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Eugen Dimant,
Kyle Hyndman

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Becoming Friends or Foes? How Competitive Environments Shape Social Preferences

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Suzanne Robey
Centre for Decision Research and Experimental Economics
School of Economics
University of Nottingham
University Park
Nottingham
NG7 2RD
Tel: +44 (0)115 95 14763
suzanne.robey@nottingham.ac.uk

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Becoming Friends or Foes?
How Competitive Environments Shape Social Preferences

Eugen Dimant **
University of Pennsylvania

Kyle Hyndman
University of Texas Dallas

Abstract

We study the interaction between competition and social proximity on altruism, trust, and reciprocity. We decompose the behavioral channels by utilizing variants of both the Trust Game and the Dictator Game in a design that systematically controls the transmission of relevant information. Our results suggest that competitive environments, and in particular the outcomes thereof when competitors are socially proximate, affect social preferences. Within the context of the Trust Game, we find that winning makes individuals *more* trusting, *less* reciprocal, and *less* altruistic. In order to decompose the underlying mechanism of decision-makers, we subsequently use the Dictator Game and find that knowledge about winning the competition *decreases* giving, especially with increased proximity between competitors. From this we can conclude that the observed increase in trust is guided by self-serving concerns to maximize the total pie rather than altruistic concerns to compensate the competitor who lost the competition. Our results provide helpful insights into the structure of incentives within institutions and companies, which is known to affect performance.

Keywords: Altruism, Competition, Reciprocity, Social Proximity, Trust
JEL: C9, D01, D6, D9

1. Introduction

In this paper, we ask a fundamental question about the relationship between competitive environments and social constructs. In many situations (e.g. workplace), coordination and cooperation among employees are shaped by the nature of competition and social interactions. We examine the impact of competitive environments on social preferences by systematically varying one's knowledge about two domains: the outcome of a competitive task and the extent of social proximity to the competitor.[1] Although the existing literature has studied each of these individually, understanding

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**Corresponding author

[1] In our context, we approximate the proximity between participants through overlapping personal preferences along various social domains. Common preferences or interests are often a first important step in creating a common identity and successful inter-personal matching (e.g., Hitsch et al., 2010; Dimant, 2019), which serves our purpose.

how and why the interaction of the two plays out helps to inform the design of collaborative and competitive environments in furtherance of innovation, cooperation, performance, and satisfaction of employees (e.g., Loch et al., 2000; Fischbacher et al., 2009; Duffy and Kornienko, 2010).

Competition is ubiquitous, and social preferences are fragile. Both are shaped by economic incentives and the social environment in which one interacts (Henrich et al., 2001; Charness and Rabin, 2002; Bowles and Polania-Reyes, 2012). People compete for promotions, companies compete for market share, and market competition affects the efficiency at which resources are allocated. We compete with friends and foes alike and are wary of potential spillovers, particularly in environments with repeated interaction. Previous work has studied such spillovers and found that, for example, competition affects ethical misconduct (Shleifer, 2004; Feltovich, 2019), charitable giving (Duffy and Kornienko, 2010), trust (Huck et al., 2012), and cooperation (Buser and Dreber, 2015). Existing literature has also examined substantial gender heterogeneity with respect to competitiveness and its impact on performance, both in the field and in the laboratory (e.g., Niederle and Vesterlund, 2007; Houser and Schunk, 2009; Exley and Kessler, 2019, but see also Apicella et al., 2017). Other research has identified social proximity and identity as the key drivers affecting the extent of altruism, cooperativeness, as well as compliance with and effectiveness of social norms (Bohnet and Frey, 1999; Charness et al., 2007; Charness and Gneezy, 2008; Chen and Li, 2009; Binzel and Fehr, 2013; Bicchieri et al., 2019a; Bolton et al., 2019; Dimant, 2019; Jiang and Li, 2019).

Based on this literature, competitiveness and social proximity have largely been studied in isolation. One recent exception to this is Cornaglia et al. (2019) who study how individuals' *willingness* to compete with each other is driven by group proximity. We pursue a complementary approach in this paper and introduce knowledge about intra-group proximity *after* competition has taken place to study how this – combined with the outcome of the competition – affects *subsequent decision-making*. With this in mind, our principal contribution is to connect these streams of research and place them in the context of a novel experimental design that accounts for potential endogeneity, self-selection, and reflection problems, which often posit challenges to the study of peer effects (see discussions by Manski, 1993, 2000; Angrist, 2014).

We extend the existing literature by examining the compound spillover effects of competition and social proximity on a battery of social preferences, including altruism, trust, and reciprocity. We design a series of experiments that capture the essential elements: a competitive environment in which the winner receives a monetary prize, followed by standard versions of either the Trust Game or Dictator Game to capture social preferences. In light of the literature above, we focus on the role that proximity between competitors plays in affecting subsequent behavior.

In our analysis, we estimate different hurdle models following Cragg (1971) and Engel and Moffatt (2014) to capture the structure of decisions in our experiment. Our results suggest that learning that one won the competition leads to *increased* giving and *decreased* reciprocity in the Trust Game. Because the former result can be explained by two very different mechanisms – either because the winner is altruistic and wants to equalize payoffs or because the winner is now greedier and takes a risk to increase the overall size of the pie in expectation of receiving more in return

– we subsequently ran the same treatments within the context of a Dictator Game. We observe behavior in those treatments that is consistent with the greed explanation. Generally speaking, we find that knowledge about proximity between competitors accentuates behavior, particularly when the competition was won.

Our paper proceeds as follows: we present the experimental design in Section 2, derive testable hypotheses in Section 3, discuss the results in Section 4, and conclude in Section 5.

2. Experimental Design

In order to study our research question, we use both a Trust Game and a Dictator Game. The former allows us to examine the impact of competitive outcomes on trust and trustworthiness in a strategic environment, and the latter gives us the ability to disentangle the different mechanisms at play for the first mover in a Trust Game. We will return to these aspects in the hypotheses discussion (Section 3).

An important aspect of our experimental design is the tight control for potential reflection problems as laid out by (Manski, 1993). It was found that the simultaneous provision of relevant information (e.g., outcome of competition) to the involved parties can trigger strategic considerations such that peers simultaneously affect and are affected by their peers, which would ultimately challenge the inferences that one can obtain from observing peers (Manski, 2000; Angrist, 2014). To this end, we introduce a design that carefully limits the provision of any relevant information (with respect to either competition, proximity, or both) to one participant within a pair at random. This mechanism is disclosed exclusively to the participant who receives the information, while the other participant, who did not receive any such information, remains unaware of this mechanism.

Our experiment follows the same three-step procedure across all treatment variations:

1. Measure social proximity
2. Competitive task
3. Observation of behavior: Dictator Game (DG) or Trust Game (TG)

1. Measure. As adopted by Dimant (2019), participants answer a selection of 25 binary personality questions taken from a major American dating website. To classify pairs of subjects as being either "high" or "low" proximity to each other, we first asked the same personality questionnaire to 179 mTurk participants. In the actual experiment, a pair of subjects was shown to have high proximity if their similarity score was above the average in the reference sample (approximately 17 questions in common), and "unknown" proximity otherwise.

2. Competition. Participants compete in pairs against each other for 90 seconds to win a prize using the real-effort task from DellaVigna and Pope (2017). Subjects alternately press two buttons on their keyboards and the participant with the highest number of hits wins.[2]

[2]In line with our expectations, we do not observe any significant gender differences in task performance in that males and females learn about winning / losing the competition at statistically indistinguishable rates.

3. Behavior. Depending on the treatment, participants play a standard version of either the DG or TG once. Participants in the first-mover (investor) role in the TG or the dictator role in the DG received an initial endowment of $E = 10$ ECU (Experimental Currency Units), which were paid at an exchange rate of 1 ECU = \$0.125.

- In the TG, participants are randomly assigned to the role of either the investor or the trustee. The investor can send any integer amount $x_i \in [0, E]$, which is then tripled and sent to the trustee. The trustee can return any integer amount $x_j \in [0, 3E]$ back to the investor. We implemented the strategy method for the trustee to obtain the trustee's complete strategy.
- In the DG, the dictator is endowed with the same amount E as the investor in the TG, while the receiver starts with an endowment of 0. The dictator can send any integer amount $x_i \in [0, E]$. In our version of the game, both participants play the role of the dictator. After both decisions are made, participants are randomly and equally likely allocated to either role and are paid accordingly. This procedure was common knowledge ahead of time.

We implemented a 2×2 between-subjects design with one dimension varying proximity feedback as {Unknown Proximity, High Proximity} and the other varying competition feedback as {Won Competition, Lost Competition}. In addition, we ran a Baseline condition in which participants did not receive feedback about proximity or the outcome of the competition. Subjects were randomly assigned to a treatment after the competitive task was completed but before the TG or DG was played. An important feature of the design is the purposeful implementation of information asymmetry within each pair of participants: exactly one randomly selected participant from each pair received the respective treatment information concerning the outcome of the competition and/or proximity, whereas neither piece of information was given to the other participants.[3]

3. Hypotheses and Questions

3.1. Dictator Game

Giving in the dictator game is commonly viewed as an act of altruism, which could plausibly be impacted by our experimental manipulations. We conjecture that dictators will give more after receiving feedback that they score highly in terms of social proximity (Hoffman et al., 1996; Bohnet and Frey, 1999; Henrich et al., 2010; Dimant, 2019). That is, the closeness generated by high social proximity should activate altruism more strongly compared to when it is unknown.

Hypothesis 1 (Dictator Game: Proximity Feedback): *Dictators give the most when interacting with a high proximity peer.*

[3]While this design choice forced us to collect more data, it was needed in order to reduce confounds and allow us to study the impact of the information on behavior in the most precise way possible. Having instead allowed both participants to observe the same pieces of information simultaneously might have reasonably introduced noise (e.g., in form of higher-order beliefs) in the interactive setting of our Trust Game (Manski, 1993, 2000; Angrist, 2014).

The existing literature points out that competition can adversely affect altruism (Duffy and Kornienko, 2010). We believe that there are potentially two opposing channels that may influence dictator giving. On one hand, knowledge about winning the competition may trigger a perceived "entitlement" to keep more of the money, since losing in our setting is upsetting both morally and monetarily. This is partially related to the experiments of Hoffman et al. (1994) in which subjects who competed (and won) the right to be the dictator gave less (see also Hoffman and Spitzer 1985). Conversely, knowledge about winning the competition may trigger a 'warm glow,' or the desire to equalize payoffs across the two parts of the experiment, which leads to increased giving. Our experiment examines the direction of the effect.

