A Note on
Reciprocity and Modified Dictator Games

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This note presents results from modified dictator games in which the payoff-relevant game is either chosen randomly or by the recipients. We do not observe reciprocal behavior when recipients choose the game: Dictators do not condition their donations on the game chosen by recipients.

Keywords: modified dictator games, reciprocity, laboratory experiments

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1 Introduction

Numerous experimental studies of different games have observed behavior that can be regarded as reciprocal. High wages are rewarded with high effort in gift exchange games (Fehr et al., 1993), trusting behavior is not exploited in investment games (Berg et al., 1995) and unfair offers are rejected in ultimatum games (Güth et al. 1982). These now classic observations have lead to several theories that try to capture the underlying motivations behind this behavior by assuming inequality aversion (e.g., Bolton & Ockenfels, 2000, Fehr & Schmidt, 1999) and reciprocity (e.g., Charness & Rabin, 2002, Dufwenberg & Kirchsteiger, 2004, Falk & Fischbacher, 2006).

However, the empirical evidence for reciprocal motivations is mixed. For example: On the one hand, Charness (2004) observes little negative reciprocity and no positive reciprocity in a gift-exchange experiment that compares randomly generated wages to wage offers made by the subjects acting as principals. On the other hand, Cox (2004) finds that 58 percent of the money returned in the investment game is due to positive reciprocity when comparing behavior in investment games to dictator games. See Fehr & Schmidt (2006) and Cooper & Kagel (2013) for recent surveys of related results.

In this paper we study the role of intentions and reciprocal behavior in the modified dictator games introduced by Andreoni & Miller (2002). Using modified dictator games Andreoni & Miller show that giving in dictator games can be rationalized with well-behaved utility functions. After their introduction these games quickly became an established workhorse in the study of other-regarding behavior (see, e.g., Brosig et al., 2007, Fisman et al., 2007). We argue that modified dictator games also lend themselves to the study of reciprocal behavior. It is well known that donations in dictator games are a highly sensitive tool for identifying subtle influences on behavior: Donations are easily influenced by changing the formulation of the instructions (e.g., Hoffman et al., 1996, Brañas-Garza, 2007), by adding social cues to the instructions (e.g., Haley & Fessler, 2005, Rigdon et al., 2009), or by varying the social distance between dictators and recipients (e.g., Bohnet & Frey, 1999, Burnham, 2003). Based on the evidence, we expect that kind receiver behavior increases donations and unkind receiver behavior decreases donations if reciprocal motivations are present.

In the standard dictator game (Forsythe et al., 1994), the budget line has a slope of -1 because every cent the dictator gives to the recipient reduces his own payoff by exactly this cent. In the

modified versions of the game the slope of the budget line (i.e., the price of keeping or giving away money) varies. Andreoni & Miller (2002) confronted subjects with nine or eleven dictator games differing in the amount of money available to share and the slope of the budget line. They randomly selected the payoff-relevant games. We make two main changes to their experimental setup. First, we limit ourselves to three dictator games: (i) a dictator game variant with a high price of giving away money and a maximum dictator payoff of 12.5 Euro, (ii) a standard dictator game with a maximum dictator payoff of 10 Euro and (iii) a dictator game variant with a low price of giving away money and a maximum dictator payoff of 7.5 Euro. Second, we introduce a treatment in which receivers choose the payoff relevant game. Although intentions cannot be observed directly, we conjecture that choosing the first game will be regarded as a kind move, choosing the third game as an unkind move. To test for an influence of intentions we compare behavior in this variation to the setting with randomly selected games.[3]

2 Experimental Design

Half of the subjects in our experiment acted as dictators and the other half as recipients. Dictators chose a payoff distribution in three modified dictator games that differed in the price of giving p. Only one of these games was selected to be relevant for final payoffs. In each of the three games, starting with the initial endowment $(\pi^A, \pi^B) = (500, 500)$, the dictator (player A) could reduce the recipient's (player B's) payoff by $d\pi^B$ in order to increase his own payoff by $d\pi^A$ at a constant relative price of $p = |d\pi^A / d\pi^B|$, such that $\pi^A = 500 + p(500 - \pi^B)$.[4] Accordingly, the budget line has a slope of $-p$. The three games only differ with respect to this slope: $p = 3/2$ in game 1, $p = 1$ in game 2 and $p = 1/2$ in game 3. Except for the equal payoff distribution of the initial endowment, the dictator is assured a higher payoff than the recipient in all other attainable payoff distributions. Table 1 presents the three resulting modified dictator games.

