6 shows that partner's true extraversion significantly enhances beliefs about partner's extraversion in the treatment, but not in

[7] Also, Table A.6 shows that beliefs about partner's neuroticism has no significant effect on decision making in the public goods game.

the control group.[8] Table 7 presents the results of a two-stage least squares instrumental variable (IV) regression for the treatment group. Since the endogeneity bias only exists for the treatment group, equation 1 is estimated without an instrumental variable for the control group, and is presented in columns 1 and 2 of Table 7.

Columns 3 and 4 of Table 7 show that in the treatment group, an increase in 1 standard deviation in extraversion belief, increases beliefs about partner's contribution and own-contribution by 0.6 and 0.5 standard deviations respectively (p-value < 0.05 for both). On the other hand, an increase in 1 standard deviation in own-extraversion decreases beliefs about partner's contribution and the player's contribution by 0.3 (p-value < 0.05) and 0.2 (insignificant) standard deviations, respectively. Thus, beliefs about partner's extraversion has a positive and relatively larger effect, compared to own-extraversion, on decision-making in the public goods game in the treatment group. For the control group, column 2 shows that the player's extraversion significantly (p-value < 0.05) and negatively impacts contribution level. Beliefs about partner's extraversion has no significant effect on both beliefs about partner's contribution and own-contribution in the control group. Columns 3 and 4 can essentially be summarised as showing that there are two forces at work in determining how the contribution level is affected by extraversion: a direct and negative effect of own-extraversion, and an indirect and positive effect that works through beliefs about the partner's extraversion. Overall, the role of beliefs seems stronger than own-extraversion though both are important.

The result that extraverts are expected to cooperate more in social situations, is consistent with the finding in psychology that higher levels of the extraversion trait are associated with pro-social behaviour ((Carlo et al. (2005); Burke and Hall (1986))). Thus, the player themselves cooperate, expecting cooperation from their partner. In contrast, with regards to the effect of a subject's own extraversion on cooperation, the literature is conflicted. While Hirsh and Peterson (2009); Ross et al. (2003) and Lu and Argyle (1991) find a positive effect of extraversion on cooperation, Koole et al. (2001), McNeil (1995) and Mills et al. (1985) find the opposite. Hirsh and Peterson (2009) posit that individuals who score high on the enthusiasm facet of extraversion tend to be more positive and are more sensitive to rewards (Depue and Collins (1999)). Hence, they view cooperation as rewarding and owing to their positivity expect others to cooperate as well. The opposing argument is that introverts, and not extraverts, are likely to cooperate more as they are more inclined to avoid conflicts. This paper supports the latter argument. We would also argue that some of the contradictions seen in the literature stem from missing the subtle interactions

[8]To test for weak instruments, a Wald test is conducted, which tests the null that the coefficients of the endogenous regressors are zero. The null for the treatment group, is rejected at the 5% level. This suggests that weak instruments are not an issue here. Further, the F-statistic in the first stage regression (for two-stage least squares) is greater than 10, which indicates that the instruments are strong (Staiger and Stock (1997)) for the treatment group.

with beliefs that are highlighted in our results.

Following Soto and John (2009), this paper divides extraversion of the player into two facets, assertiveness and activity.[9] This is done to examine which particular facet of extraversion is responsible for driving cooperation decisions. Assertiveness is an attribute which helps individuals meet societal demands and thrive amidst other people. An assertive person is one with strong interpersonal communication skills. Activity or enthusiasm, on the other hand, describes both positive emotions and outgoing friendliness or sociability (DeYoung et al. (2007)). The facet analysis (Table A.8) revealed that of the two facets of extraversion, it is facet assertiveness which is responsible for the negative effect of the player's extraversion score on beliefs about partner's contribution, as well as own contribution in the public goods game.

With regards to payoffs earned in the public goods game, average earnings for the treatment group was 26.3 EP whereas for the control group it was 24.9 EP. The null of no difference in average earnings was rejected at the 5% significance level with a p-value 0.0210 and t-statistic of -2.3189. In the treatment group, average earnings were higher for those that could be reasonably categorized as extraverts (those with an above median extraversion score) who earned 27 EP, than introverts (with a below median extraversion score) who earned 25.5 EP. The null of no difference in payoffs between extraverts and introverts in the treatment group was rejected at 10% significance level with a p-value 0.0715 and a t-statistic of -1.8137. No significant difference was found between average earnings earned by extraverts and introverts (again defined as above or below median extraversion respectively) in the control group.

To summarize, when a player believes that their partner is extraverted, they believe that their partner will cooperate more. This seems likely to be because extraversion is associated with pro-social behaviours such as cooperation. This in turn encourages the players to cooperate more themselves. Contrastingly, a player's own extraversion has a negative effect on beliefs about their partner's likelihood to cooperate, as well as their own cooperation. This negative effect of extraversion is driven by the assertive facet of an extravert's personality. Lastly, beliefs about partner's extraversion have a relatively larger effect on decision-making in the public goods game than own-extraversion. Since these effects work in opposite directions they may partly explain the apparent contradictions seen in the general literature on extraversion and cooperation since they only become apparent when we disentangle the impact of beliefs and own-characteristics.

[9] Soto and John (2009) propose forming 10 facet scores, 2 for each of the Big Five traits, by dividing the 44 items in the BFI questionnaire. Assertiveness and activity facet scores are formed for each individual based on their responses to specific items in the BFI.

4 Text Analysis

In this paper, we randomly allocate players either to a treatment in which they engage in small talk with their partners or to a control in which they do not. In accordance with experimental method it is hard not to conclude that the treatment has a pronounced effect on behaviour and payoffs. In other words, small talk matters. Our results also support the idea that the mechanism works through theory of mind (or belief formation). The next logical step is to investigate directly how small talk communication is supporting theory of mind at a practical level: how are subjects in the study who talk about seemingly irrelevant topics for a few minutes improving their ability to play in the games that follow? This section is an exploratory effort to examine, post hoc, the different language characteristics which might affect belief formation.

A first pass approach is to look at the text that is used during the small talk between players. We know that language can be reflective of their personalities and social behaviour so this seems to have potential. We provide some examples of the text used in Appendix B. What becomes immediately apparent is how seemingly irrelevant these conversations can be with large numbers of "heys" and "hahas" together with sudden digressions into themes such as goldfish and exams. Figure 6 shows a word cloud of the words spoken by the subjects during the pre-game communication. A word cloud is a visualisation tool which shows words used in text, with the size of each word indicating the relative frequency of its usage in the text. The word cloud in Figure 6 depicts the very general and trivial nature of small talk.

Figure 7 attempts to distinguish between the most frequently used words by subjects believed to have different personalities. Through a simple examination of word usage, it's hard to distinguish between the nature of language used by subjects believed to have different personalities. Those who are believed to be highly extraverted (believed to have above median extraversion scores) have a similar set of most frequently used words when compared to those who are believed to be less extraverted (believed to have below median extraversion scores) which are likely to reflect the social norms of small talk (Figures 7 A and B). Figures 7 C and D show a similar story for neuroticism beliefs. This is not surprising given the unstructured nature of the small talk but we know from our results and experimental design that somehow language is playing an important role. The word clouds serve as a great way to highlight the need for conducting regressions. Accordingly, in the rest of this section we provide a deeper examination of the different characteristics of language used by players and how these characteristics *can* shed light into how and why players develop specific beliefs about each other.

4.1 The Number of Words

Perhaps the simplest way to examine the text data is to look at whether beliefs about any personality trait are associated with the total number of words spoken. From the player's perspective the number of words is relatively simple to calculate, arguably easier than say considering the emotional content of words in a very brief conversation. Table 8 reports the results: column 1 shows that beliefs about partner's extraversion increase with the number of words spoken by the partner. Extraversion is characterised by attributes like sociability, gregariousness, enthusiasm and overall positive affect and so it is not surprising that those who speak more, appear more social, and are believed to be extraverted.

Column 2 shows that the result persists even after controlling for the player's IQ, eyes test score, age, gender, beliefs about partner's IQ, a dummy for non-native speaker (equals 1 if the player is a non-native English speaker and 0 otherwise) and a dummy for first speaker (equals 1 if the player started the conversation and 0 otherwise). Columns 3 and 4 show that beliefs about partner's neuroticism decrease with the number of words spoken by the partner, although the impact is insignificant. Further, age diminishes beliefs about partner's neuroticism. Also, non-native speakers were more likely to find their partners extraverted. Lastly, those who spoke first were less likely to find their partners neurotic.

Next we consider whether the beliefs formed by examining the number of words used in communication provides an accurate picture of someone's true personality type. What we see from the results in Table 9 is that extraverts genuinely do seem to use more words, a result which is true at the 10% level, with and without the addition of sensible control variables.[10] As we will see in the analysis to follow, regardless of how we analyse text, the number of words is always a useful predictor of true personality type.

4.2 Language Characteristics

We examine the scores for three affective or emotional components of the partner's language use, namely *valence*, *arousal* and *dominance*, using the score-ratings proposed by Warriner et al. (2013). Valence refers to the pleasantness of a stimulus, arousal is the intensity of emotion provoked by a stimulus, and dominance is the degree of control exerted by a stimulus. We find that beliefs about partner's neuroticism decrease with the valence rating of the partner's speech (Table A.9). The valence rating of a word refers to the pleasant emotion conveyed by a word, with the rating increasing as it moves from unhappy to happy. Since the trait of neuroticism is associated with negative emotions, beliefs about a partner's neuroticism decrease with the pleasantness of the words they use. The results

[10]Recall that the small talk communication lasts only 4 minutes which means that each player might be communicating for around 2 minutes. While this reflects the reality of casual small talk it also makes higher levels of significance difficult to obtain.

persist even after controlling for the number of words spoken by the partner, the player's IQ, eyes test score, age, gender, beliefs about partner's IQ, a dummy for non-native speaker and a dummy for first speaker.

We also find that arousal ratings of the text used by the partner increases beliefs about partner's extraversion and decreases beliefs about neuroticism (Table A.10). As arousal rating of a word is the degree of excitement emoted by it, more excited sounding communication is associated with extraverts. Further, we find that beliefs about a partner's extraversion increase, and beliefs about neuroticism decrease, with the dominance rating of the text used by the partner (Table A.11). The dominance rating of a word increases when the degree to which it conveys the emotion of *being in control* increases. Extraversion is associated with leadership and social dominance (Watson and Clark (1992)), while neuroticism is associated with insecurity and self-consciousness (Judge et al. (1999)). Thus, those believed to convey the message of being in control, or being dominant, through the words they use, are believed to be more extraverted and less neurotic by their partners.

We also examined the effect of the use of *humour* by a subject on beliefs formed about their personality. This was accomplished by calculating humour ratings of the text used by each subject, using the humour ratings proposed by Engelthaler and Hills (2018). An increase in humour rating of the language used by the partner increases beliefs about their extraversion and decreases beliefs about their neuroticism (Table A.12). This is consistent with the literature which finds that higher levels of humour is associated with greater positive affect (Cann and Collette (2014); Martin et al. (1993)), a quality observed among extraverts.

Next we consider whether beliefs about partner's personality are related to the *concreteness* rating of the partner's speech (Table A.13). Concreteness refers to a word's ability to make specific and definite reference to particular objects (Hills et al. (2016)). The total concreteness score of the language used by the partner is calculated using the list of concreteness ratings proposed by Brysbaert et al. (2014). We find that an increase in the concreteness rating of the partner's speech increases beliefs about partner's extraversion (insignificant effect) and decreases beliefs about partner's neuroticism (significant at 10% level). This shows that players associate the use of abstract words with neuroticism.

We see a clear pattern from word usage of a partner to beliefs about the type of partner which suggests that word usage is facilitating belief-formation. However, once again the next logical question to ask is whether these beliefs are accurate? It turns out that in this case we find little evidence to support the association between the perceived personality types of partner's based on the various language characteristics examined so far and their true personality (as declared via the Big Fine inventory). Glancing at Tables A.14 to A.18 we can see no statistical significance between any of the language characteristics and true

personality and indeed in the case of humour the only relationship we can see moves in the wrong direction with extraverts displaying lower levels of humor in their communication. The number of words used, however, remains an accurate and significant predictor when considered alongside language characteristics.