Empirical Question 1 (Dictator Game: Competition Feedback): *How does knowledge of the outcome of an unrelated competitive task affect dictator giving?*

3.2. Trust Game

Introducing the TG enriches our analysis with the possibility to study reciprocity and strategic altruism. Following the existing literature, we expect social proximity to be positively linked to the extent of trust and reciprocity (Kosfeld et al., 2005; Charness et al., 2007; Binzel and Fehr, 2013).

Hypothesis 2 (Investors and Trustees in Trust Game: Proximity Feedback): *Investors give (trustees return) the most when interacting with a high proximity peer.*

As was the case for the DG, the impact of competition feedback is unclear. For example, suppose that the mechanism is that the winner of the competition "deserves" more and that the investor won the competition. In this case, we can predict two behavioral responses depending on whether only the investor or only the trustee observes the outcome. For the trustees, this would imply that learning that one lost (won) the competition should lead to bigger (smaller) amounts returned. For the investor, "deservingness" comes in two forms: learning that one won (lost) the competition could manifest either in keeping more (less) money to begin with and sending less (more) to the trustee, or if one believes that trust pays the investor would send the maximum amount in expectation of receiving a larger return. Alternatively, if the mechanism is one of a 'warm glow,' then winners should give more. A similar reasoning applies to the trustees, in line with the predictions in the Dictator Game. The lack of a clear prediction yields a second testable empirical question.

Empirical Question 2 (Investors and Trustees in Trust Game: Competition Feedback): *How does knowledge of the outcome of an unrelated competitive task affect behavior?*

4. Results

We collected data from a total of 1508 participants[4] on Amazon Mechanical Turk (mTurk) across several conditions. Each participant was randomly allocated to only one condition. The

[4]Our sample-size was guided, in part, by existing meta-studies on the trust games (Johnson and Mislin, 2011) and dictator games (Engel, 2011) to achieve suitable power at the conventional levels. Details are available upon request.

pool consisted of approximately 42.5% females and were, on average, approximately 34.5 years old.[5] An average session lasted about 15 minutes and yielded an hourly income of around $5.46 for the trust game and $4.24 for the dictator game including a $0.50 show up fee, which is well above typical payments for economic experiments on mTurk (Hara et al., 2018). Table 1 contains sample size information for all treatments/conditions of our experiment.[6]

Table 1: Number of Subjects In Each Treatment

(a) Dictator Game

	No Comp. FB	Won Comp. FB	Lost Comp.
High Prox.		107	110
Unknown Proximity	68	81	81

(b) Investors in Trust Game

	No Comp. FB	Won Comp. FB	Lost Comp.
High Prox.		89	100
Unknown Proximity	191†	64	80

(c) Trustees in Trust Game

	No Comp. FB	Won Comp. FB	Lost Comp.
High Prox.		44	59
Unknown Proximity	337†	45	41

Note: Prox. = Proximity; Comp = Competition; and FB = Feedback.
† For the subjects in these cells, we did not give them either competition or proximity feedback; rather, in these cases, their matched subject in the other role would be in one of the four main feedback conditions.

4.1. Trust Game (First Movers)

In a first step, we examine the behavior of participants in the Trust Game. In addition to altruism, reciprocity may play a role in the amount given by the investor, which can be influenced by the received feedback. Table 2 summarizes the average amounts sent by first movers. As can be seen, the investments in the treatment in which feedback about winning the competition and receiving the high proximity feedback are combined stand out.

This is supported by the finding presented in Figure 1, which shows that winning shifts the whole cumulative distribution to the right.

[5]mTurk is well-suited for our purposes in that it ensures complete anonymity of subjects and thereby reduces the risk of subjects behaving in a "socially desirable" way or other potential experimenter demand effects. At the same time, we were able to operationalize simultaneous play by using the experimental software platform SoPHIE. With this setup, we expect to induce lower-bound interventions – that is, outside the lab, we might expect social proximity to be more salient and, therefore, generate larger effects. To ensure data quality, participants had to be in the U.S., possess an approval rating greater than 95% on mTurk, and could only participate in the study once.

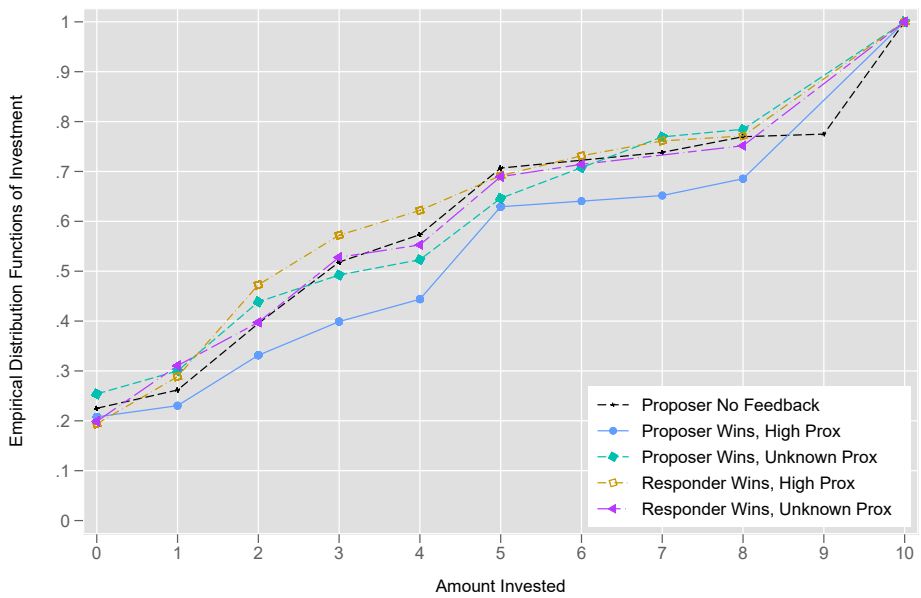
[6]In addition to the treatment variables and measures of performance, in some estimations, we also include: *Age*: The subject's self-reported age. *Risk Willingness*: The subject's self-reported willingness to take risk. The question was taken from Dohmen et al. (2011). *Male*: A 0/1 indicator is the subject self-identified as a male.

Table 2: Trust Game: Average Amount Sent by First Movers

	No Comp. FB	Won Comp. FB	Lost Comp.
High Prox.		5.124	4.140
		(3.88)	(3.72)
Unknown Prox	4.314	4.344	4.400
	(3.69)	(3.77)	(3.81)

In light of Empirical Question 2 above, we find that proximity amplifies the effect of winning or losing the competition; we observe a significant rightward shift of the distribution in "Proposer Wins, High Prox" compared to "Responder Wins, High Prox" (Epps-Singleton test p-value = 0.0422). With unknown proximity, the difference in giving when the investor or trustee won the competition is insignificant (Epps-Singleton test p-value = 0.6597).

Figure 1: Cumulative Distribution Function: Trustor Contributions (By Winning Status and Proximity)



Next, we turn to our regression analysis. Given the two-step nature of a participant's decision process (step 1: whether to give at all; step 2: how much to give), we follow Krupka and Croson (2016) and employ a hurdle-model to capture the behavior across treatments.[7] Within the table, *Selection (Pos)* corresponds to the step 1 probit estimation producing the treatment effect of making a non-zero contribution, while *Interior* corresponds to the extent of giving. Our findings in Table 3 consistently suggest that – compared to a baseline in which neither proximity between participants

[7]Hurdle models overcome key limitations of alternative empirical approaches because they divide the decision-process into two separate steps and estimates them accordingly (Cameron and Trivedi, 2010; Wooldridge, 2010). We use the approach by Cragg (1971) in which a probit model estimates the participation decision (step 1) and subsequently a truncated normal regression estimates the conditional behavior (step 2).

nor the outcome of the competition are known to the proposer – conditional on investing a non-zero amount a proposer invests significantly *more* when high proximity is paired with her *winning* the competition (upper part of Table 3). Conversely, neither proximity nor the knowledge about the competition outcome affect the investor's likelihood to invest any differently than when no information was provided to the investor (lower part of Table 3). Other noteworthy results include that males – compared to females – are much *less* likely to send a non-zero amount, but, conditional on sending a non-zero amount, they then invest a substantially *larger* amount. In addition, higher risk willingness predicts higher likelihood of sending a non-zero amount, which intuitively makes sense since sending any amount in a Trust Game is a risky endeavour.

Table 3: Hurdle Model For Trust Game: First Movers (Lower Selection Only)

Interior	(1)		(2)	
Proposer Wins, High Prox	1.190*	[0.679]	1.822**	[0.757]
Proposer Wins, Unknown Prox	0.326	[0.800]	1.032	[0.833]
Responder Wins, High Prox	−0.702	[0.693]	−0.070	[0.747]
Responder Wins, Unknown Prox	−0.101	[0.732]	0.815	[0.787]
Absolute Difference in Competitive Task Scores†			−0.388*	[0.199]
Age			0.031	[0.021]
Risk			0.038	[0.096]
Male			2.079***	[0.491]
Constant	4.632***	[0.449]	2.333**	[1.096]
Selection				
Proposer Wins, High Prox	0.079	[0.182]	−0.025	[0.219]
Proposer Wins, Unknown Prox	−0.080	[0.198]	−0.145	[0.230]
Responder Wins, High Prox	0.123	[0.176]	−0.031	[0.209]
Responder Wins, Unknown Prox	0.087	[0.189]	−0.072	[0.226]
Absolute Difference in Competitive Task Scores†			0.055	[0.059]
Age			0.006	[0.006]
Risk			0.120***	[0.026]
Male			−0.431***	[0.141]
Constant	0.755***	[0.101]	0.268	[0.295]
Observations	524		517	

† In instances with no competition feedback, this variable is coded as 0, regardless of the true scores.

It is important to note that while these results suggest that competition does affect giving, with winning yielding a positive effect on amounts invested, they do not yet allow us to distinguish between the underlying motives: do winners invest more because of warm glow, or because winning the competition made them feel deserving of more? We will return to this question in Section 4.4 and use the Dictator Game setting to eliminate the strategic component of reciprocity and thus eliminate the latter channel.