[3] The first to test for the role of intentions using a random device was Blount (1995). Since then this approach has commonly been applied in experiments (see, e.g., Offerman, 2002, Charness, 2004, Falk et al., 2008).

[4] Accordingly, the game was framed as a take game and dictators were asked by how much they "want to reduce the payment to player B". See the Online-Appendix for screenshots of the instructions and the games.

Table 1 – Modified Dictator Games

Game	π	Payoff Distributions (in Euro-Cent)										
		1	2	3	4	5	6	7	8	9	10	11
1	π^A	500	575	650	725	800	875	950	1025	1100	1175	1250
	π^B	500	450	400	350	300	250	200	150	100	50	0
2	π^A	500	550	600	650	700	750	800	850	900	950	1000
	π^B	500	450	400	350	300	250	200	150	100	50	0
3	π^A	500	525	550	575	600	625	650	675	700	725	750
	π^B	500	450	400	350	300	250	200	150	100	50	0

In the spirit of Selten's strategy method (Selten, 1967) dictators made their choices in all of the three games. Only at the end of the experiment did they learn about the selected game. Depending on the treatment, the payoff-relevant game was selected at random (**Random**) or by the recipient (**Choice**). In the former treatment each game was equally likely. In the latter treatment recipients were ignorant of the dictator's choice when selecting the game. All players were informed about the procedure in their respective treatment. Additionally, we asked recipients about the expected donation and dictators in the **Random** treatment about the expected choice of game. The two treatments and the order of events are summarized in Table 2.

We conducted the experiment in three sessions. In each session both treatments were conducted at the same time with each being carried out in a separate room of the laboratory. After their arrival all subjects randomly drew a ball from an urn indicating their seat in one of the two rooms. This draw also determined whether they would act as a receiver or a dictator. The experiment was conducted using zTree (Fischbacher, 2007) and subjects were recruited with Orsee (Greiner, 2004). We paid subjects their earnings from the selected game plus a 5 Euro show-up fee using a double-blind procedure similar to that employed in Ockenfels & Weimann (1999) and Brosig-Koch et al. (2011).

Table 2 – Treatments

Treatment	Step 1	Step 2	Step 3	Step 4	Subjects
Random	Instructions	Dictators choose allocation. Game is selected at random.	Recipients indicate expected allocation.	Result display & questionnaire	42
Choice	Instructions	Dictators choose allocation. Recipients select game.	Dictators indicate expected game. Recipients indicate expected allocation.	Result display & questionnaire	46

3 Results

First of all, game 2 in the **Random** treatment resembles a standard dictator game with the restriction that dictators can give at most half of their endowment. The results are in line with previous dictator game studies: Dictators keep on average 8.36 of their 10 Euro, but most do not behave completely selfish. Only 38 percent of dictators keep the whole pie and 5 percent share the endowment equally.[5]

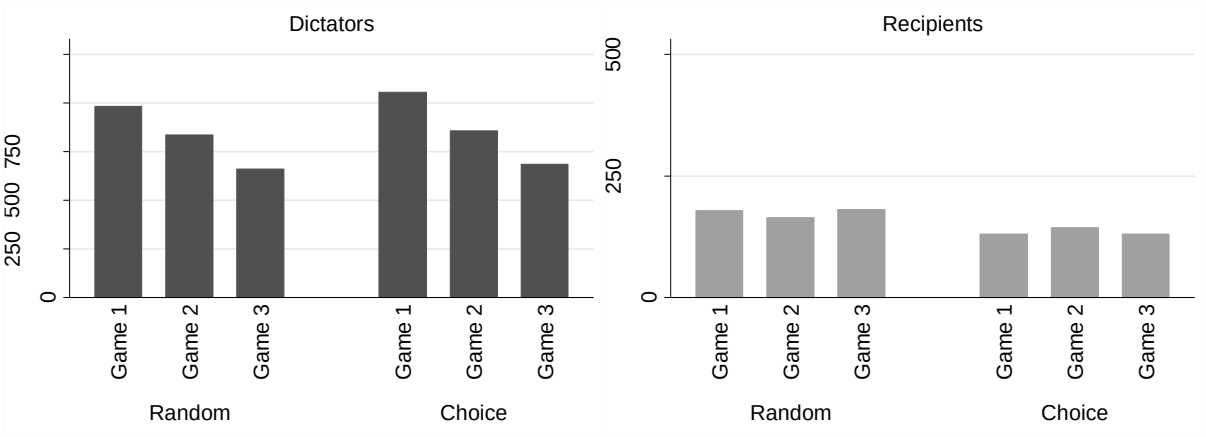
How does behavior change when we modify the standard game and change the price of giving? When giving becomes more expensive in game 1, dictators keep more for themselves (9.82 Euro); when giving becomes cheaper in game 3, they keep less (6.60 Euro). Applying two-tailed Wilcoxon tests to compare dictator payoffs between games, these differences are revealed to be significant ($p < 0.001$). However, there is no tendency to equalize payoffs. Instead dictators claim all efficiency gains from games 1 and 2 for themselves: The amount left to recipients is approximately the same in all three games (1.75 Euro on average, $p \geq 0.663$).