4.3 The Age of Acquisition of Words

The age of acquisition of a word is the age at which the word is learnt: some will be learnt early in life while others are generally associated with latter stages of life. Words learnt earlier in life are easier to recall than words learnt later (Izura et al. (2011)) as their meaning is more accessible (Sailor et al. (2011), Brysbaert et al. (2000)) and so may be more salient. Also words learnt later in life may convey a different personality (high levels of maturity for instance). We can analyse *age of acquisition* ratings from the text data by using the rating proposed by Kuperman et al. (2012). We find that partners who use words which have a higher age of acquisition are believed to be more extraverted and less neurotic (Table A.19). However, if we attempt to marry these results to true personality types we find no evidence that the views that are formed are accurate (Table A.20).

4.4 Summary

In this section, we examine a series of different ways to analyse language and find clear patterns that provoke different beliefs about extraversion and neuroticism. In particular, partners who use higher numbers of words and words which evoke more arousal, dominance and humour are believed to be extraverted. On the other hand, partners who use words with lower valence, arousal, dominance and humour content and more abstract rather than concrete words are associated with neuroticism. This shows how and why even unstructured small talk contains a variety of ways to form beliefs about partner's type. However, although certain language characteristics are believed to be associated with specific personality traits, these language characteristics are not necessarily predictive of those traits except in the case of the number of words used: in that case individuals do seem to form accurate predictions about their partner's type.

5 Concluding Remarks

The notion that cheap talk has a strategic impact has been studied extensively at the highest level in the discipline, while the idea that small talk might have significant outcome relevant effects is by contrast a novel concept. This has a lot to do with the large difference in definition between small talk (communication about seemingly unimportant topics) and

cheap talk (communication with full knowledge of the rules of the game to be played, involving signals about behavior, albeit without commitment). However, small talk is the most ubiquitous of all forms of communication: if small talk turns out to be important then it must be worthy of the same level of study as cheap talk. We find that small talk is indeed important, it operates through belief formation and the development of theory of mind, and it has very significant effects on final outcomes.

This paper examines the impact of small talk on decision making in two very different one-shot games. The first game is the 11-20 money request game which is a pure level-k reasoning game and resembles real world scenarios where payoffs depend on having to outwit others, such as competitive sports or partisan politics. The second game is a public goods game which is a game of cooperation and resembles real world scenarios involving social dilemmas such as deciding whether to cooperate to combat climate change, knowing that the outcome will depend on collective action. In both games belief formation matters. In the social preferences game, it is the absolute value of the opponent's perceived type which matters for decision making. On the other hand, for the level-k reasoning game, where the objective is to out-reason the opponent, it is the perceived difference in types which affects choice.

Extraversion plays a crucial role as one of the most easily detectable personality traits: the level chosen in the 11-20 game is impacted by perceived similarity between player and their partner's extraversion. The smaller the perceived difference, the higher the level chosen. This result follows from the *perceived similarity hypothesis* which states that people expect perceivably like-minded people to act similarly, when faced with the same situation. Hence, when a player believes that their opponent is similar to them, the player reasons more and chooses a higher level, expecting the opponent to reason more as well. Also, believing that their partner is similar to them, reduces the probability of the player best-responding to the distribution of beliefs. In the public goods game, when players believe their partners to be extraverted, they expect their partner to be more likely to cooperate. This is due to the association of extraversion with pro-social behaviors such as cooperation. This in turn, enhances the player's own level of cooperation. Moreover, in the public goods game, it was found that beliefs about partner's type had a larger impact on cooperation, relative to own type.

Small talk occurred before players knew they would be playing games together. Nevertheless communication, as our key experimental intervention, was the only way in which players could develop theory of mind. Analysis of the language used by players during the pre-game communication revealed that players were indeed drawing inferences from the words used by their partners. Partners who use a higher number of words, words which evoke more arousal and dominance and humour, are believed to be extraverted. On the

other hand, partners who use words with lower valence, arousal, dominance and humour content and words which are more abstract rather than concrete in nature are believed to be neurotic. Of these different ways to assess language it is the number of words that provides the best link between language, perceived beliefs and the true personality of the partner.

To conclude, it appears that communication need not be *about* future strategic interaction in order for it be important *for* future strategic interaction. Small talk covering even the most trivial things can help people to learn about each other which in turn helps them to predict how others are likely to behave in strategic situations. Our paper shows not only that this is indeed the case but also provides a mechanism through which this process can work in two very different games supported by direct text analysis of the language used.

Tables and Figures

Table 1: Impact of own personality and partner's true personality on beliefs about partner's personality

	Extraversion Belief		Neuroticism Belief	
	(1)	(2)	(3)	(4)
Own Extraversion × Treatment	0.2139*	0.2962**	-0.1105	-0.1241
	(0.117)	(0.125)	(0.117)	(0.130)
Own Neuroticism × Treatment	0.1484	0.1531	-0.0470	-0.0418
	(0.125)	(0.131)	(0.110)	(0.109)
Partner's Extraversion × Treatment	0.4108***	0.4199***		
	(0.108)	(0.110)		
Partner's Neuroticism × Treatment			0.0269	-0.0005
			(0.103)	(0.102)
Own Extraversion	0.0209	0.0248	-0.0822	-0.0718
	(0.073)	(0.080)	(0.073)	(0.075)
Own Neuroticism	-0.0075	0.0008	0.0462	0.0600
	(0.085)	(0.087)	(0.083)	(0.080)
Partner's Extraversion	-0.1280*	-0.1339*		
	(0.070)	(0.075)		
Partner's Neuroticism			0.0866	0.1069
			(0.071)	(0.070)
Treatment	0.3539***	-0.3127	-0.5100***	-0.1983
	(0.098)	(0.632)	(0.102)	(0.550)
Controls	No	Yes	No	Yes
N	338	338	338	338

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Impact of (absolute) difference between own personality and predicted on level chosen

	Level Belief			Level Chosen		
	(1)	(2)	(3)	(4)	(5)	(6)
DiffExtraversion × Treatment	-0.5302*	-0.4948*	-0.3846	-0.6597***	-0.6061**	-0.4930*
	(0.269)	(0.289)	(0.314)	(0.237)	(0.254)	(0.284)
DiffNeuroticism × Treatment	0.1879	0.2738	0.2855	-0.0415	0.0792	0.0716
	(0.248)	(0.272)	(0.279)	(0.248)	(0.268)	(0.270)
Treatment	0.1668	-2.7645	-2.2777	0.0677	-2.1026	-1.5003
	(0.267)	(2.047)	(2.113)	(0.279)	(1.833)	(1.864)
DiffExtraversion	0.1470	0.1000	0.1170	0.2046	0.1357	0.0362
	(0.198)	(0.196)	(0.208)	(0.177)	(0.176)	(0.193)
DiffNeuroticism	-0.1579	-0.2457	-0.2631	-0.1604	-0.3031*	-0.2876
	(0.183)	(0.199)	(0.204)	(0.174)	(0.178)	(0.182)
Own Extraversion × Treatment		0.1223	0.6575		0.1893	0.8496
		(0.325)	(0.652)		(0.296)	(0.659)
Own Extraversion		-0.1175	-0.0548		-0.2818	-0.6718
		(0.182)	(0.419)		(0.198)	(0.432)
Own IQ × Treatment		-0.2432	-0.2216		-0.2507	-0.2317
		(0.292)	(0.296)		(0.302)	(0.310)
IQ Belief × Treatment		0.3372	0.3149		0.1938	0.2191
		(0.311)	(0.312)		(0.266)	(0.269)
Eyes Test Score × Treatment		0.4966*	0.5011		0.5404*	0.5428*
		(0.297)	(0.306)		(0.305)	(0.310)
Female × Treatment		-0.7721	-0.7518		-0.9905*	-0.9789*
		(0.594)	(0.606)		(0.546)	(0.560)
Order × Treatment		1.1342**	1.1732**		1.0958*	1.1306*
		(0.572)	(0.581)		(0.584)	(0.589)
Own IQ		0.1886	0.1673		0.2319	0.1729
		(0.203)	(0.209)		(0.211)	(0.220)
IQ Belief		-0.3431*	-0.3514*		-0.3187	-0.3323*
		(0.203)	(0.204)		(0.193)	(0.200)
Eyes Test Score		-0.4170*	-0.4018		-0.4428*	-0.4370*
		(0.244)	(0.250)		(0.245)	(0.247)
Female		1.0815***	1.0963***		1.4610***	1.4796***
		(0.408)	(0.413)		(0.364)	(0.374)
Order		-0.7868**	-0.8305**		-1.0018**	-1.0201**
		(0.390)	(0.400)		(0.408)	(0.412)
Extraversion × Extraversion Quartile	No	No	Yes	No	No	Yes
Controls	No	Yes	Yes	No	Yes	Yes
N	338	338	338	338	338	338

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Distribution of Level-k beliefs

Level	0	1	2	3	4	5	6	7	8	9
Equilibrium (%)	5	10	15	20	25	25				
Treatment (%)	12.50	**32.14**	17.26	5.95	4.17	11.31	4.17	2.38	3.57	6.55
Control (%)	17.06	**25.88**	18.82	5.29	7.06	10.00	7.06	3.53	1.76	3.53

Table 4: Expected Payoffs

Level	0	1	2	3	4	5	6	7	8	9
Treatment (EP)	20.00	21.50	**24.43**	20.45	17.19	15.83	16.26	13.83	12.48	11.71
Control (EP)	20.00	22.41	**23.18**	20.76	17.06	16.41	16.00	14.41	12.71	11.35

Table 5: Impact of (absolute) difference between own personality and predicted on the probability of choosing the best response - Probit Model

	Control		Treatment	
	(1)	(2)	(3)	(4)
	Pr(Level=2)	Pr(Level=2)	Pr(Level=2)	Pr(Level=2)
DiffExtraversion	-0.0453	-0.0508	0.0846***	0.0983***
	(0.038)	(0.037)	(0.030)	(0.032)
DiffNeuroticism	-0.0008	-0.0145	-0.0459	-0.0464
	(0.031)	(0.031)	(0.032)	(0.032)
Own Extraversion		-0.0083		0.0187
		(0.030)		(0.042)
Own IQ		0.0619*		0.0596
		(0.036)		(0.038)
IQ Belief		-0.0452		-0.0059
		(0.029)		(0.036)
Eyes Test Score		0.0474		0.0424
		(0.038)		(0.032)
Controls	No	Yes	No	Yes
N	170	170	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The table reports the average marginal effects from Probit regressions.