4.2. Trust Game (Second Movers)

We now examine the behavior of the second movers in our TG. These subjects are effectively dictators. However, the difference is that rather than having an exogenous amount of money to allocate, their endowment was determined by the amount sent by the first-mover. Recall that we employed the strategy method for second-movers. Therefore, we have the amount that they *would*

return for every possible amount sent by first-movers. We estimate a panel double-hurdle regression model as introduced by Engel and Moffatt (2014) that respects the panel structure of our data – i.e., for each subject, we have one observation for each possible investment. In this case, subjects who do not pass the hurdle are those that *never* return money regardless of the amount sent by the first-mover. We can view these players as payoff-maximizers based on selfish preferences.

Table 4: Hurdle Model For Trust Game: Second Movers

Above Hurdle	(1)		(2)	
Investment	1.246***	[0.019]	1.242***	[0.019]
Responder Wins, High Prox (RWHP)	−0.344	[0.695]	−0.470	[0.669]
RWHP×Investment	−0.273***	[0.057]	−0.269***	[0.057]
Responder Wins, Unknown Prox (RWUP)	−2.504***	[0.684]	−2.295***	[0.761]
RWUP×Investment	0.408***	[0.060]	0.409***	[0.059]
Proposer Wins, High Prox (PWHP)	−0.856	[0.560]	−0.867	[0.677]
PWHP×Investment	−0.026	[0.048]	−0.025	[0.048]
Proposer Wins, Unknown Prox (PWUP)	−0.276	[0.669]	−0.464	[0.763]
PWUP×Investment	0.072	[0.055]	0.076	[0.055]
Absolute Difference in Competitive Task Scores†			0.000	[0.001]
Age			0.021	[0.023]
Risk			0.083	[0.069]
Male			0.907**	[0.384]
Constant	−0.305	[0.233]	−2.078**	[1.005]
Selection				
Responder Wins, High Prox	−0.022	[0.215]	−0.050	[0.234]
Responder Wins, Unknown Prox	−0.081	[0.197]	−0.174	[0.241]
Proposer Wins, High Prox	0.197	[0.197]	0.162	[0.234]
Proposer Wins, Unknown Prox	0.294	[0.244]	0.261	[0.277]
Absolute Difference in Competitive Task Scores†			0.000	[0.001]
Age			0.011	[0.007]
Risk			−0.005	[0.024]
Male			−0.234*	[0.132]
Constant	0.771***	[0.073]	0.570**	[0.290]
Observations	5270		5210	

† In instances with no competition feedback, this variable is coded as 0, regardless of the true scores.

Table 4 contains the estimation results. First, observe that the feedback variables – either competition or proximity – do not appear to affect selection, indicating that about 20% of the subjects are payoff maximizers based on selfish preferences. However, once subjects pass the hurdle and are "potential givers," the treatment variables play an important role. First, observe that for potential givers, in the absence of feedback, the coefficient on "Investment" is greater than 1, which indicates that, on average, this group of second movers returns more than investors send. Now consider how feedback affects this. First, observe that *any* type of feedback appears to reduce the amount returned, but it is only when the second-mover knows that she won the competition that the differences become significant. Interestingly, the response is different depending on whether there is a known high proximity between the first and second-movers or an unknown proximity. In the former case, second movers become less reciprocal – that is, the coefficient on the investment interaction term is significantly negative. In the latter case, the coefficient on the interaction is

actually significantly positive, indicating that unknown proximity makes winning second-movers more reciprocal. However, there is a large (2.5 ECU) drop in the intercept, indicating a wholesale reduction in the amount returned. Similar to first-movers, men are less likely to give anything but, conditional on giving, they tend to give more.

4.3. Does Trust Pay?

Another way of looking at the behavior in our experiment is to examine whether trust pays based on the impact that competition and proximity have on subsequent trusting behavior. As our analysis above has shown, regardless of feedback, about 20% of second-movers *never* send any money back to first-movers. This is already a significant hurdle for trust to pay-off. However, it also turns out that the likelihood of returning a positive amount depends on the amount sent by first-movers, and that this does appear to respond to feedback.

Figure 2: Frequency of Returning a Positive Amount

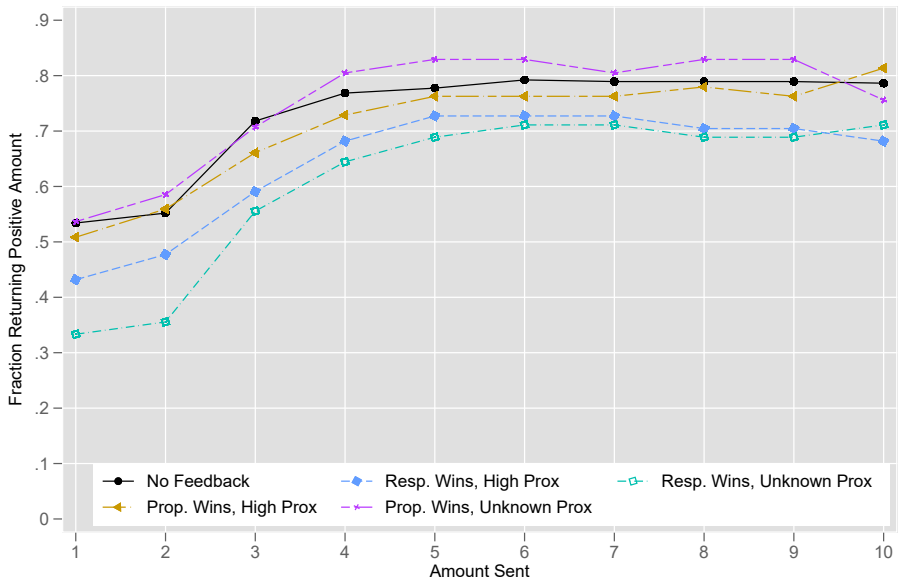


Figure 2 plots the average frequency that subjects return a positive amount given each possible amount sent by first-movers. As can be seen, for the first 4ECU sent, the likelihood of returning something is increasing – starting at between 30 and 50% and increasing to between 65 and 80% – before flattening off for amounts sent of 5ECU and above. The results of a random effects probit estimation on giving a positive amount on feedback variables and the amount sent, are largely consistent with Table 4 and indicate that feedback matters – particularly knowledge that one won.

Since the average amount sent by first movers was approximately 4, this figure suggests that first movers face a substantially higher likelihood of not receiving anything in return, further reducing the chance that trust will pay. Although insignificant at the conventional levels, the results presented in Table 5 indicate directionally that irrespective of the competitive outcome, known high proximity leads to trust paying off more often. Collapsing behavior across winning outcomes yields

a significant effect of proximity at the 10% level ($\tilde{\chi}^2(1) = 3.4799$, p = 0.062).[8] By and large, we obtain the sobering result that trust does not seem to pay in competitive environments, which is an insightful addition to the existing economic literature on trust and trustworthiness (e.g., Johnson and Mislin, 2011; Falk et al., 2018; Bicchieri et al., 2019b).[9]

Table 5: Trust Game: Frequency With Which Trust Pays For First-Mover

	No Comp. FB	Investor Won Comp. FB	Investor Lost Comp. FB
High Prox.		31.46	27.00
Unknown Prox.	23.83	20.31	20.00

4.4. Dictator Game

Next, we turn to behavior in the Dictator Game. One of the advantages of this approach is the ability to tease apart the underlying behavioral mechanisms. As discussed above, while rich in its implications, the strategic nature of the Trust Game does not allow us to distinguish between greed and pure altruism. We achieve this by capitalizing on the non-strategic nature of the Dictator Game. Consistent with our previous analysis, our dependent variable is the transferred amount conditional on outcomes of competition and the observed social proximity with the recipient.

First, as indicated in Figure 3 we observe very little difference in mean behavior, both in terms of the role that social proximity plays[10] and the outcome of the competition.[11] The only exception is that, relative to the baseline, learning about winning the competition yields a significant *decrease* in average giving at the 10% level, which is consistent with the greed interpretation.[12] Overall, even with competition and social proximity in place, these results are in line with what is typically observed in Dictator Games (see the meta-analysis by Engel, 2011).

[8] Regression estimates confirm this result and are available upon request.

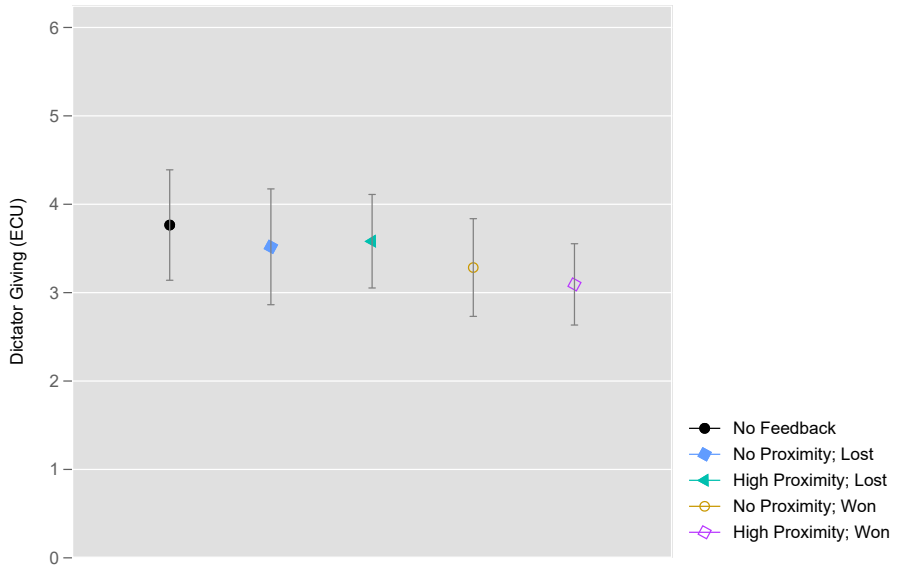
[9] From the perspective of the trustee, Figures A.1 and A.2 provide similar insights for the amount returned overall as a fraction of the amount received. The former figure is the overall average, while the latter is conditional on returning a positive amount. As can be seen, on average trustees do not make trust pay for investors. This is especially the case when the second-mover knows that she won and that she is matched with a high-proximity first-mover. Note that this is a subtly different result than for first-movers. There, high proximity increased the likelihood of trust paying but also induced a difference depending on the outcome of the competition. In contrast, for trustees, high proximity substantially lowers the chance that they will repay trust.

[10] Epps-Singleton test $p-$values: 0.53, 0.92 and 0.79, respectively.

[11] A $t-$test has $p-$value: 0.60.

[12] A $t-$test has $p-$value: 0.098.

Figure 3: Average Dictator Giving (ECU) Across Conditions



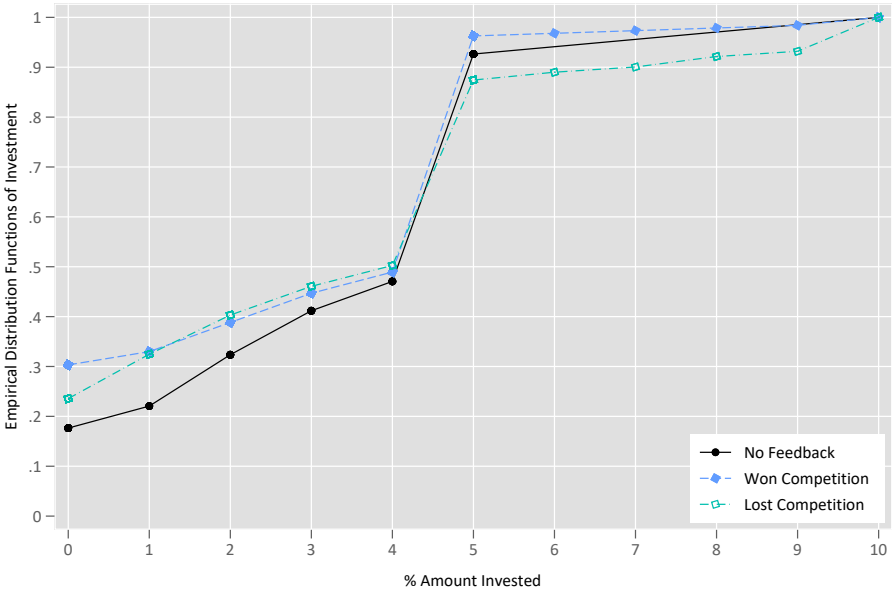
Importantly, however, these simple average comparisons mask the important effect that competitive outcomes have on the *distribution* of behavior across treatments.[13] In particular, distribution tests show that there are significant differences between knowingly winning, knowingly losing and not receiving any feedback, as displayed in Figure 4. As can be seen, giving feedback increases the likelihood of giving nothing, especially for subjects who learn that they won. In all cases, giving exactly half of the available money is the modal response, but this is lowest for dictators who lose the competition.[14] The other notable difference is that while a non-negligible fraction of subjects actually send all 10 ECU with no feedback or learning that they lost, very few subjects who won the competition send all 10 ECU. Overall, the distributions of behavior are highly statistically different from each other.[15] In conjunction with the TG results, these insights confirm the intuition that succeeding in a competitive environment triggers greed.

[13]As was the case in the Trust Game, competitive outcomes dominate behavior compared to social proximity indicators. We provide a more detailed breakdown in Figure A.3.

[14]Note that if a dictator who won the competition sends 5, then she still comes out ahead if we think of overall expected earnings - noting that the competitive task is paid 50% of the time and the dictator game is paid 50% of the time.

[15]For the comparisons Won/Lost, Won/No Feedback, Lost/No Feedback, the $p-$values of the Epps-Singleton tests are, respectively, < 0.01, 0.03 and 0.01.

Figure 4: Cumulative Distribution Function: Dictator Contributions (By Winning Status)



To tie these mean and distribution comparisons together, Table 6 reports the results of a hurdle model on the amount given by dictators. Conditional on giving, there is no effect of either competition or proximity feedback. However, feedback does significantly affect selection into giving. In particular, *any* feedback makes dictators less likely to give. The effect is most pronounced for dictators who know that they won the competition and are paired with a high-proximity peer. As before, high proximity appears to amplify the effect of competition feedback as the difference between winning and losing is larger with known high proximity than with unknown proximity. From this we conclude that the positive and significant relationship between winning the competition and investing more money in the Trust Game is not driven by purely altruistic concerns – since this would also have to show up in our Dictator Game setting – but is more likely driven by the belief that they deserve more money.

Table 6: Hurdle Model For Dictator Game (Lower Selection Only)

Interior	(1)		(2)	
Dictator Lost, Unknown Prox	0.361	[0.558]	0.314	[0.551]
Dictator Lost, High Prox	−0.126	[0.531]	−0.277	[0.534]
Dictator Won, Unknown Prox	0.138	[0.560]	0.086	[0.580]
Dictator Won, High Prox	−0.287	[0.566]	−0.316	[0.568]
Absolute Difference in Competitive Task Scores†			−0.000	[0.001]
Age			0.018	[0.017]
Risk			0.115	[0.075]
Male			0.450	[0.344]
Constant	4.633***	[0.402]	3.261***	[0.834]
Selection				
Dictator Lost, Unknown Prox	−0.526	[0.323]	−0.545*	[0.329]
Dictator Lost, High Prox	−0.458	[0.312]	−0.607*	[0.322]
Dictator Won, Unknown Prox	−0.526	[0.323]	−0.644*	[0.337]
Dictator Won, High Prox	−0.818***	[0.309]	−0.945***	[0.324]
Absolute Difference in Competitive Task Scores†			0.000	[0.000]
Age			0.012	[0.009]
Risk			0.093**	[0.037]
Male			−0.368**	[0.182]
Constant	1.119***	[0.257]	0.528	[0.454]
Observations	246		247	

† In instances with no competition feedback, this variable is coded as 0, regardless of the true scores.

5. Conclusion

Competitive interactions are ubiquitous and shape underlying social preferences. Because competitive environments are usually embedded within some kind of social structure, it is important to understand how the two interact. We contribute to the literature by studying the compound effect of competitive environments and social proximity among the involved parties on social preferences. For this, we systematically vary one's knowledge about the outcome of a competitive task and the social proximity to one's opponent.

Our results suggest that competitive environments, and in particular the outcomes thereof when people are matched with a socially proximate competitors, affect both the extensive and intensive margin of social preferences as measured in our experiments. In particular, we find that winning makes individuals *more* trusting, *less* reciprocal, and *less* altruistic and known proximity nuances the results. To decompose the underlying mechanism of first-mover behavior, we subsequently decompose these findings using the Dictator Game and find that knowledge about winning the competition *decreases* subsequent giving, especially as proximity between competitors increases. Thus, from this we can conclude that the observed increase in trust is guided by self-serving concerns to maximize one's own profit rather than altruistic concerns to compensate the competitor who lost the competition. From a practical viewpoint, our results can be informative for intra-organizational structures where competition-based incentives and trust relationships need to be balanced and are known to affect firm performance (Brown et al., 2015). For example, broadly publicizing ranking of workers in promotion contests or performance evaluations could undermine the work environment.

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Appendix

Appendix A. Supplemental Results

Figure A.1: Average Amount Returned (As a Fraction of Amount Received)

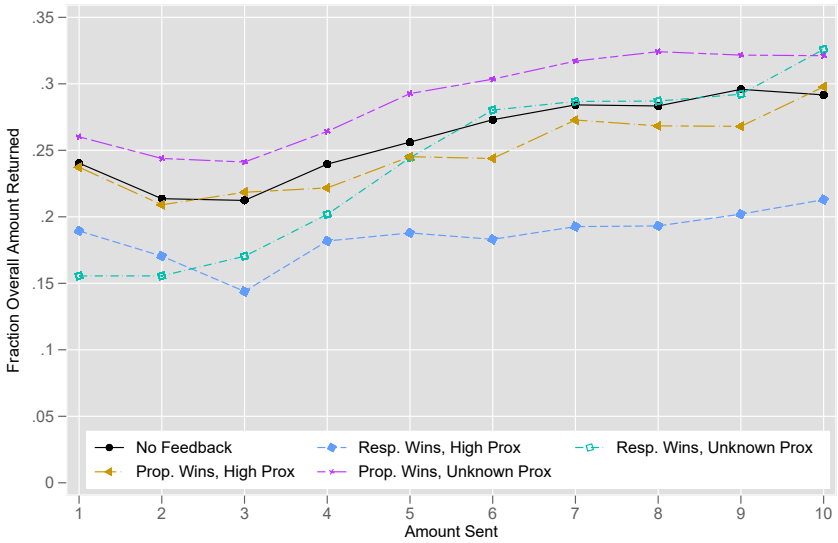


Figure A.2: Average Amount Returned (Fraction of Amount Received), Conditional on Returning a Positive Amount