Table 6: First Stage

	Control		Treatment	
	(1) Extraversion Belief	(2) Extraversion Belief	(3) Extraversion Belief	(4) Extraversion Belief
Own Extraversion	0.0299	0.0333	0.2147**	0.2614**
	(0.086)	(0.102)	(0.106)	(0.103)
Partner's Extraversion	-0.1015	-0.0977	0.3541***	0.3648***
	(0.081)	(0.092)	(0.093)	(0.094)
Own IQ		-0.1034		0.0121
		(0.103)		(0.102)
IQ Belief		-0.0559		0.0166
		(0.147)		(0.095)
Eyes Test Score		-0.0470		0.1195
		(0.107)		(0.073)
Control	No	Yes	No	Yes
N	110	110	106	106

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Impact of beliefs about partner's personality and own personality on beliefs about partner's contribution and own contribution in Public Goods Game

	Control OLS		Treatment IV	
	(1) Contribution Belief	(2) Own Contribution	(3) Contribution Belief	(4) Own Contribution
Extraversion Belief	0.0601	0.1110	0.6091**	0.5184**
	(0.082)	(0.092)	(0.264)	(0.262)
Own Extraversion	-0.0733	-0.2041**	-0.3074**	-0.2018
	(0.095)	(0.088)	(0.134)	(0.138)
Own IQ	-0.0583	-0.0417	0.0856	0.1548
	(0.096)	(0.084)	(0.094)	(0.103)
IQ Belief	0.1250	0.1140	0.0871	0.2402***
	(0.091)	(0.100)	(0.086)	(0.088)
Eyes Test Score	-0.0431	-0.0015	0.1043	0.1502
	(0.096)	(0.118)	(0.117)	(0.139)
Controls	Yes	Yes	Yes	Yes
N	110	110	106	106

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Impact of number of words spoken by the partner on beliefs about partner's personality

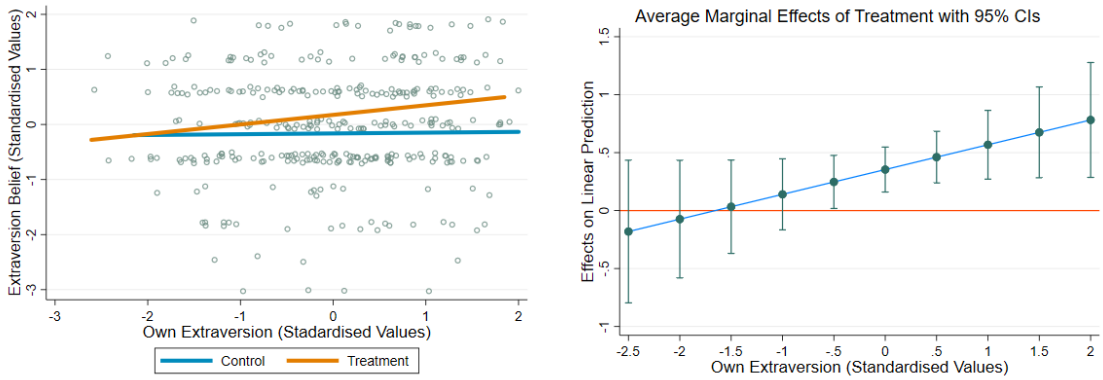
	(1) Extraversion Belief	(2) Extraversion Belief	(3) Neuroticism Belief	(4) Neuroticism Belief
Number of Words	0.0094***	0.0088***	-0.0020	-0.0024
	(0.003)	(0.003)	(0.002)	(0.002)
Own IQ		-0.0739		0.0960
		(0.087)		(0.077)
Eyes Test Score		0.0643		0.0307
		(0.060)		(0.095)
Age		0.0266		-0.0453**
		(0.021)		(0.020)
Female		-0.0798		-0.1667
		(0.160)		(0.157)
IQ Belief		0.0976		-0.0672
		(0.082)		(0.083)
Non-Native Speaker		0.3460**		-0.2244
		(0.152)		(0.159)
First Speaker		-0.0143		-0.3160**
		(0.142)		(0.153)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Relationship between number of words spoken and own personality

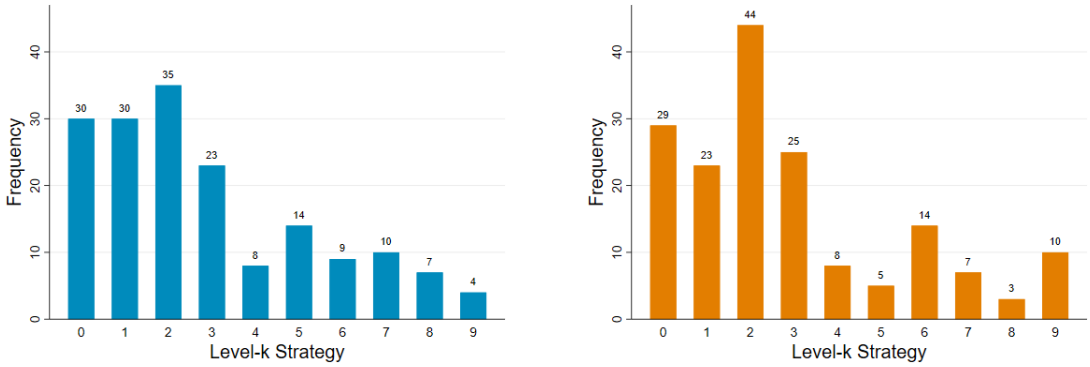
	(1) Extraversion	(2) Extraversion	(3) Neuroticism	(4) Neuroticism
Number of Words	0.0049**	0.0049*	0.0044*	0.0030
	(0.002)	(0.003)	(0.002)	(0.003)
Own IQ		-0.1839**		0.0102
		(0.092)		(0.082)
Eyes Test Score		-0.0250		0.1536*
		(0.089)		(0.082)
Age		0.0113		0.0056
		(0.029)		(0.023)
Female		0.0692		0.3476**
		(0.166)		(0.155)
IQ Belief		0.0172		-0.0563
		(0.088)		(0.078)
Non-Native Speaker		0.0858		-0.1252
		(0.157)		(0.178)
First Speaker		0.1590		0.0954
		(0.157)		(0.162)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

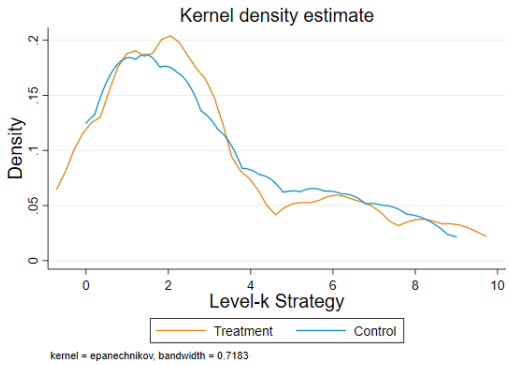


(a) (b)

Figure 1: Relationship between the beliefs formed about partner's extraversion by the player and the player's own extraversion score. (a) shows that individuals are more likely to project their own extraversion on their partners in the Treatment group compared to Control. (b) shows that this difference between the Treatment and the Control group increases with the value of own extraversion.



(a) Control (b) Treatment

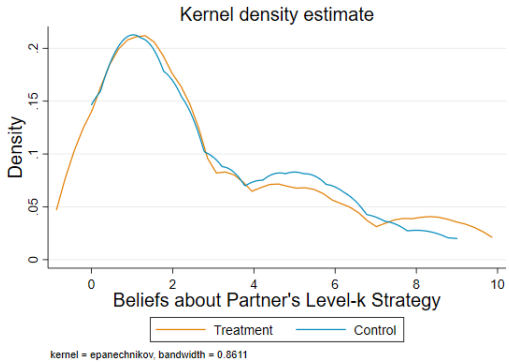


(c) Kernel Density Plot

Figure 2: The Distribution of level-k strategy chosen in the 11-20 money request game

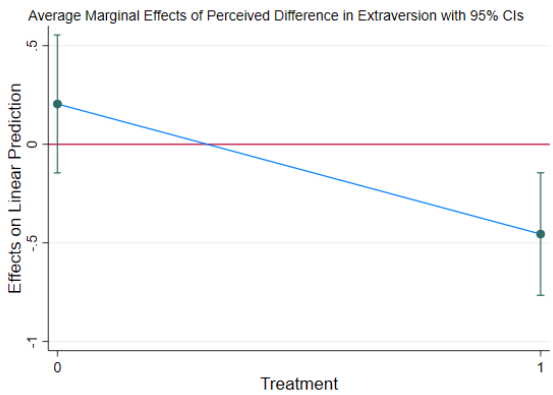
(a) Control

(b) Treatment

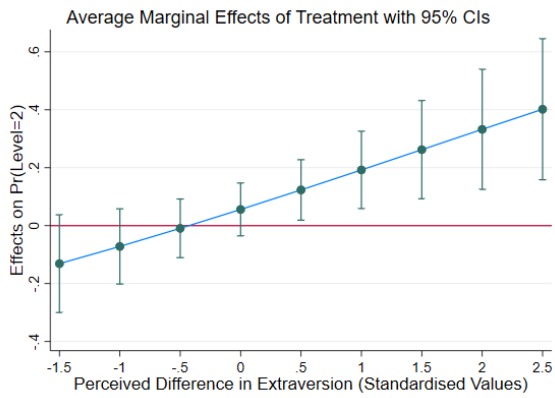


(c) Kernel Density Plot

Figure 3: The Distribution of the player's beliefs about partner's level-k strategy in the 11-20 money request game

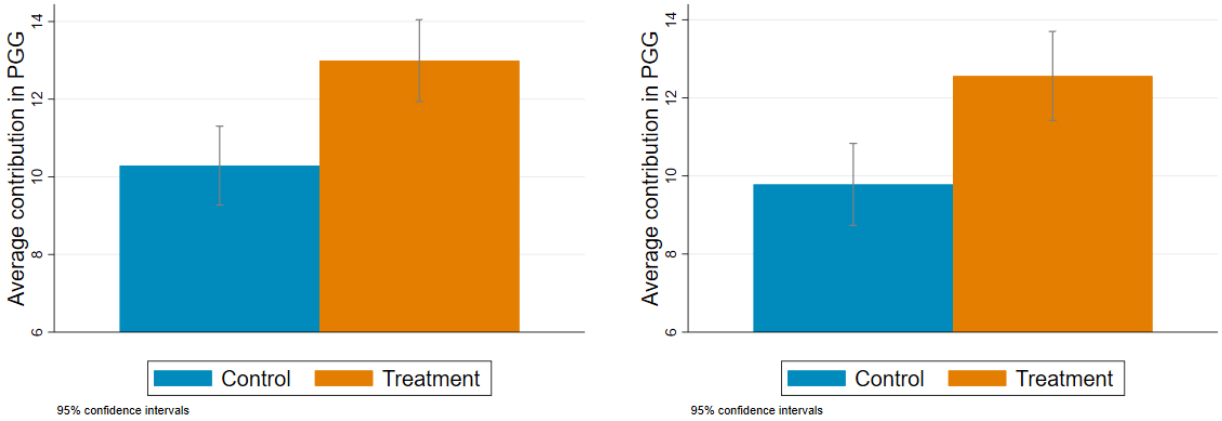


(a)



(b)

Figure 4: (a) Effect of perceived difference in extraversion on level choice in control and treatment groups. The figure shows that perceived difference in extraversion has a significant negative effect on level choice in Treatment group. (b) shows that the effect of Treatment on probability of best responding to the distribution of level beliefs increases as the perceived difference in extraversion increases.