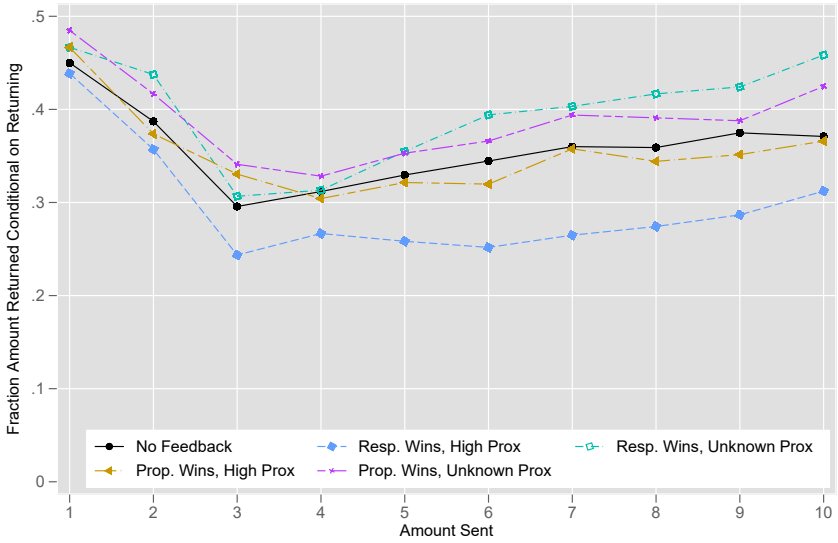
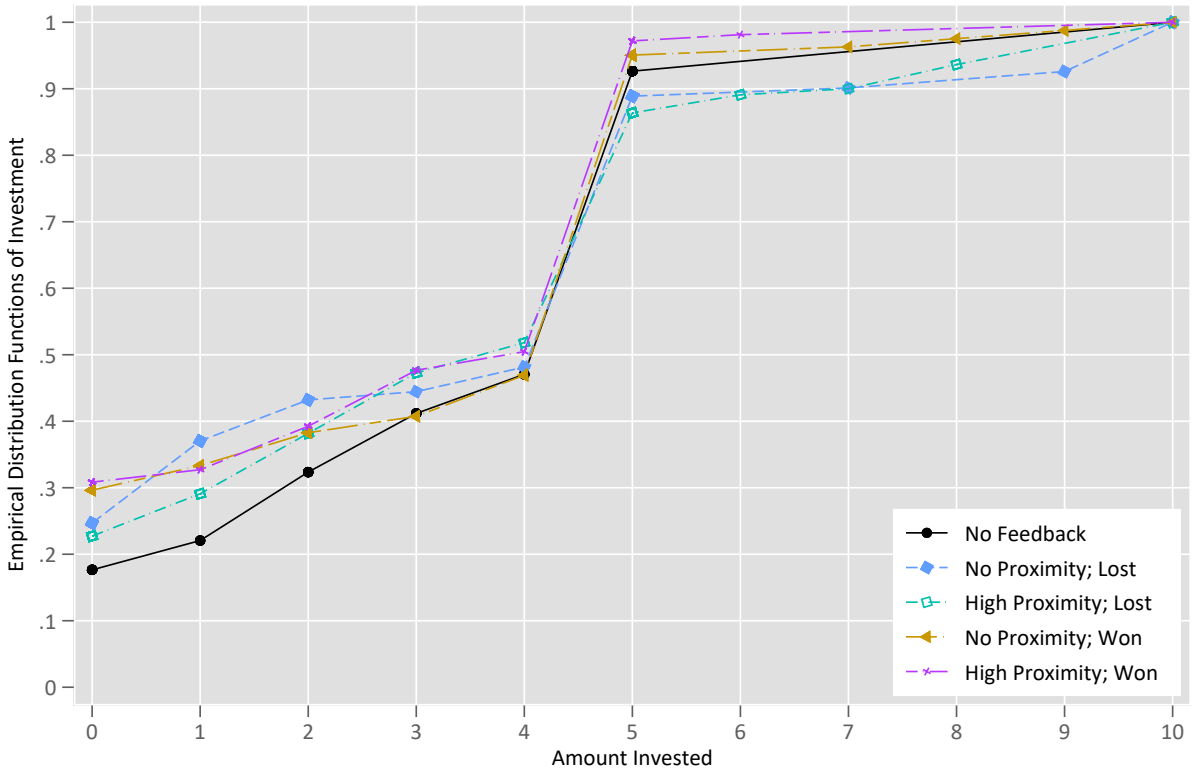
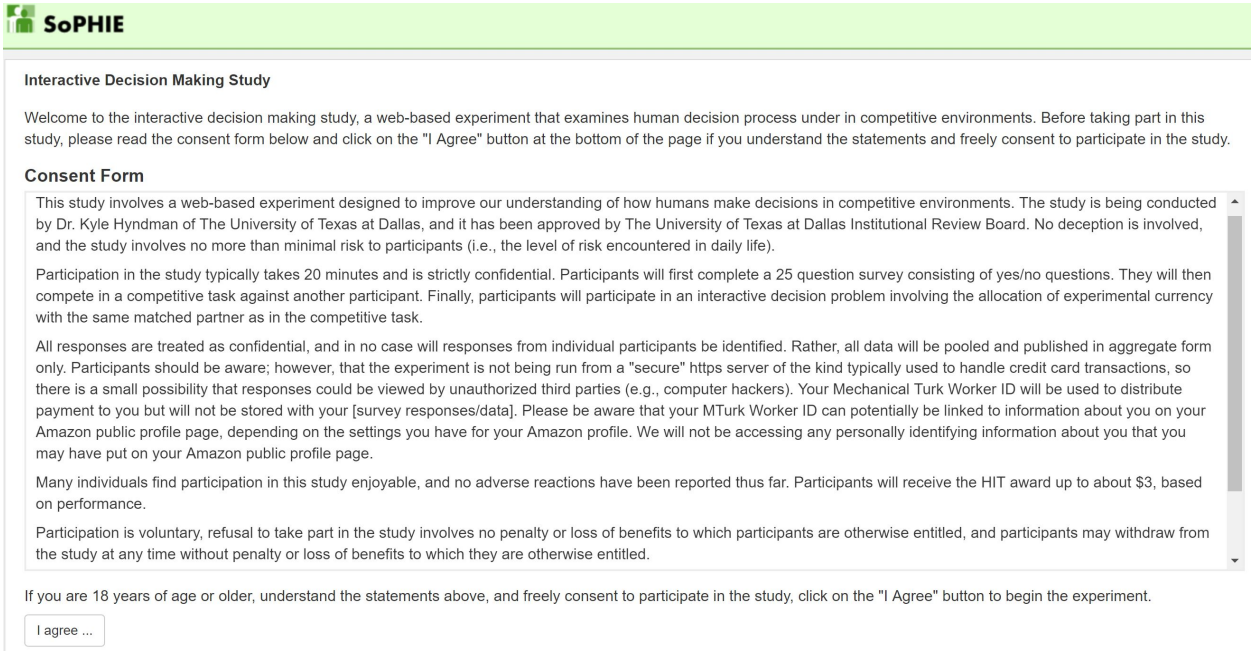


Figure A.3: Cumulative Distribution Function: Dictator Contributions (By Winning Status and Proximity)



Appendix B. Experimental Screenshots

Figure A.4: Consent form



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Interactive Decision Making Study

Welcome to the interactive decision making study, a web-based experiment that examines human decision process under in competitive environments. Before taking part in this study, please read the consent form below and click on the "I Agree" button at the bottom of the page if you understand the statements and freely consent to participate in the study.

Consent Form

This study involves a web-based experiment designed to improve our understanding of how humans make decisions in competitive environments. The study is being conducted by Dr. Kyle Hyndman of The University of Texas at Dallas, and it has been approved by The University of Texas at Dallas Institutional Review Board. No deception is involved, and the study involves no more than minimal risk to participants (i.e., the level of risk encountered in daily life).

Participation in the study typically takes 20 minutes and is strictly confidential. Participants will first complete a 25 question survey consisting of yes/no questions. They will then compete in a competitive task against another participant. Finally, participants will participate in an interactive decision problem involving the allocation of experimental currency with the same matched partner as in the competitive task.

All responses are treated as confidential, and in no case will responses from individual participants be identified. Rather, all data will be pooled and published in aggregate form only. Participants should be aware; however, that the experiment is not being run from a "secure" https server of the kind typically used to handle credit card transactions, so there is a small possibility that responses could be viewed by unauthorized third parties (e.g., computer hackers). Your Mechanical Turk Worker ID will be used to distribute payment to you but will not be stored with your [survey responses/data]. Please be aware that your MTurk Worker ID can potentially be linked to information about you on your Amazon public profile page, depending on the settings you have for your Amazon profile. We will not be accessing any personally identifying information about you that you may have put on your Amazon public profile page.

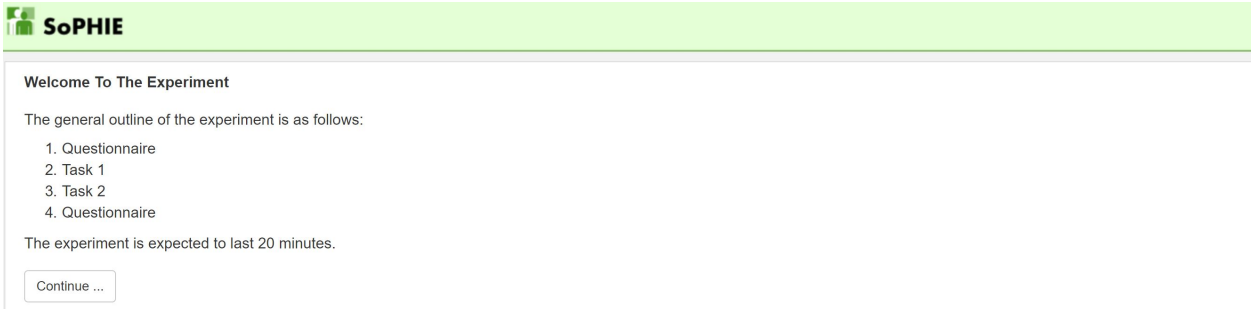
Many individuals find participation in this study enjoyable, and no adverse reactions have been reported thus far. Participants will receive the HIT award up to about $3, based on performance.

Participation is voluntary, refusal to take part in the study involves no penalty or loss of benefits to which participants are otherwise entitled, and participants may withdraw from the study at any time without penalty or loss of benefits to which they are otherwise entitled.

If you are 18 years of age or older, understand the statements above, and freely consent to participate in the study, click on the "I Agree" button to begin the experiment.

I agree ...

Figure A.5: Structure of the experiment



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Welcome To The Experiment

The general outline of the experiment is as follows:

1. Questionnaire
2. Task 1
3. Task 2
4. Questionnaire

The experiment is expected to last 20 minutes.

Continue ...