(a) Contribution Belief

(b) Own-Contribution

Figure 5: (a) Average Contribution and (b) Average Beliefs about Partner's Contribution in the Public Goods Game

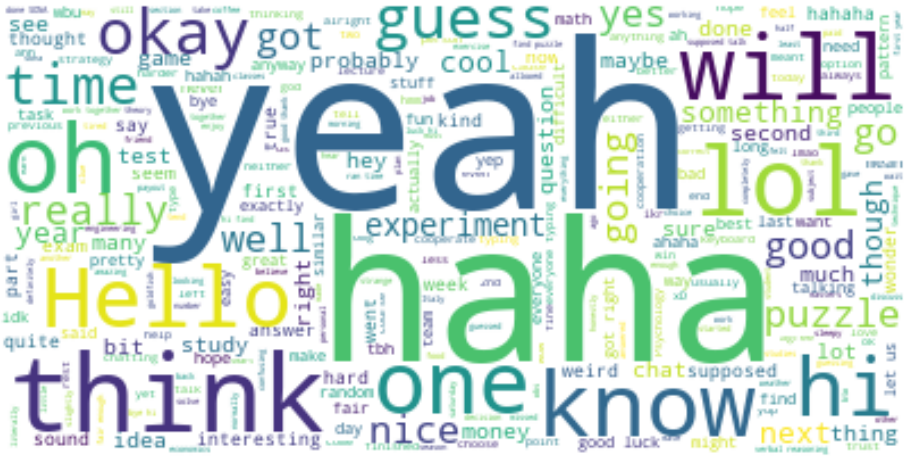
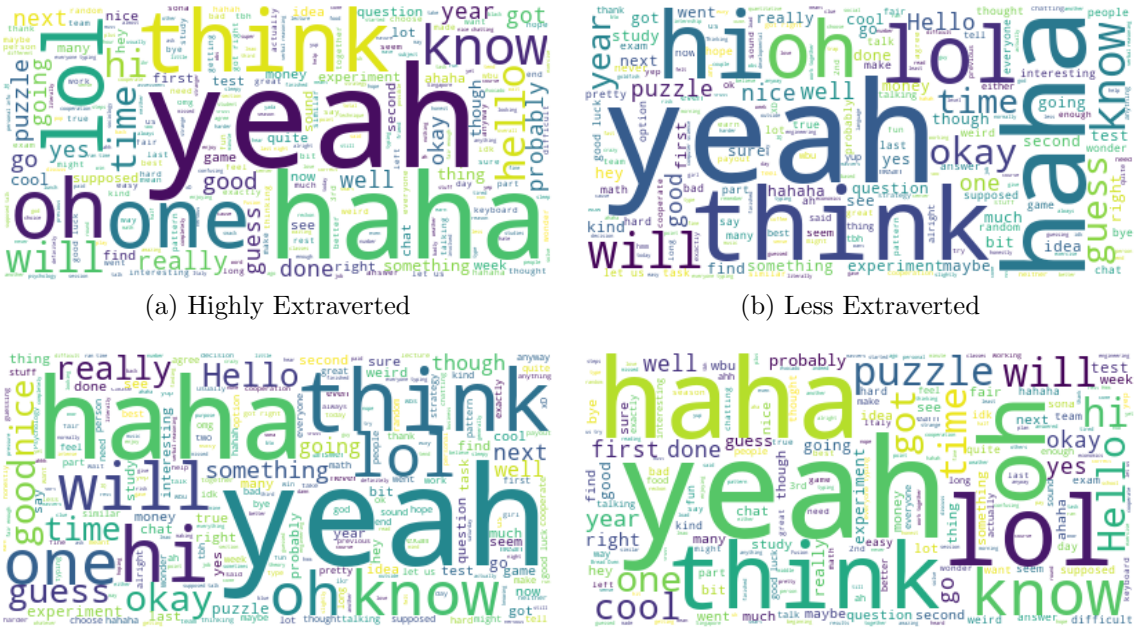


Figure 6: Most frequently used words by subjects during small talk communication



(a) Highly Extraverted

(b) Less Extraverted

(c) Highly Neurotic

(d) Less Neurotic

Figure 7: Most frequently used words during small talk communication by subjects who are believed to be (a) highly extraverted (b) less extraverted (c) highly neurotic and (d) less neurotic.

References

Agranov, M., E. Potamites, A. Schotter, and C. Tergiman (2012): "Beliefs and endogenous cognitive levels: An experimental study," *Games and Economic Behavior*, 75, 449 – 463.

Andreoni, J. and J. M. Rao (2011): "The power of asking: How communication affects selfishness, empathy, and altruism," *Journal of Public Economics*, 95, 513–520.

Arad, A. and A. Rubinstein (2012): "The 11-20 Money Request Game: A Level-k Reasoning Study," *American Economic Review*, 102, 3561–73.

Baron-Cohen, S., S. Wheelwright, J. Hill, Y. Raste, and I. Plumb (2001): "The "Reading the Mind in the Eyes" Test Revised Version: A Study with Normal Adults, and Adults with Asperger Syndrome or High-functioning Autism," *Journal of Child Psychology and Psychiatry*, 42, 241–251.

Blais, A.-R. and E. U. Weber (2006): "A Domain-Specific Risk-Taking (DOSPERT) scale for adult populations," *Judgment and Decision Making*, 1, 33, copyright Society for Judgment.

Blume, A. and A. Ortmann (2007): "The effects of costless pre-play communication: Experimental evidence from games with Pareto-ranked equilibria," *Journal of Economic Theory*, 132, 274–290.

Bochet, O., T. Page, and L. Putterman (2006): "Communication and punishment in voluntary contribution experiments," *Journal of Economic Behavior and Organization*, 60, 11–26.

Bruguier, A. J., S. R. Quartz, and P. Bossaerts (2010): "Exploring the Nature of "Trader Intuition"," *The Journal of Finance*, 65, 1703–1723.

Brysbaert, M., I. Van Wijnendaele, and S. De Deyne (2000): "Age-of-acquisition effects in semantic processing tasks," *Acta Psychologica*, 104, 215–226.

Brysbaert, M., A. B. Warriner, and V. Kuperman (2014): "Concreteness ratings for 40 thousand generally known English word lemmas," *Behavior Research Methods*, 46, 904–911.

Burke, D. M. and M. Hall (1986): "Personality Characteristics of Volunteers in a Companion for Children Program," *Psychological Reports*, 59, 819–825.

Bursztyn, L., B. Ferman, S. Fiorin, M. Kanz, and G. Rao (2017): "Status Goods: Experimental Evidence from Platinum Credit Cards," *The Quarterly Journal of Economics*, 133, 1561–1595.

Canli, T. (2004): "Functional brain mapping of extraversion and neuroticism: learning from individual differences in emotion processing," *Journal of personality*, 72, 1105–1132.

Cann, A. and C. Collette (2014): "Sense of humor, stable affect, and psychological well-being," *Europe's Journal of Psychology*, 10, 464–479.

Carlo, G., M. A. Okun, G. P. Knight, and M. R. T. de Guzman (2005): "The interplay of traits and motives on volunteering: Agreeableness, extraversion and prosocial value motivation," *Personality and Individual Differences*, 38, 1293–1305.

Charness, G. and M. Dufwenberg (2006): "Promises and Partnership," *Econometrica*, 74, 1579–1601.

Cooper, R., D. V. DeJong, R. Forsythe, and T. Ross (1992): "Communication in Coordination Games," *The Quarterly Journal of Economics*, 107, 739–771.

Coricelli, G. and R. Nagel (2009): "Neural correlates of depth of strategic reasoning in medial prefrontal cortex," *Proceedings of the National Academy of Sciences*, 106, 9163–9168.

Costa, P. T. and R. R. McCrae (1980): "Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people," *Journal of Personality and Social Psychology*, 38, 668–678.

Costa-Gomes, M., V. P. Crawford, and B. Broseta (2001): "Cognition and behavior in normal-form games: an experimental study." *Econometrica*, 69, 1193–1235.

Das, S. R. and M. Y. Chen (2007): "Yahoo! for Amazon: Sentiment extraction from small talk on the web," *Management science*, 53, 1375–1388.

Dawes, R. M., J. McTavish, and H. Shaklee (1977): "Behavior, Communication, and Assumptions About Other People's Behavior in a Commons Dilemma Situation," *Journal of Personality and Social Psychology*, 35, 1–11.

De Martino, B., J. P. O'Doherty, D. Ray, P. Bossaerts, and C. Camerer (2013): "In the mind of the market: Theory of mind biases value computation during financial bubbles," *Neuron*, 79, 1222–1231.

Depue, R. A. and P. F. Collins (1999): "Neurobiology of the structure of personality: Dopamine, facilitation of incentive motivation, and extraversion," *Behavioral and brain sciences*, 22, 491–517.

DeYoung, C. G., L. C. Quilty, and J. B. Peterson (2007): "Between facets and domains: 10 aspects of the Big Five." *Journal of personality and social psychology*, 93, 880–896.

Eaton, L. G. and D. C. Funder (2003): "The creation and consequences of the social world: an interactional analysis of extraversion," *European Journal of Personality*, 17, 375–395.

Ellingsen, T. and M. Johannesson (2004): "Promises, Threats and Fairness," *The Economic Journal*, 114, 397–420.

Engelthaler, T. and T. T. Hills (2018): "Humor norms for 4,997 English words," *Behavior research methods*, 50, 1116–1124.

Eysenck, H. J. (1947): *Dimensions of personality.*, Oxford, England: Kegan Paul.

Fe, E. and D. Gill (2018): "Cognitive Skills and the Development of Strategic Sophistication," IZA Discussion Papers 11326, Institute for the Study of Labor (IZA).

Fehr, E. and S. Gaechter (2002): "Altruistic punishment in humans," *Nature*, 415, 137–140.

Fischbacher, U. (2007): "z-Tree: Zurich toolbox for ready-made economic experiments," *Experimental economics*, 10, 171–178.

Furnham, A. (1990): "Language and personality," in *Handbook of language and social psychology*, ed. by H. Giles and W. P. Robinson, Chichester: Wiley.

Georganas, S., P. J. Healy, and R. A. Weber (2015): "On the persistence of strategic sophistication," *Journal of Economic Theory*, 159, 369–400.

Gill, D. and V. Prowse (2014): "Cognitive Ability, Character Skills, and Learning to Play Equilibrium: A Level-k Analysis," *Journal of Political Economy*, 0, 000–000.

Herrmann, B., C. Thöni, and S. Gächter (2008): "Antisocial Punishment Across Societies," *Science*, 319, 1362–1367.

Hills, T. T., J. S. Adelman, and T. Noguchi (2016): "Attention economies, information crowding, and language change," *Big Data in Cognitive Science*, 270.

Hirsh, J. B. and J. B. Peterson (2009): "Extraversion, neuroticism, and the prisoner's dilemma," *Personality and Individual Differences*, 46, 254–256.

Hudak, P. L. and D. W. Maynard (2011): "An interactional approach to conceptualising small talk in medical interactions," *Sociology of health & illness*, 33, 634–653.

Izura, C., M. A. Pérez, E. Agallou, V. C. Wright, J. Marín, H. Stadthagen-González, and A. W. Ellis (2011): "Age/order of acquisition effects and the cumulative learning of foreign words: A word training study," *Journal of Memory and Language*, 64, 32 – 58.

John, O. P. and S. Srivastava (1999): "The Big Five trait taxonomy: History, measurement, and theoretical perspectives," *Handbook of personality: Theory and research*, 2, 102–138.

Johnson, M. K., A. Rustichini, and A. W. MacDonald (2009): "Suspicious personality predicts behavior on a social decision-making task," *Personality and Individual Differences*, 47, 30–35.

Judge, T. A., C. A. Higgins, C. J. Thoresen, and M. R. Barrick (1999): "The big five personality traits, general mental ability, and career success across the life span," *Personnel Psychology*, 52, 621–652.

Kessler, J. B. and S. Leider (2012): "Norms and Contracting," *Management Science*, 58, 62–77.

Koole, S. L., W. Jager, A. E. van den Berg, C. A. Vlek, and W. K. Hofstee (2001): "On the Social Nature of Personality: Effects of Extraversion, Agreeableness, and Feedback About Collective Resource Use on Cooperation in a Resource Dilemma," *Personality and Social Psychology Bulletin*, 27, 289–301.

Kriss, P. H., A. Blume, and R. A. Weber (2016): "Coordination with decentralized costly communication," *Journal of Economic Behavior and Organization*, 130, 225–241.

Krupka, E. L., S. Leider, and M. Jiang (2017): "A Meeting of the Minds: Informal Agreements and Social Norms," *Management Science*, 63, 1708–1729.

Kuperman, V., H. Stadthagen-Gonzalez, and M. Brysbaert (2012): "Age-of-acquisition ratings for 30,000 English words," *Behavior Research Methods*, 44, 978–990.

Lu, L. and M. Argyle (1991): "Happiness and cooperation," *Personality and Individual Differences*, 12, 1019–1030.

Martin, R. A., N. A. Kuiper, L. J. Olinger, and K. A. Dance (1993): "Humor, coping with stress, self-concept, and psychological well-being," .

McNeil, M. S. (1995): "The problem of the non-firing soldier and the non-performing student: Morale explained as the resolution of a game of mixed motives." *Dissertation Abstracts International*, 56.

Mills, J., D. Robey, and L. Smith (1985): "Conflict-handling and personality dimensions of project-management personnel," *Psychological Reports*, 57, 1135–1143.

Nagel, R. (1995): "Unraveling in Guessing Games: An Experimental Study," *The American Economic Review*, 85, 1313–1326.