Figure A.6: Explanation of earnings

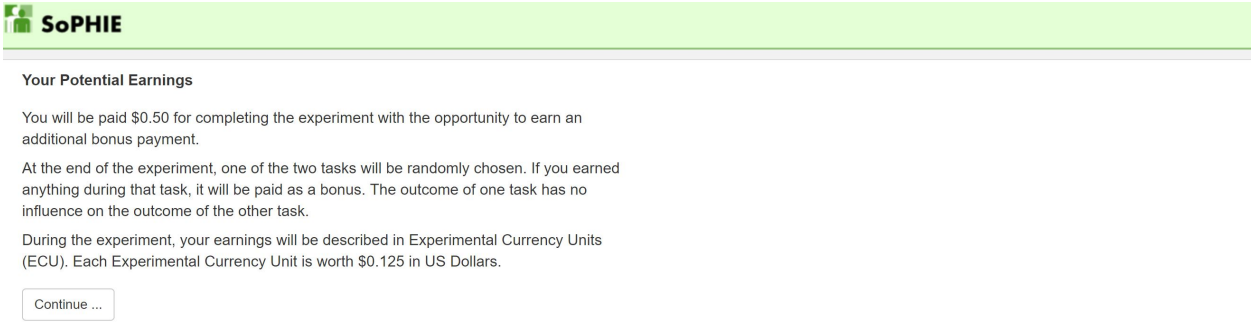

Figure A.7: Begin of the experiment

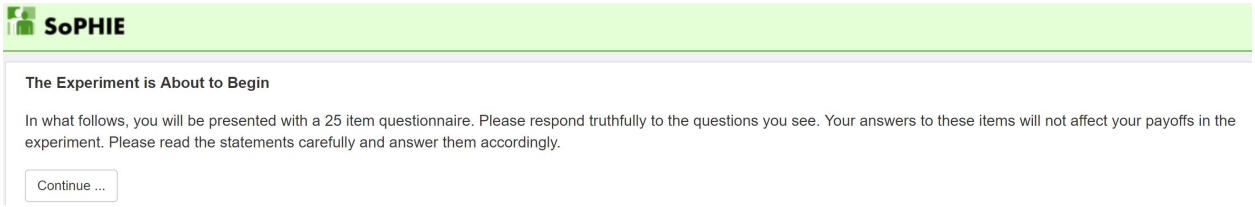

Figure A.8: Proximity questions (screen 1 out of 3)

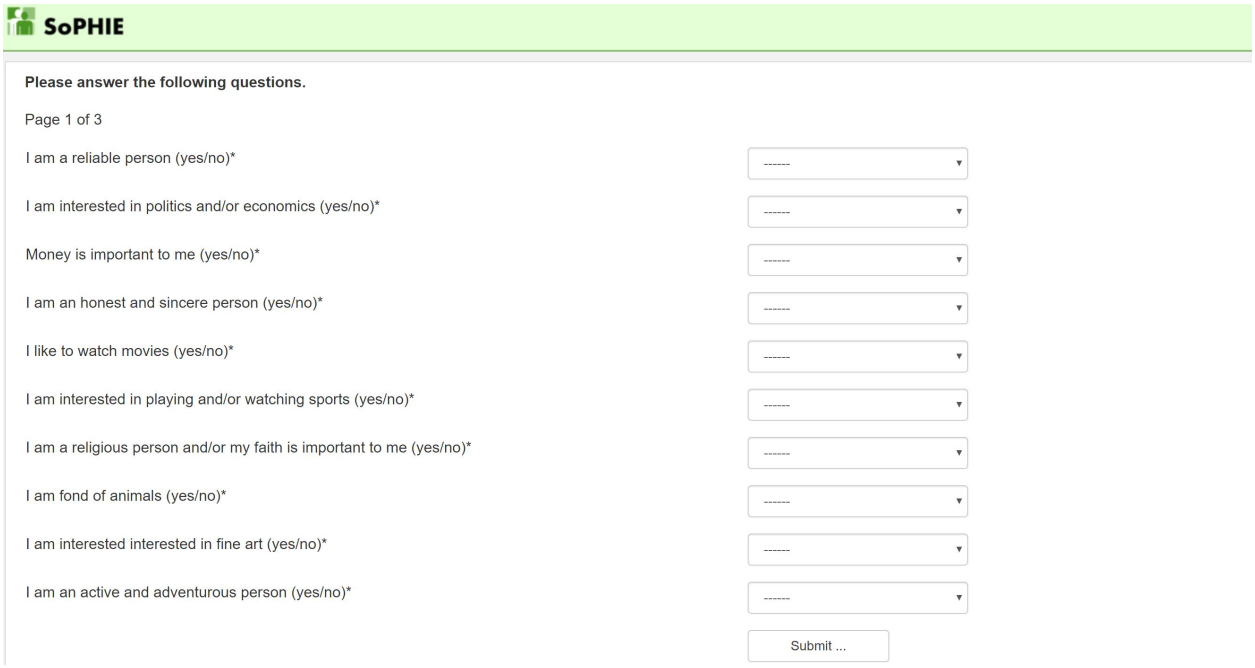

Figure A.9: Proximity questions (screen 2 out of 3)

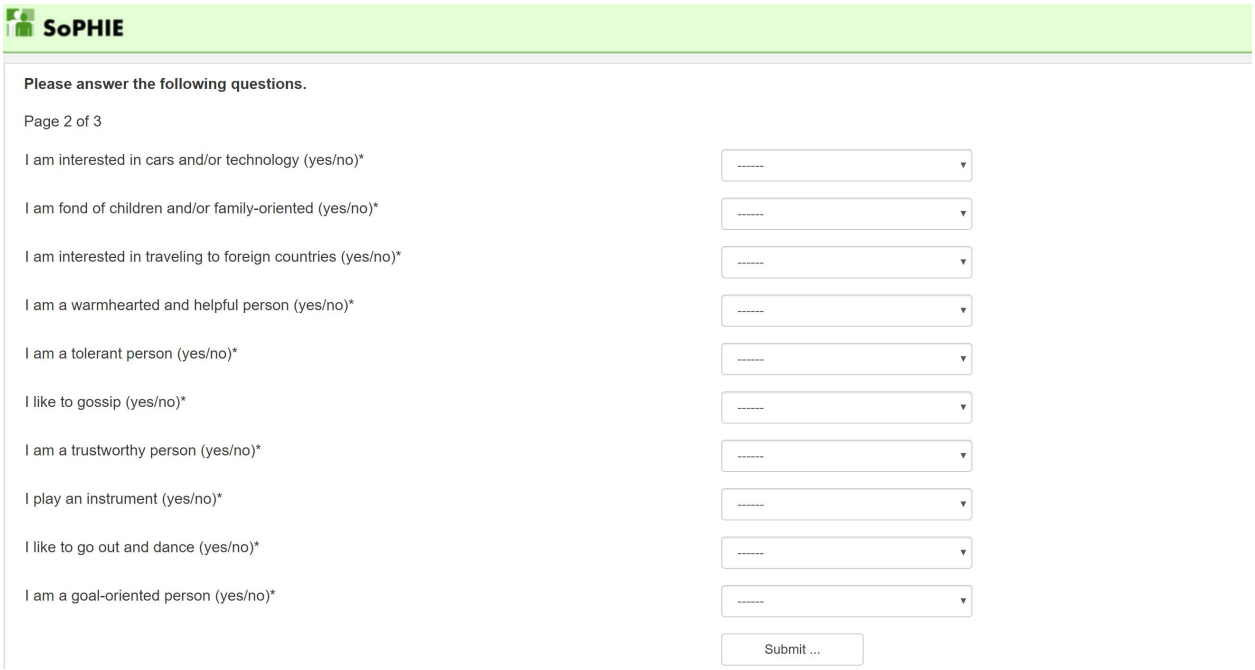

Figure A.10: Proximity questions (screen 3 out of 3)