Nettle, D. and B. Liddle (2008): "Agreeableness is related to social-cognitive, but not social-perceptual, theory of mind," *European Journal of Personality*, 22, 323–335.

Ostrom, E., J. Walker, and R. Gardner (1992): "Covenants With and Without a Sword: Self-Governance is Possible," *The American Political Science Review*, 86, 404–417.

Pennebaker, J. W. and L. A. King (1999): "Linguistic styles: Language use as an individual difference." *Journal of Personality and Social Psychology*, 77, 1296–1312.

Proto, E. and A. Rustichini (2014): "Cooperation and Personality," *The Warwick Economics Research Paper Series (TWERPS).*

Pullin, P. (2010): "Small Talk, Rapport, and International Communicative Competence: Lessons to Learn From BELF," *The Journal of Business Communication (1973)*, 47, 455–476.

Rammstedt, B. and O. P. John (2007): "Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German," *Journal of Research in Personality*, 41, 203–212.

Ross, S. R., M. K. Rausch, and K. E. Canada (2003): "Competition and cooperation in the five-factor model: Individual differences in achievement orientation," *The Journal of psychology*, 137, 323–37.

Sailor, K. M., M. E. Zimmerman, and A. E. Sanders (2011): "Differential impacts of age of acquisition on letter and semantic fluency in Alzheimer's disease patients and healthy older adults," *The Quarterly Journal of Experimental Psychology*, 64, 2383–2391.

Soto, C. J. and O. P. John (2009): "Ten facet scales for the Big Five Inventory: Convergence with NEO PI-R facets, self-peer agreement, and discriminant validity," *Journal of Research in Personality*, 43, 84–90.

Stahl, D. and P. Wilson (1995): "On Players' Models of Other Players: Theory and Experimental Evidence," *Games and Economic Behavior*, 10, 218–254.

Stahl, D. O. and P. W. Wilson (1994): "Experimental evidence on players' models of other players," *Journal of Economic Behavior & Organization*, 25, 309 – 327.

Staiger, D. and J. H. Stock (1997): "Instrumental Variables Regression with Weak Instruments," *Econometrica*, 65, 557–586.

Stiller, J. and R. I. Dunbar (2007): "Perspective-taking and memory capacity predict social network size," *Social Networks*, 29, 93–104.

Thomas, K., P. DeScioli, O. Sultan Haque, and S. Pinker (2014): "The Psychology of Coordination and Common Knowledge," *Journal of Personality and Social Psychology*, 107, 657–676.

Uziel, L. (2006): "The extraverted and the neurotic glasses are of different colors," *Personality and Individual Differences*, 41, 745 – 754.

Warriner, A. B., V. Kuperman, and M. Brysbaert (2013): "Norms of valence, arousal, and dominance for 13,915 English lemmas," *Behavior Research Methods*, 45 VN - r, 1191–1207.

Watson, D. and L. A. Clark (1992): "On Traits and Temperament: General and Specific Factors of Emotional Experience and Their Relation to the Five-Factor Model," *Journal of Personality*, 60, 441–476.

Watson, D., D. Wiese, J. Vaidya, and A. Tellegen (1999): "The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence." *Journal of Personality and Social Psychology*, 76, 820–838.

Weintraub, W. (1989): *Verbal behavior in everyday life*, Springer Pub. Co.

Yoshida, W., R. J. Dolan, and K. J. Friston (2008): "Game Theory of Mind," *PLoS Comput Biol PLoS Computational Biology*, 4.

A Appendix

A Additional Tables and Figures

Table A.1: Summary Statistics for Independent Variables

Variable	Mean	Std. Dev.	Min.	Max.	N
Own Extraversion	3.372	0.814	1.25	5	338
Own Neuroticism	2.935	0.811	1	5	338
Extraversion Belief	3.499	0.827	1	5	338
Neuroticism Belief	2.818	0.865	1	5	338
Own IQ	18.604	4.464	4	28	338
IQ Belief	18.213	4.825	1	30	338
Eyes Test Score	27.817	3.759	11	35	338

Table A.2: Summary Statistics for Control Variables

Variable	Mean	Std. Dev.	Min.	Max.	N
Age	21.154	3.622	17	42	338
Risk Aversion	4.317	0.767	1.533	6	338
Female	0.615	0.487	0	1	338
Non-native English speaker	0.349	0.477	0	1	338

Table A.3: Inaccuracy of personality beliefs

	Inaccuracy of Extraversion Belief		Inaccuracy of Neuroticism Belief	
	(1)	(2)	(3)	(4)
Own Extraversion × Treatment	0.1601*	0.2170**	-0.0760	-0.0954
	(0.086)	(0.092)	(0.092)	(0.100)
Own Neuroticism × Treatment	0.1040	0.1121	-0.0404	-0.0321
	(0.093)	(0.096)	(0.085)	(0.083)
Own Extraversion	0.0101	0.0181	-0.0740	-0.0552
	(0.052)	(0.059)	(0.058)	(0.058)
Own Neuroticism	-0.0061	0.0006	0.0343	0.0461
	(0.062)	(0.064)	(0.062)	(0.061)
Partner's Extraversion × Treatment	0.3031***	0.3075***		
	(0.079)	(0.081)		
Partner's Neuroticism × Treatment			0.0169	-0.0004
			(0.078)	(0.078)
Partner's Extraversion	-0.8160***	-0.8189***		
	(0.052)	(0.055)		
Partner's Neuroticism			-0.6530***	-0.6395***
			(0.053)	(0.054)
Treatment	0.2609***	-0.2290	-0.3866***	-0.1525
	(0.071)	(0.463)	(0.080)	(0.423)
Eyes Test Score × Treatment	0.0663	0.0773	0.1146	0.1503
	(0.072)	(0.072)	(0.099)	(0.102)
Eyes Test Score	-0.0459	-0.0368	-0.0930	-0.1352*
	(0.054)	(0.057)	(0.070)	(0.074)
Controls	No	Yes	No	Yes
N	338	338	338	338

Standard errors in parentheses. Statistical significance indicated as follows:

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The dependant variable (inaccuracy of personality beliefs) is computed by taking the difference between the player's beliefs about their partner's personality and the partner's true personality scores. This difference is then standardised. The dependent variable is thus a measure of overestimation of the partner's personality by the player. The independent variables are the player's own personality traits, the true personality trait score of the partner, the player's eyes test score and these variables interacted with the treatment dummy. The control variables are the player's IQ, gender, age and risk aversion and these variables interacted with the treatment dummy. Columns 1 and 2 show that overestimation of partner's extraversion increases with the player's own extraversion, an effect which is significantly stronger in the treatment group compared to the control group. The player's performance in the eyes test has no significant impact on the accuracy of beliefs. Columns 3 and 4 show that the overestimation of the partner's neuroticism decreases with the player's own extraversion in the treatment group, compared to the control group. However, the impact is insignificant.

Table A.4: Impact of beliefs about own cognitive ability on beliefs about partner's cognitive ability

	IQ Belief		Inaccuracy of IQ Belief	
	(1)	(2)	(3)	(4)
Own IQ Belief × Treatment	-0.0588	-0.0626	-0.0445	-0.0474
	(0.086)	(0.116)	(0.065)	(0.088)
Partner's IQ × Treatment	-0.0345	-0.0186	-0.0261	-0.0141
	(0.081)	(0.082)	(0.061)	(0.062)
Own IQ belief	0.6706***	0.7319***	0.5077***	0.5541***
	(0.060)	(0.078)	(0.045)	(0.059)
Partner's IQ	0.0937*	0.0894*	-0.6296***	-0.6328***
	(0.050)	(0.050)	(0.038)	(0.038)
Treatment	-0.0833	0.4362	-0.0631	0.3303
	(0.082)	(0.506)	(0.062)	(0.383)
Own IQ × Treatment		-0.0172		-0.0130
		(0.110)		(0.083)
Eyes Test Score × Treatment		0.0276		0.0209
		(0.099)		(0.075)
Own IQ		-0.0714		-0.0541
		(0.069)		(0.053)
Eyes Test Score		0.0194		0.0147
		(0.077)		(0.058)
Controls	No	Yes	No	Yes
N	338	338	338	338

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Column 1 examines the impact of the player's beliefs about own IQ, partner's true IQ and the treatment dummy, on beliefs about the partner's IQ. While own IQ belief interacted with treatment dummy has no significant effect, own IQ belief positively impacts beliefs about partner's IQ. Column 2 includes the independent variables, the player's true IQ as measured by the Raven test, the player's eyes test score and the control variables - player's age, gender and risk aversion - as well as the 3 control variables interacted with the treatment dummy. For columns 3 and 4 the dependant variable is the standardised difference between the beliefs about partner's IQ and the partner's true IQ (as measured by the partner's performance in the Raven test). Hence, for columns 3 and 4 the dependant variable is a measure of the degree by which the player overestimates their partner's IQ. Columns 3 and 4 indicate that an increase in player's own IQ belief leads to overestimation of the partner's IQ, irrespective of being in the treatment or control group i.e. players project beliefs about their own IQ onto their partner.

Table A.5: Impact of (absolute) difference between own personality and predicted on the probability of choosing the best response - Logit Model

	Control		Treatment	
	(1) Pr(Level=2)	(2) Pr(Level=2)	(3) Pr(Level=2)	(4) Pr(Level=2)
DiffExtraversion	-0.0486	-0.0486	0.0843***	0.0992***
	(0.041)	(0.041)	(0.029)	(0.032)
DiffNeuroticism	-0.0019	-0.0169	-0.0459	-0.0471
	(0.030)	(0.032)	(0.032)	(0.032)
Own Extraversion		-0.0104		0.0201
		(0.029)		(0.045)
Own IQ		0.0652*		0.0600
		(0.039)		(0.041)
IQ Belief		-0.0446		-0.0077
		(0.028)		(0.037)
Eyes Test Score		0.0497		0.0404
		(0.039)		(0.034)
Controls	No	Yes	No	Yes
N	170	170	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.6: Impact of beliefs about partner's personality on beliefs about partner's contribution and own contribution in the public goods game

	Control Order 1				Treatment Order 1			
	(1) Contribution Belief	(2) Contribution Belief	(3) Own Contribution	(4) Own Contribution	(5) Contribution Belief	(6) Contribution Belief	(7) Own Contribution	(8) Own Contribution
Extraversion Belief	0.0430	0.0575	0.0951	0.1042	0.1964*	0.1879*	0.1882**	0.1667*
	(0.083)	(0.082)	(0.087)	(0.101)	(0.101)	(0.100)	(0.087)	(0.083)
Neurotcisim Belief	0.0440	0.0456	-0.0207	-0.0275	0.1771	0.1627	0.1591	0.1697
	(0.090)	(0.109)	(0.087)	(0.101)	(0.111)	(0.109)	(0.117)	(0.112)
Own IQ		-0.0664		-0.0114		0.1265		0.1782*
		(0.106)		(0.087)		(0.088)		(0.101)
IQ Belief		0.1329		0.1016		0.0964		0.2512**
		(0.097)		(0.107)		(0.096)		(0.097)
Eyes Test Score		-0.0256		0.0221		0.1197		0.1694
		(0.096)		(0.130)		(0.090)		(0.117)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	110	110	110	110	106	106	106	106

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table shows that of the two fundamental personality traits - extraversion and neuroticism - only beliefs about partner's extraversion affect decision making in the public goods game, for treatment group subjects.

Table A.7: Impact of beliefs about partner's personality and own personality on beliefs about partner's contribution and own contribution in Public Goods Game - Order 2

	Control OLS		Treatment IV	
	(1) Contribution Belief	(2) Own Contribution	(3) Contribution Belief	(4) Own Contribution
Extraversion Belief	-0.0357	-0.2345*	0.1273	1.2682
	(0.147)	(0.121)	(1.065)	(1.986)
Own Extraversion	0.1603	0.0317	0.1219	-0.1167
	(0.158)	(0.158)	(0.189)	(0.321)
Own IQ	0.1372	0.0435	-0.0345	-0.0495
	(0.203)	(0.162)	(0.120)	(0.223)
IQ Belief	0.1792	0.0170	-0.0657	-0.1679
	(0.159)	(0.133)	(0.142)	(0.209)
Eyes Test Score	-0.2673	0.2327	0.2574	0.0801
	(0.174)	(0.164)	(0.157)	(0.330)
Controls	Yes	Yes	Yes	Yes
N	60	60	62	62

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table replicates the IV regression results from the main paper but only for those subjects which played the 11-20 game first.