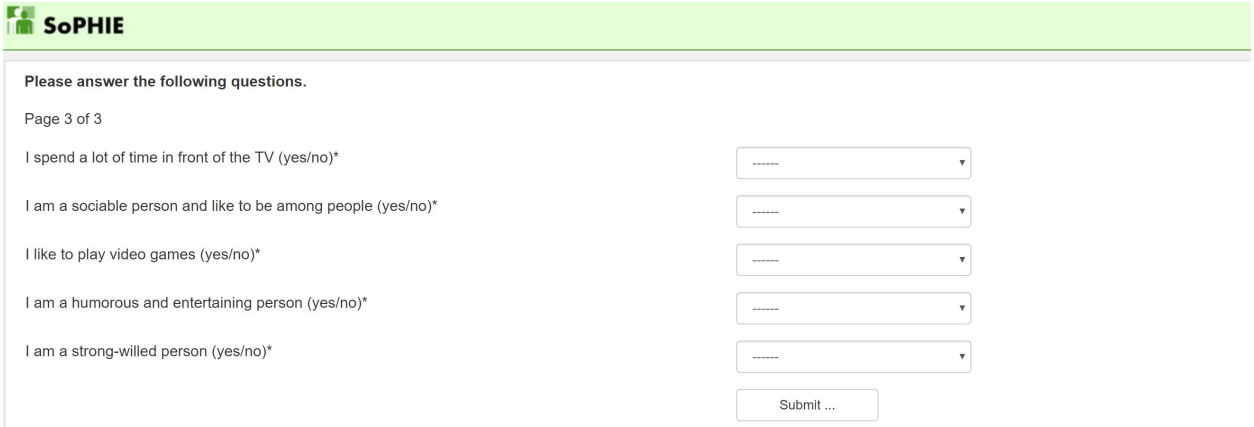

Figure A.11: Instructions for competition task

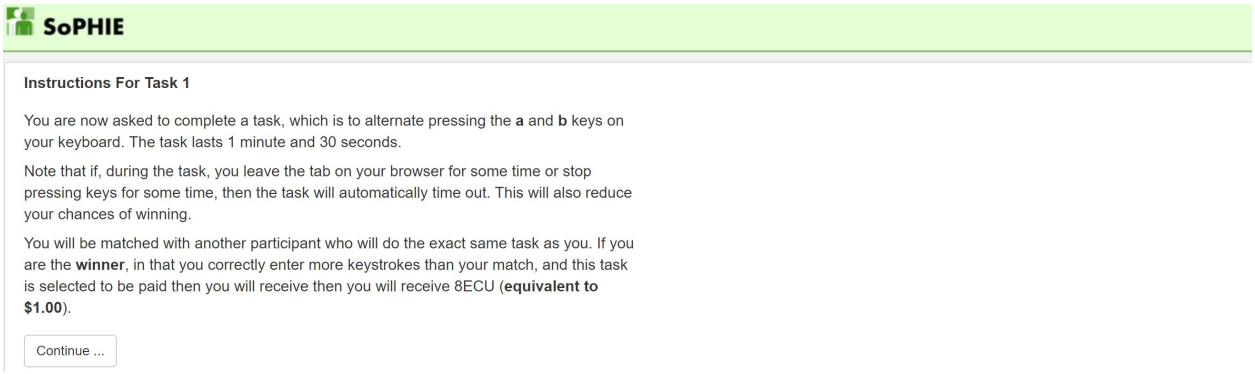

Figure A.12: Comprehension check

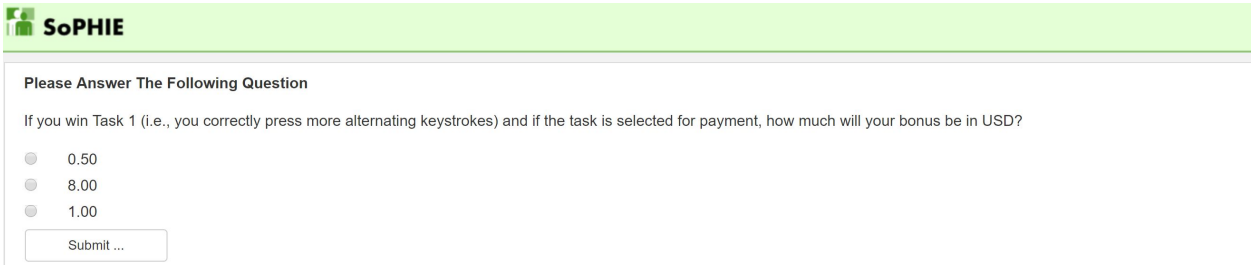

Figure A.13: Competition task

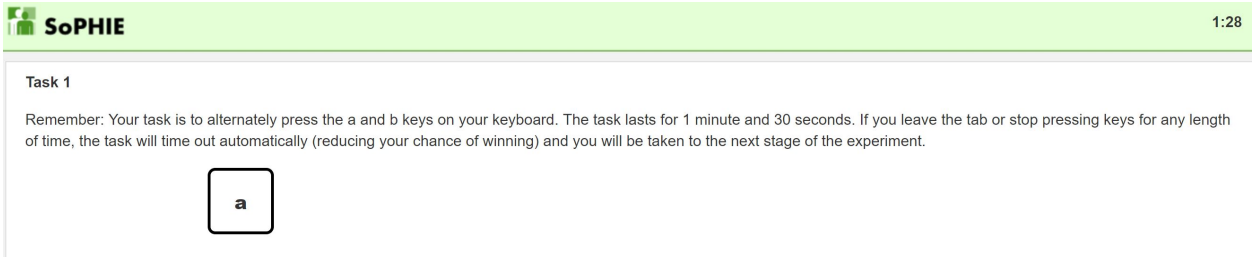

Figure A.14: Explanation of Trust Game

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Instructions For Task 2 (Interactive Game)

You are about to take place in an interactive game. You are matched with the **same person** that you competed against in Task 1.

In what follows, **you** are in the role of **Player 2** and your match is in the role of **Player 1**.

You have been given an initial endowment of **0ECU**, while your match has been given an initial endowment of **10ECU**.

Your match is asked to send any **whole number** of ECU (between 0 and 10) to you. Below we graphically illustrate the case in which your match sent **A** ECU to you.

For every **1ECU** that your match sends, you will receive **3ECU**.

Before observing the amount that your match (**Player 1**) actually sent to you, *for every possible amount sent by your match*, we ask you to state the number of ECU that you would like to send back. Each response must be a **whole number** between 0ECU and 3 times the amount received.

As soon as your match (**Player 1**) has made his/her decision, the software will automatically send back the amount you stated for the choice made by your match. *Because you do not know the amount that your match will send to you before making your decision, it is in your best interest to truthfully report the amount you would like to send back for every possible amount that your match could choose to send to you.*

In the illustration above, we illustrate the case in which your match sent **A** ECU to you and you sent back **B** ECU to your match.

If this task is selected for payment, then you will be paid (in ECU) **3 times the amount your match sent minus the amount you send back**. Your match's payment will be **10 minus the amount your match sent plus the amount you send back**. The potential payments can be seen at the far left (for your match) and the far right (for you) in the illustration above.