Table A.8: Impact of beliefs about partner's personality and own personality facets on beliefs about partner's contribution and own contribution in Public Goods Game

	Control OLS		Treatment IV	
	(1) Contribution Belief	(2) Own Contribution	(3) Contribution Belief	(4) Own Contribution
ExtraversionBelief	0.0542	0.1036	0.6169**	0.5262**
	(0.084)	(0.093)	(0.265)	(0.251)
OwnAssertiveness	-0.1258	-0.2271*	-0.3287**	-0.3095**
	(0.113)	(0.114)	(0.128)	(0.124)
OwnActivity	0.0593	0.0333	0.0255	0.1562
	(0.122)	(0.123)	(0.125)	(0.106)
Own IQ	-0.0497	-0.0323	0.0781	0.1396
	(0.099)	(0.088)	(0.098)	(0.105)
IQ Belief	0.1391	0.1301	0.1041	0.2708***
	(0.089)	(0.102)	(0.091)	(0.092)
Eyes Test Score	-0.0342	0.0114	0.1193	0.1751
	(0.102)	(0.122)	(0.118)	(0.139)
Controls	Yes	Yes	Yes	Yes
N	110	110	106	106

Standard errors in parentheses. Statistical significance indicated as follows:

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Columns 1 and 2 report the OLS regression results for the control group. Column 2 shows that the players own assertiveness has a negative significant effect (p-value < 0.05) on contribution levels whereas facet activity has an insignificant positive effect. None of the facets significantly impact beliefs about partner's contribution. Columns 3 and 4 present the results from 2SLS IV regression for the treatment group. For the treated subjects, beliefs about partner's extraversion positively and significantly (p-value < 0.05) affects beliefs about partner's contribution as well as own-contribution. With regards to the player's own personality, facet assertiveness has a significant negative effect (p-value < 0.05) on both contribution belief and own-contribution, whereas facet activity has an insignificant positive effect.

Table A.9: Impact of Valence rating of the text used by the partner on beliefs about partner's personality

	(1) Extraversion Belief	(2) Extraversion Belief	(3) Neuroticism Belief	(4) Neuroticism Belief
Valence	0.1029	0.0850	-0.0932**	-0.1047**
	(0.074)	(0.066)	(0.037)	(0.048)
Number of Words		0.0082***		-0.0017
		(0.003)		(0.002)
Own IQ		-0.0858		0.1108
		(0.089)		(0.077)
Eyes Test Score		0.0725		0.0206
		(0.060)		(0.097)
Age		0.0263		-0.0449**
		(0.021)		(0.020)
Female		-0.0824		-0.1635
		(0.161)		(0.156)
IQ Belief		0.1130		-0.0861
		(0.082)		(0.086)
Non-Native Speaker		0.3560**		-0.2367
		(0.150)		(0.156)
First Speaker		-0.0167		-0.3131**
		(0.142)		(0.152)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.10: Impact of Arousal rating of the text used by the partner on beliefs about partner's personality

	(1) Extraversion Belief	(2) Extraversion Belief	(3) Neuroticism Belief	(4) Neuroticism Belief
Arousal	0.1579**	0.1528***	-0.1016***	-0.1308***
	(0.061)	(0.052)	(0.037)	(0.045)
Number of Words		0.0077***		-0.0015
		(0.003)		(0.002)
Own IQ		-0.1109		0.1278
		(0.087)		(0.078)
Eyes Test Score		0.0672		0.0282
		(0.058)		(0.095)
Age		0.0237		-0.0428**
		(0.021)		(0.020)
Female		-0.0865		-0.1609
		(0.159)		(0.155)
IQ Belief		0.1344*		-0.0986
		(0.080)		(0.085)
Non-Native Speaker		0.3751**		-0.2493
		(0.149)		(0.157)
First Speaker		-0.0098		-0.3198**
		(0.141)		(0.151)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.11: Impact of Dominance rating of the text used by the partner on beliefs about partner's personality

	(1) Extraversion Belief	(2) Extraversion Belief	(3) Neuroticism Belief	(4) Neuroticism Belief
Dominance	0.1177**	0.1051**	-0.0881***	-0.1082***
	(0.059)	(0.051)	(0.029)	(0.039)
Number of Words		0.0081***		-0.0018
		(0.003)		(0.002)
Own IQ		-0.0901		0.1128
		(0.089)		(0.076)
Eyes Test Score		0.0742		0.0205
		(0.060)		(0.096)
Age		0.0262		-0.0449**
		(0.021)		(0.020)
Female		-0.0702		-0.1766
		(0.162)		(0.155)
IQ Belief		0.1149		-0.0850
		(0.082)		(0.085)
Non-Native Speaker		0.3588**		-0.2375
		(0.149)		(0.156)
First Speaker		-0.0160		-0.3142**
		(0.142)		(0.153)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.12: Impact of Humour rating of the text used by the partner on beliefs about partner's personality

	(1) Extraversion Belief	(2) Extraversion Belief	(3) Neuroticism Belief	(4) Neuroticism Belief
Humour	0.1642***	0.1521***	-0.0789**	-0.0938**
	(0.047)	(0.043)	(0.036)	(0.045)
Number of Words		0.0077***		-0.0017
		(0.003)		(0.002)
Own IQ		-0.1058		0.1157
		(0.090)		(0.076)
Eyes Test Score		0.0744		0.0245
		(0.059)		(0.096)
Age		0.0256		-0.0446**
		(0.021)		(0.020)
Female		-0.0912		-0.1596
		(0.159)		(0.156)
IQ Belief		0.1282		-0.0860
		(0.081)		(0.086)
Non-Native Speaker		0.3603**		-0.2332
		(0.147)		(0.158)
First Speaker		-0.0159		-0.3150**
		(0.141)		(0.152)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.13: Impact of Concreteness rating of the text spoken by the partner on beliefs about partner's personality

	(1) Extraversion Belief	(2) Extraversion Belief	(3) Neuroticism Belief	(4) Neuroticism Belief
Concreteness	0.1090	0.0760	-0.1400***	-0.1187*
	(0.077)	(0.071)	(0.052)	(0.062)
Number of Words		0.0084***		-0.0018
		(0.003)		(0.002)
Own IQ		-0.0844		0.1125
		(0.089)		(0.078)
Eyes Test Score		0.0671		0.0263
		(0.060)		(0.094)
Age		0.0260		-0.0444**
		(0.021)		(0.020)
Female		-0.0915		-0.1484
		(0.159)		(0.155)
IQ Belief		0.1112		-0.0884
		(0.081)		(0.089)
Non-Native Speaker		0.3251**		-0.1917
		(0.149)		(0.164)
First Speaker		-0.0244		-0.3002*
		(0.142)		(0.155)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.14: Relationship between Valence rating of the text spoken by the subject and the subject's own personality

	(1) Extraversion	(2) Extraversion	(3) Neuroticism	(4) Neuroticism
Valence	-0.0912	-0.1348*	0.0696*	0.0454
	(0.063)	(0.071)	(0.036)	(0.039)
Number of Words		0.0058**		0.0027
		(0.003)		(0.003)
Own IQ		-0.1876**		0.0115
		(0.090)		(0.082)
Eyes Test Score		-0.0109		0.1488*
		(0.090)		(0.083)
Age		0.0162		0.0040
		(0.029)		(0.023)
Female		0.0504		0.3539**
		(0.167)		(0.156)
IQ Belief		0.0134		-0.0550
		(0.088)		(0.078)
Non-Native Speaker		0.0830		-0.1242
		(0.156)		(0.178)
First Speaker		0.1601		0.0950
		(0.155)		(0.163)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.15: Relationship between Arousal rating of the text spoken by the subject and the subject's own personality

	(1) Extraversion	(2) Extraversion	(3) Neuroticism	(4) Neuroticism
Arousal	-0.0434	-0.0820	-0.0077	-0.0461
	(0.050)	(0.058)	(0.057)	(0.054)
Number of Words		0.0055**		0.0033
		(0.003)		(0.003)
Own IQ		-0.1859**		0.0091
		(0.091)		(0.081)
Eyes Test Score		-0.0176		0.1578*
		(0.088)		(0.083)
Age		0.0139		0.0070
		(0.029)		(0.024)
Female		0.0672		0.3465**
		(0.165)		(0.155)
IQ Belief		0.0207		-0.0543
		(0.089)		(0.078)
Non-Native Speaker		0.0790		-0.1290
		(0.157)		(0.178)
First Speaker		0.1620		0.0971
		(0.157)		(0.163)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.16: Relationship between Dominance rating of the text spoken by the subject and the subject's own personality

	(1) Extraversion	(2) Extraversion	(3) Neuroticism	(4) Neuroticism
Dominance	-0.0531	-0.0908	0.0556*	0.0287
	(0.043)	(0.057)	(0.030)	(0.039)
Number of Words		0.0054**		0.0028
		(0.003)		(0.003)
Own IQ		-0.1890**		0.0118
		(0.092)		(0.082)
Eyes Test Score		-0.0168		0.1510*
		(0.090)		(0.083)
Age		0.0133		0.0050
		(0.029)		(0.023)
Female		0.0635		0.3494**
		(0.167)		(0.155)
IQ Belief		0.0204		-0.0573
		(0.088)		(0.079)
Non-Native Speaker		0.0858		-0.1252
		(0.157)		(0.179)
First Speaker		0.1606		0.0948
		(0.156)		(0.163)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.17: Relationship between Humour rating of the text spoken by the subject and the subject's own personality

	(1) Extraversion	(2) Extraversion	(3) Neuroticism	(4) Neuroticism
Humour	-0.0710	-0.1141*	0.0055	-0.0165
	(0.055)	(0.062)	(0.051)	(0.043)
Number of Words		0.0057**		0.0031
		(0.003)		(0.003)
Own IQ		-0.1899**		0.0093
		(0.091)		(0.082)
Eyes Test Score		-0.0239		0.1538*
		(0.089)		(0.083)
Age		0.0126		0.0058
		(0.029)		(0.023)
Female		0.0658		0.3471**
		(0.164)		(0.155)
IQ Belief		0.0208		-0.0558
		(0.089)		(0.079)
Non-Native Speaker		0.0851		-0.1253
		(0.157)		(0.179)
First Speaker		0.1560		0.0949
		(0.157)		(0.163)
N	168	168	168	168

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.18: Relationship between Concreteness rating of the text spoken by the subject and the subject's own personality

	(1) Extraversion	(2) Extraversion	(3) Neuroticism	(4) Neuroticism
Concreteness	0.0161	0.0057	0.0702*	0.0579
	(0.041)	(0.047)	(0.041)	(0.047)
Number of Words		0.0049*		0.0027
		(0.003)		(0.003)
Own IQ		-0.1841**		0.0085
		(0.092)		(0.083)
Eyes Test Score		-0.0250		0.1532*
		(0.089)		(0.083)
Age		0.0112		0.0041
		(0.029)		(0.023)
Female		0.0689		0.3445**
		(0.166)		(0.156)
IQ Belief		0.0169		-0.0593
		(0.088)		(0.079)
Non-Native Speaker		0.0871		-0.1119
		(0.158)		(0.182)
First Speaker		0.1598		0.1039
		(0.159)		(0.163)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.19: Impact of Age of Acquisition rating of the text used by the partner on beliefs about partner's personality