Figure A.15: Explanation of Dictator Game

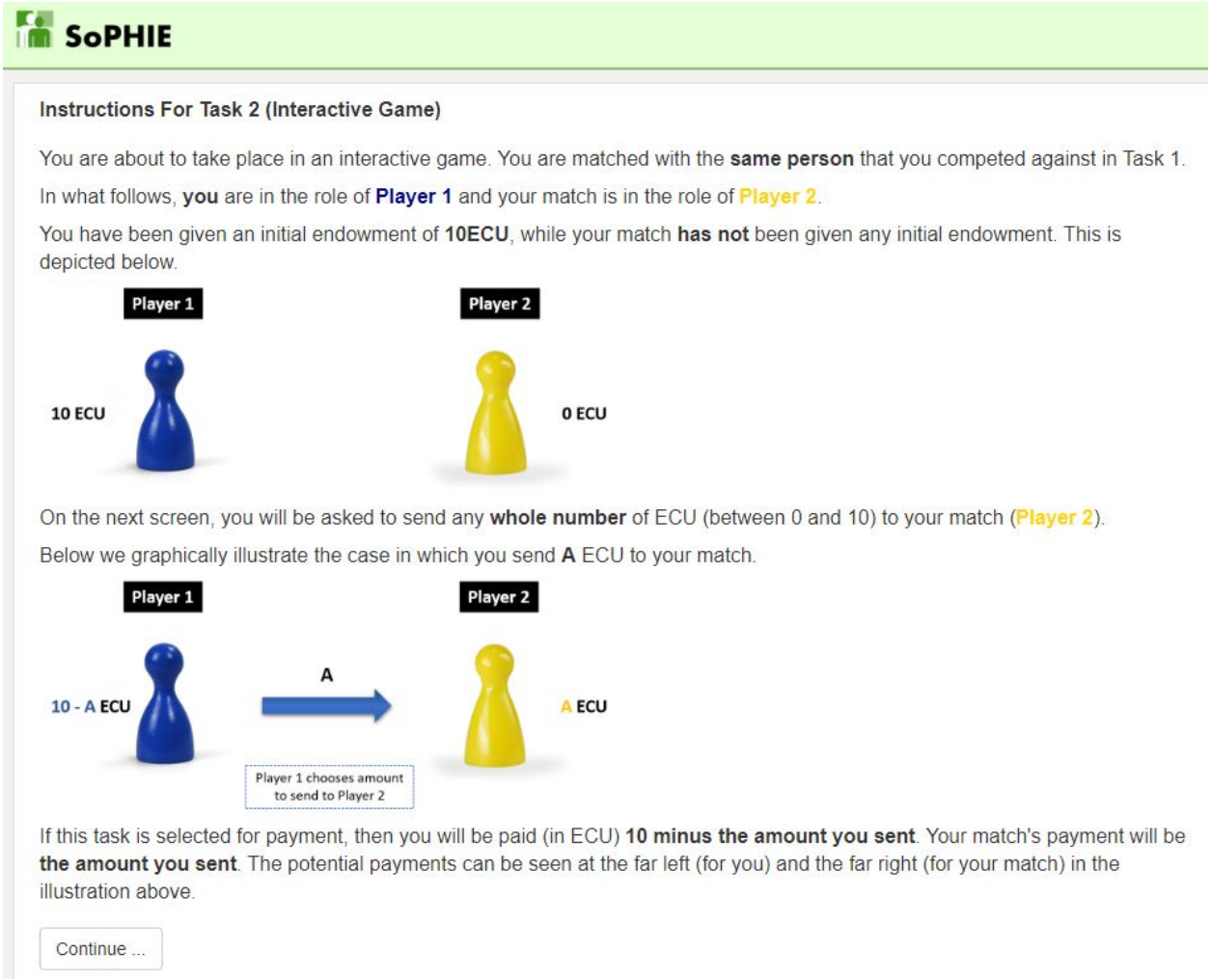

Figure A.16: Matching procedure

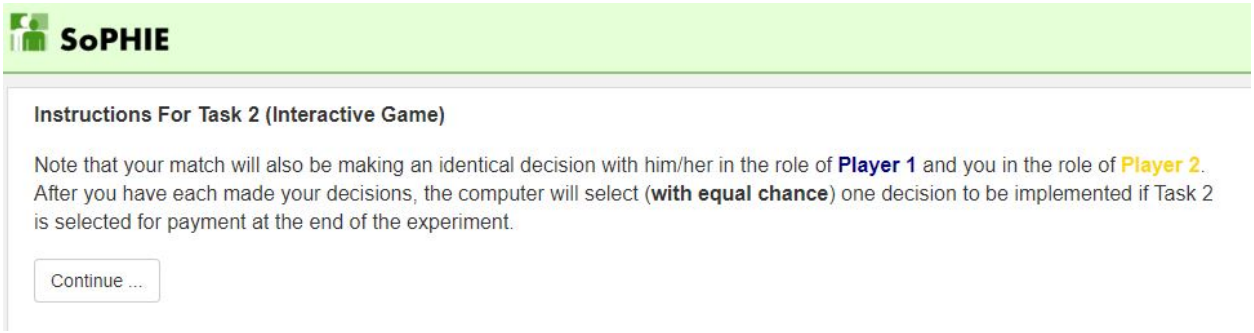

Figure A.17: Matching procedure comprehension check

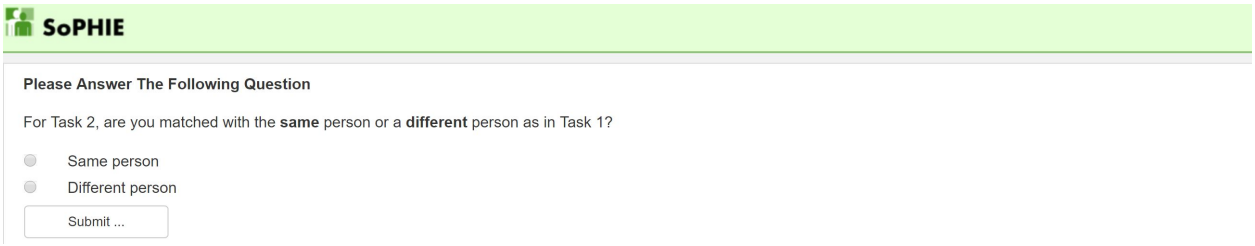

Figure A.18: Outcome competition task and comprehension check

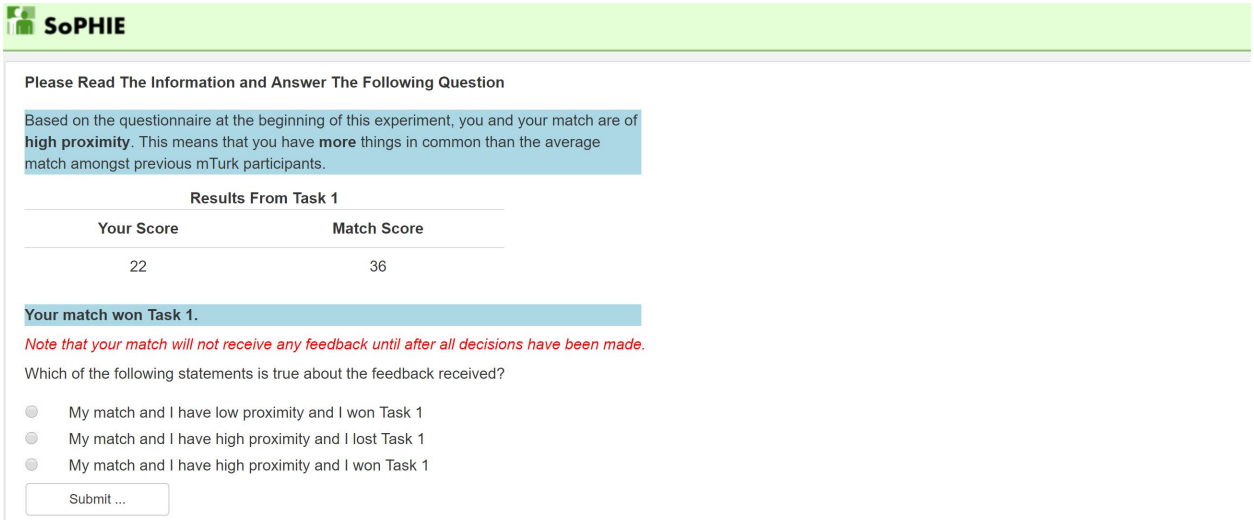

Figure A.19: Decision in Dictator Game (when participant won the competition task)

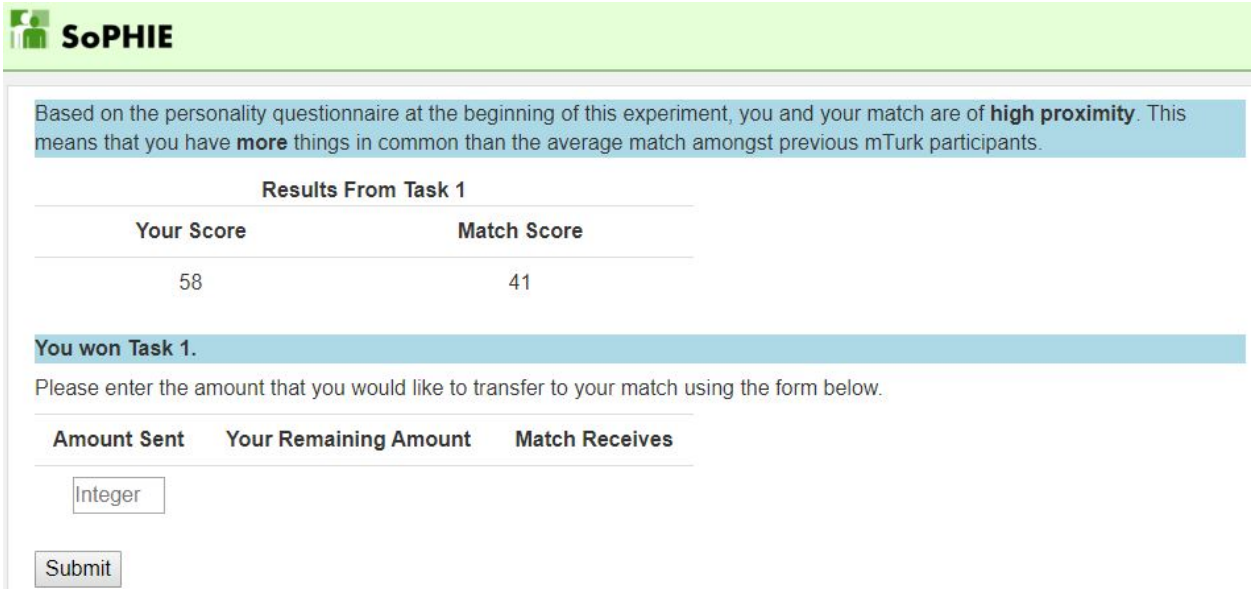

Figure A.20: Decision in Dictator Game (when participant lost the competition task)

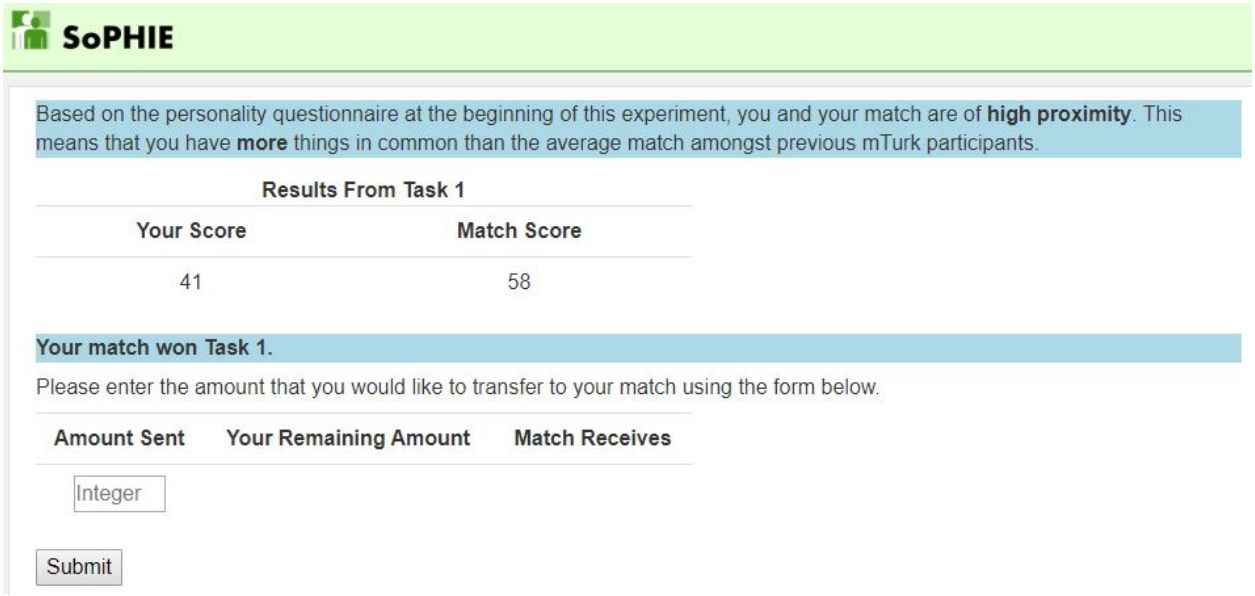

Figure A.21: First-Mover Decision in Trust Game

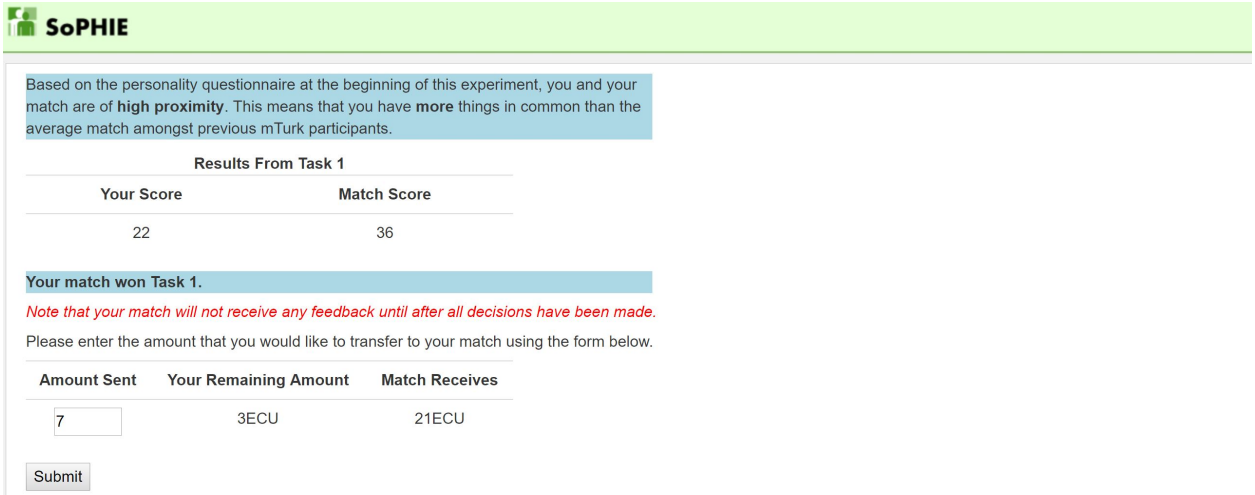

Figure A.22: Second-Mover Decision in Trust Game

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Please make a decision about the amount that you would like to send back to the proposer for each possible value that he/she sends to you.

Once we know the amount sent by the proposer, we will automatically implement the relevant decision to determine your potential payoff.

Match Sent	You Received	Amount Sent Back	Your Payoff	Match's Payoff
0	0	n/a	0	10
1	3	1	2ECU	10ECU
2	6	3	3ECU	11ECU
3	9	4	5ECU	11ECU
4	12	5	7ECU	11ECU
5	15	7	8ECU	12ECU
6	18	8	10ECU	12ECU
7	21	10	11ECU	13ECU
8	24	12	12ECU	14ECU
9	27	13	14ECU	14ECU
10	30	14	16ECU	14ECU

Submit

Figure A.23: Post-Experimental Questionnaire

SoPHIE

Please answer the following questions.

How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? (0: not at all willing to take risks; 10: very willing to take risks.)* ------

Gender*
- female
- male
- - prefer not to say -

Age*

Age in years. If you would prefer not to tell your age, please enter 0.

Current Location*

Please enter your ZIP code location inside the US or your Country location outside of the US. If you do not want to enter please put a dash '-'

About the Experiment*

If you have any comments about the experiment, please provide them here. For example, we are particularly interested in your experience with Task 1 and also the clarity of the instructions.

Submit ...