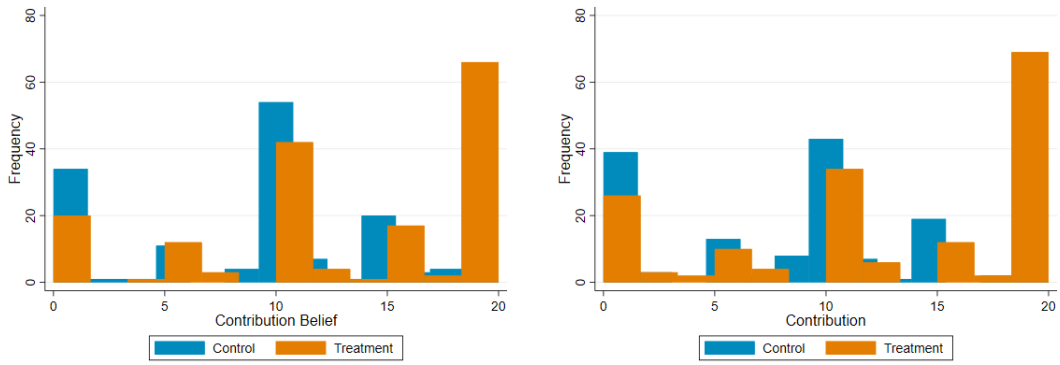
	(1) Extraversion Belief	(2) Extraversion Belief	(3) Neuroticism Belief	(4) Neuroticism Belief
Age of Acquisition	0.2104***	0.1750***	-0.0952***	-0.0894*
	(0.041)	(0.048)	(0.035)	(0.052)
Number of Words		0.0073**		-0.0017
		(0.003)		(0.002)
Own IQ		-0.0934		0.1060
		(0.088)		(0.076)
Eyes Test Score		0.0731		0.0261
		(0.059)		(0.096)
Age		0.0225		-0.0432**
		(0.021)		(0.020)
Female		-0.0487		-0.1826
		(0.160)		(0.156)
IQ Belief		0.1071		-0.0720
		(0.081)		(0.082)
Non-Native Speaker		0.3778**		-0.2407
		(0.149)		(0.159)
First Speaker		-0.0569		-0.2943*
		(0.141)		(0.155)
N	168	168	168	168

Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.20: Relationship between Age of Acquisition rating of the text spoken by the subject and the subject's own personality

	(1) Extraversion	(2) Extraversion	(3) Neuroticism	(4) Neuroticism
Age of Acquisition	0.0914	0.0735	-0.0103	-0.0227
	(0.066)	(0.079)	(0.069)	(0.067)
Number of Words		0.0044		0.0032
		(0.003)		(0.002)
Own IQ		-0.1790*		0.0087
		(0.092)		(0.082)
Eyes Test Score		-0.0285		0.1547*
		(0.089)		(0.083)
Age		0.0097		0.0061
		(0.029)		(0.024)
Female		0.0807		0.3441**
		(0.167)		(0.154)
IQ Belief		0.0024		-0.0517
		(0.090)		(0.080)
Non-Native Speaker		0.1040		-0.1308
		(0.160)		(0.181)
First Speaker		0.1679		0.0926
		(0.158)		(0.163)
N	168	168	168	168

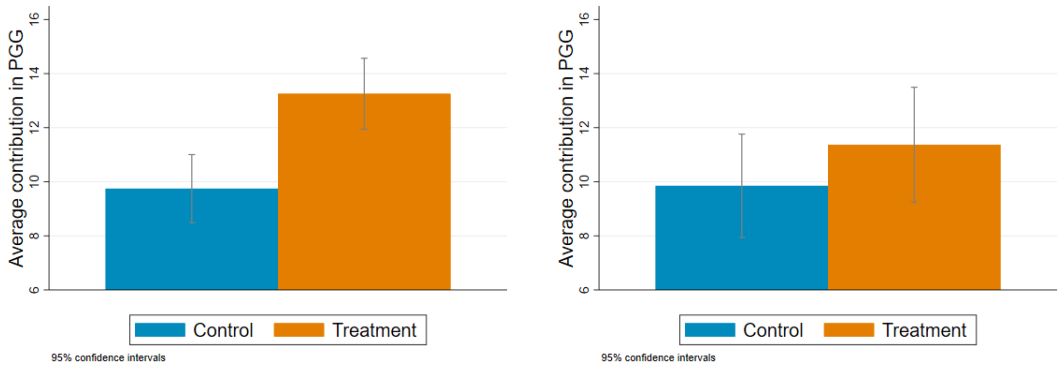
Standard errors in parentheses. Statistical significance indicated as follows:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$



(a) Contribution Belief

(b) Own Contribution

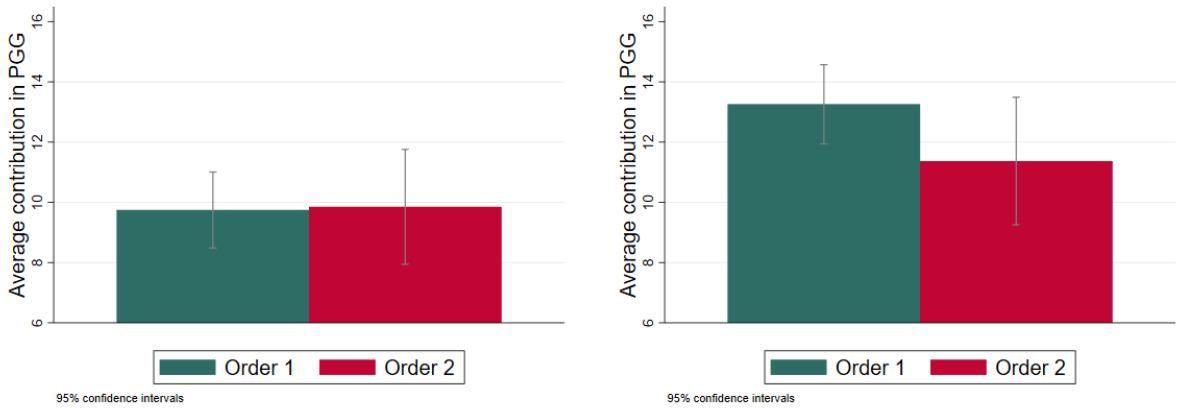
Figure A.1: Distribution of Contribution and Beliefs about Partner's Contribution in the Public Goods Game



(a) Order 1

(b) Order 2

Figure A.2: Average contribution in Public Goods Game (PGG) (a) when PGG is played first (Order 1) and (b) when the 11-20 game is played first (Order 2). Treated subjects contribute more than control group subjects in order 1. The average contribution of treated subjects is 13.2 EP where as that of control group subjects is 9.7 EP in order 1. The difference is statistically significant with t-statistic of -3.8060 and p-value < 0.01. There is no significant difference in contribution levels between the treatment and control groups in order 2.



(a) Control

(b) Treatment

Figure A.3: Average contribution in Public Goods Game (PGG) for different orders of play of the two games for (a) Control and (b) Treatment groups. Order 1 is when PGG is played first and order 2 is when the 11-20 game is played first. On average players contribute more in the treatment group when PGG is played first compared to when 11-20 is played first. We reject the null of no significant difference in contribution between treated players in order 1 and treated players in order 2 in favour of the alternative that treated players in order 1 contribute more at the 10% significance level (t-statistic = 1.5752, p-value =0.0586). There is no significant difference for control group subjects.

B Examples of Small Talk Communication

Example 1

Player 1: *hey*

Player 2: *Hey how are you doing :)*

Player 1: *lol alright*

Player 1: *you*

Player 2: *yeah fine haha*

Player 1: *tbh this is strange*

Player 2: *this is strange*

Player 2: *exactly haha*

Player 1: *omg*

Player 1: *so...*

Player 1: *do you have any pets?*

Player 2: *probably they want to see if we will cooperate depending on our chat or something haha*

Player 2: *nope and you?*

Player 1: *trying to make conversation :D*

Player 1: *yep, two cats*

Player 2: *I had fish when I was little haha*

Player 2: *What are their names?*

Player 1: *aww like goldfish?*

Player 1: *Cosmos and Titan*

Player 2: *Yes a goldfish and one more but I forgot the type lol*

Player 2: *That is great!*

Player 1: *i used to have goldfish*

Player 1: *but we could not keep them cause of the cats*

Player 2: *Goldfish live a long I think generally haha*

Player 2: *Oh no!*

Player 1: *we had 4 goldfish*

Player 2: *Cats is more interesting haha*

Player 2: *are**

Player 1: *yeah i know*

Player 1: *only problem is they scratch you*

Player 1: *a lot*

Player 2: *Ahaha yes*

Player 2: *scars all the time*

Player 1: *so now i have lots of marks on me*

Player 2: *This keyboard is so bad*

Player 2: *Oh no*

Player 2: *The pain of being a cat owner haha*

Player 1: *the keyboard never crossed my mind lol*

Player 2: *I barely can type on it haha*

Player 2: *It was nice chatting to you haha*

Player 1: *aww goodbye*

Example 2

Player 1: *hi*

Player 2: *hey*

Player 1: *what is up?*

Player 2: *not much, you?*

Player 1: *same, just waiting haha*

Player 2: *same, it is a bit dead is not it*

Player 1: *it really is...*

Player 2: *think I mucked up most of those puzzles tbh*

Player 1: *although everyone is now typing fervently*

Player 1: *you think you did that bad?*

Player 2: *not that bad, but some of them I just did not get*

Player 2: *or I almost got them and then the time ran out*

Player 1: *there were some really weird ones though*

Player 2: *yeah igy*

Player 1: *yeah same, 30 seconds is a bit too quick for some of those*

Player 2: *some just made no sense to me*

Player 1: *true that*

Player 1: *but they take 2/30 anyway,*

Player 2: *seems like a bit of a waste of time*

Player 2: *to do 30 and then only 2 count*

Player 1: *and for some reason \ q random \ q selection always ends up in me being paid nothing xD*

Player 2: *same haha*

Player 1: *Ikr*

Player 2: *or i am in a team and the team does really badly and i get almost no money*

Player 1: *but yeah, pretty much a waste*

Player 2: *really**

Player 1: *omg yes....*

Player 2: *its a bit annoying*

Player 1: *These dictator games where in the end one person decides whether I can keep my money or get nothing*
Player 2: *yes! so irritating*
Player 1: *Being paid £3 after 1,5 hours....*
Player 2: *what a drag*
Example 3
Player 1: *Hi*
Player 2: *Hello*
Player 1: *how are you?*
Player 2: *How are you?*
Player 2: *haha*
Player 1: *haha i'm good you?*
Player 2: *great*
Player 2: *How are exams going?*
Player 1: *yeah not too bad, some have gone worse that i had wanted, you?*
Player 2: *Most of them were alright, three more to go*
Player 2: *How about you?*
Player 2: *Any more left?*
Player 1: *i've got 1 more to go, thank god, i have 7 overall*
Player 1: *how many do you have overall?*
Player 2: *That's a lot. When is your last one?*
Player 2: *I have 6 in total*
Player 1: *next wednesday*
Player 1: *so i can go to circle and pop and celebrate by getting black out drunk haha*
Player 2: *Still some time to prepare. I have one this Saturday*
Player 2: *Yeah, pop is back on again next week*
Player 1: *that's grim, my boyfriend does to, i don't get why exams on saturday is a thing*
Player 1: **too*
Player 2: *None of your 7 exams were on Saturday?*
Player 1: *nope, i had 1 in week 3, 1 week 4, 3 last week, 1 this week and one next week*
Player 2: T*ime is running out heh*

C Experiment Script

This following part is read out by the experimenter.

Thank you everyone for coming to our experiment today. Before we begin, please check that the number on the card handed to you matches with the number on the cubicle that

you are seated in.

During the whole experiment, please do not speak with each other. If you do not understand something, please ask the experimenter by raising your hand. We will come to you and answer your question individually. Please also refrain from using your mobile phones during the experiment.

Also bear in mind that you may have to wait a few moments during the experiment, as we want everyone to finish at the same time. You will see the message 'Please wait until the experiment continues' on your screen when this is applicable.

Before we begin, I would just like to say, that your participation is very crucial for our research and we truly appreciate all of you being here. Thank you. We will now begin the experiment.

General Instructions

In the laboratory experiment you are taking part in, you can - depending on your decisions and the decisions of your fellow players- earn money in addition to the show-up fee of £4. It is, therefore, of importance that you read these instructions carefully. Today's experiment consists of the following: In the first section, you will be asked to answer a few questions and solve some puzzles. In the second section, you will be asked to make decisions in a few tasks. Lastly, there will be some questions for you to answer. Please note that the experiment will not involve any deception and your answers today will remain strictly anonymous. The generated anonymous data will only be used for the purpose of our study. Therefore, we request you to answer to the best of your ability as it is integral to our research. The outcomes from each task will be disclosed at the end of the experiment. Detailed instructions for each part will follow. We will now begin the experiment.

(a) Questionnaire: Personality (44 questions)

You will be asked to answer some questions about yourself. Your payment will not be affected by this. Just to remind you, your answers will remain anonymous so please answer as truthfully as possible as this is critically important for our research. You will see a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please pick an option next to each statement to indicate the extent to which you agree or disagree with that statement. I see myself as someone who...

START BFI QUESTIONNAIRE

(b) PUZZLES: Raven Test (30 items)

You will be asked to solve some puzzles, a pattern game. On the screen, you will see a set of abstract pictures with one of the pictures missing. You need to choose a picture from the choices given below to complete the pattern. You will have 30 seconds to complete each set of pictures. The first picture you will see will be an example, no input is required. You

will then be asked to solve a total of 30 such puzzles. 2 of these 30 puzzles will randomly be selected. For each correct answer, from the random 2, you will receive £1. Please make sure to click 'submit answer', as otherwise your answer will not be recorded, and you might lose money.

START RAVEN TEST

Out of the 30 puzzles you just saw, how many puzzles do you think you correctly solved? If your answer to this question is correct, then you will win an additional £1.

Now subjects will be allocated to one of 2 treatment groups

Control Group

Placebo Task 1: (4 minutes)[11]

Can you please indicate the title and summarize the story of the last movie you have seen? Please be as specific as possible and include as many details as possible. Please use a minimum of 250 characters. You will have 4 minutes to write the summary.

Please write the summary in the box provided on the next screen.

(next screen) Please make sure to click 'Submit' after you are done, as otherwise your answer will not be recorded.

Beliefs

You have been randomly and anonymously matched with another person in this room who is participating in the experiment. Please answer a few questions about the other player to the best of your ability, before you proceed with the tasks.

1. You will see a number of characteristics that may or may not apply to the other player. For example, do you agree that the other player is someone who likes to spend time with others? Please pick an option next to each statement to indicate the extent to which you agree or disagree with the statement regarding the other player.

   You will see 11 statements about the other player.

   1 out of these 11 statements will be randomly chosen and if your answer matches that of the other player, then you will win an additional £1.

   START PERSONALITY PREDICTION QUESTIONNAIRE

2. Recall the visual puzzle task from earlier in the experiment. On the screen, you saw a set of abstract pictures with one of the pictures missing. You had to choose a picture from the choices given below to complete the pattern. You had 30 seconds to complete each set of pictures. You were asked to solve a total of 30 such puzzles. How many puzzles do you think the other player, with whom you have been matched, correctly solved? Please indicate a (whole) number between 0 and 30.

[11] This task has been adapted from the Placebo Task used in Bursztyn et al. (2017).

If your answer to this question is correct, then you will win an additional of £1.

Tasks

You will now take part in a few decision-making tasks with the player with whom you have already been matched. Note that you will be participating in all tasks with the same player. Your payoff from these tasks will be calculated in Experimental Pounds (EP). The exchange rate between £ and EP is 1:5, i.e. 5 EP = £1. The outcomes from each task will be disclosed at the end of the experiment. You will receive payment based on your results from one of the tasks randomly selected from the tasks in this part of the experiment. Please note that each task is equally likely to be chosen for payment.

Task 1: PGG

You will now participate in a task with the player with whom you have been matched. You have 20 EP and the other player has 20 EP as well. Your task in the game, and also the other player's task, is to decide how much to contribute to a joint project. You can choose to contribute any amount between 0 and 20 EP (only integer numbers). Your earnings from the project is the total contribution to the project, made by you and the other player, multiplied by a factor of 3/4. Your payoff from this task will be your earnings from the project, plus the amount you did not contribute. Thus, your final payoffs (in EP) will be given by:

Your payoff = (20– your contribution)+3/4(your contribution + the other player's contribution)

Other player's payoff = (20– the other player's contribution)+3/4(your contribution + the other player's contribution)

If for example, you contribute 20 EP to the project and the other player contributes 20 EP then, Your payoff will be: $20–20 + 3/4(20 + 20) = 30$ The other player's payoff will be: $20–20 + 3/4(20 + 20) = 30$

If for example, you contribute 0 EP to the project and the other player contributes 20 EP then, Your payoff will be: $20–0 + 3/4(0 + 20) = 35$ The other player's payoff will be: $20–20 + 3/4(0 + 20) = 15$

If you have a question, please raise your hand. If you have read the instructions and do not have any questions, please click 'OK' to proceed to a practice quiz. The quiz is to make sure that you understand the task and your answers will not affect your payoffs from the experiment.

Suppose you choose to contribute 20 EP and the other player chooses to contribute 0 EP. Your payoff will be: The other player's payoff will be:

Suppose you choose to contribute 10 EP and the other player chooses to contribute 14 EP. Your payoff will be: The other player's payoff will be:

You have correctly answered the practice quiz. Click 'Continue' to proceed with the task.

How much money do you think the other player will contribute? Please indicate a number (an integer) between 0 and 20.

If your answer to this question matches that of the other player, then you will win an additional £1. How much would you like to contribute? Please choose a number (an integer) between 0 and 20.

Task 2: 11-20 money request game

You will now participate in a different task with the same player.

You and the other player are playing a game in which each player requests an amount of money. The amount must be (an integer) between 11 and 20 Experimental Pounds. Each player will receive the amount he or she requests. A player will receive an additional amount of 20 Experimental Pounds if he or she asks for exactly one Experimental Pound less than the other player.

If for example, you request 19 EP and the other player requests 20 EP then, Your payoff will be: $19 + 20 = 39$

The other player's payoff will be: 20

If for example, you request 17 EP and the other player requests 16 EP then, Your payoff will be: 17

The other player's payoff will be: $16 + 20 = 36$

If you have a question, please raise your hand.

If you have read the instructions and do not have any questions, please click 'OK' to proceed to a practice quiz. The quiz is to make sure that you understand the task and your answers will not affect your payoffs from the experiment.

Suppose you choose to request 13 EP and the other player chooses to request 14 EP. Your payoff will be: The other player's payoff will be:

Suppose you choose to request 15 EP and the other player chooses to request 18 EP. Your payoff will be: The other player's payoff will be:

You have correctly answered the practice quiz. Click 'Continue' to proceed with the task.

How much money do you think the other player will request? Please indicate a number (an integer) between 11 and 20.

If your answer to this question matches that of the other player, then you will win an additional £1.

What amount of money would you request? Please choose a number (an integer) between 11 and 20.

Treatment Group

Chat Instructions

You have been randomly and anonymously matched with another person in this room who is participating in the experiment.

Before you proceed with the tasks, you are allowed to chat with the other player for 4 minutes. You can type in the box provided at the bottom of the screen and press Enter on your keyboard to send your messages.

Your message should not contain any personal information such as your name or your computer ID. The purpose is to preserve anonymity throughout the experiment. You are allowed to chat freely in English and in a non-abusive manner.

Beliefs

Now that you have chatted with the other player please answer a few questions about the other player, before you proceed with the tasks.

1. You will see a number of characteristics that may or may not apply to the other player. For example, do you agree that the other player is someone who likes to spend time with others? Please pick an option next to each statement to indicate the extent to which you agree or disagree with the statement regarding the other player. You will see 11 statements about the other player.

   1 out of these 11 statements will be randomly chosen and if your answer matches that of the other player, then you will win an additional £1.

   START PERSONALITY PREDICTION QUESTIONNAIRE

2. Recall the visual puzzle task from earlier in the experiment. On the screen, you saw a set of abstract pictures with one of the pictures missing. You had to choose a picture from the choices given below to complete the pattern. You had 30 seconds to complete each set of pictures. You were asked to solve a total of 30 such puzzles. How many puzzles do you think the other player, with whom you chatted, correctly solved? Please indicate a (whole) number between 0 and 30. If your answer to this question is correct, then you will win an additional £1.

Tasks

You will now take part in a few decision-making tasks with the player you chatted with. Note that you will be participating in all tasks with the same player. Your payoff from these tasks will be calculated in Experimental Pounds (EP). The exchange rate between £ and EP is 1:5, i.e. 5 EP = £1.

The outcomes from each task will be disclosed at the end of the experiment. You will receive payment based on your results from one of the tasks randomly selected from the tasks in this part of the experiment. Please note that each task is equally likely to be chosen for payment.

Task 1: PGG

You will now participate in a task with the player you chatted with. You have 20 EP and the other player has 20 EP as well. Your task in the game, and also the other player's task, is to decide how much to contribute to a joint project. You can choose to contribute any amount between 0 and 20 EP (only integer numbers). Your earnings from the project is the total contribution to the project, made by you and the other player, multiplied by a factor of ¾. Your payoff from this task will be your earnings from the project, plus the amount you did not contribute. Thus, your final payoffs (in EP) will be given by:

Your payoff = (20– your contribution)+$^3/_4$(your contribution + the other player's contribution)

Other player's payoff = (20– the other player's contribution)+$^3/_4$(your contribution + the other player's contribution)

Examples and quiz related to the game, then strategy belief and task choice

Task 2: 11-20 money request game

You will now participate in a different task with the same player.

You and the other player are playing a game in which each player requests an amount of money. The amount must be (an integer) between 11 and 20 Experimental Pounds. Each player will receive the amount he or she requests. A player will receive an additional amount of 20 Experimental Pounds if he or she asks for exactly one Experimental Pound less than the other player.

Examples and quiz related to the game, then strategy belief and task choice

FOR BOTH CONTROL AND TREATMENT:

Eyes Test (36 questions)

In this section, you will be asked to look at 36 pictures of different pairs of eyes.

For each set of eyes, choose the word which best describes what the person in the picture is thinking or feeling. You may feel that more than one word is applicable but please choose just one word, the word which you consider to be most suitable. Before making your choice, make sure that you have read all 4 words. You should try to do the task as quickly as possible, but you will not be timed. If you do not know what a word means you can read the meaning of the word provided at the bottom of the screen.

2 of these 36 questions you answer will randomly be selected. For each correct answer, from the random 2, you will receive £1.

You will first see a practice question with four options. The correct option will be highlighted. After that you may proceed to the questions.

Which word best describes what the person in the picture is thinking or feeling?

START EYES TEST

Questionnaire

Thank you. Now, in the final section, you will be asked to answer some questions about yourself.

(a) Risk Please indicate the likelihood that you would engage in the described activity or behaviour if you were to find yourself in that situation.

START DOSPERT

(b) Personal information

1. How old are you? (in years)
2. What is your year of study? (1, 2, 3, Post-graduate Other)
3. What is your gender? (M, F, Other, Prefer not to say)
4. What is your nationality?
5. Is English your Native language? (Yes, No)
6. What is your current degree course?
7. Would you consider your degree course mostly: (quantitative, qualitative)
8. Have you ever taken any game theory modules/courses? (Yes, No)
9. How dissatisfied or satisfied are you with your life in general? (1-7 scale from completely dissatisfied to completely satisfied)

Profit display screen

1. Number of correct answers from the visual puzzles task (out of 30):
2. Your payoff (in EP) from the first decision-making task:
3. Your payoff (in EP) from the second decision-making task:
4. Number of correct answers from the eyes task (out of 36):
5. Additional amount earned (in £):
6. Total earnings (in £):

Thank you for completing the experiment successfully. Please queue at the marked line once you are done, show the number card and collect your payment in cash.