How does behavior change when recipients choose the payoff-relevant game in the **Choice** treatment? Based on Figure 1 the answer appears to be little. Now, dictators keep 10.54 Euro in

[5] Comparing these observations to the results of a recent meta-study by Engel (2011), our subjects appear to be slightly more selfish. Based on 131 dictator game studies Engel reports an average donation of 72 percent. He observes that 36 percent of subjects donate nothing and 22 percent donate half of the pie or more.

game 1, 8.57 Euro in game 2 and 6.85 Euro in game 3. Again, reactions to price changes are significant ($p < 0.001$) and in this treatment the recipients also earn the same in all three games (1.35 Euro on average, $p \geq 0.249$). [6]

Figure 1 – Payoff Distributions



In order to identify whether dictators react to the intentional choice of a game, we run the following random-effects Tobit regression on dictator i's donation π_{ij}^{B} in game j

$$\pi_{ij}^{B} = \beta_0 + \beta_1 \cdot p_j + \beta_2 \cdot Choice_i + \beta_3 \cdot p_j \cdot Choice_i + \eta_i + \varepsilon_{ij},$$

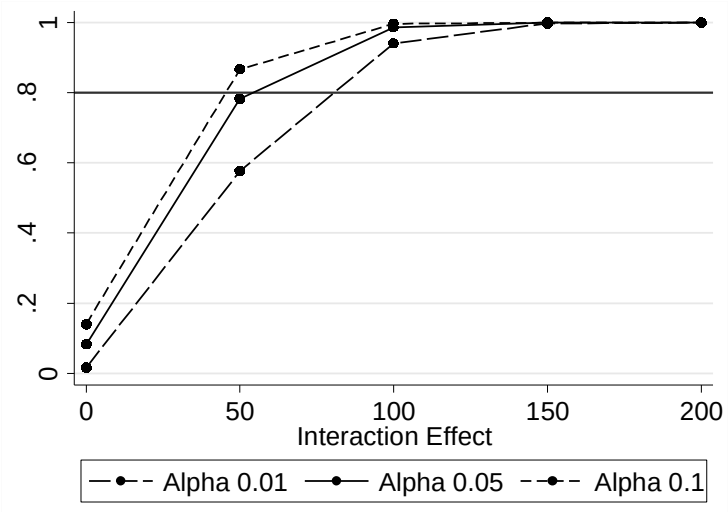
where η_i and ε_{ij} are independently and normally distributed error terms. The lower bound on the recipient's payoff is 0 Euro-Cents and the upper bound 500 Euro-Cents.

If intentionality drives donations, we would expect a significant and positive coefficient β_3 for the interaction effect: The donations of a reciprocal dictator increase more strongly with p if the game is chosen intentionally. That means, we test the one-sided null hypothesis that $\beta_3 \leq 0$. However, all of the model's coefficients – including β_3 – turn out to be insignificant at any conven-

[6] Individual patterns of behavior are also similar across treatments. In **Random** 95 percent of the dictators obey the law of demand including 33 percent of strictly selfish dictators. One dictator (5 percent) always shares equally. In **Choice** 91 percent of the dictators obey the law of demand including 35 percent of strictly selfish dictators. One dictator (4 percent) always shares equally.

tional level ($\hat{\beta}_0$ = 104.25, SE = 81.80; $\hat{\beta}_1$ = -9.34, SE = 34.35; $\hat{\beta}_2$ = -59.04, SE = 111.76; $\hat{\beta}_3$ = 6.80, SE = 47.41). Thus, we are not able to reject the null hypothesis.

Figure 2 – Power Estimates



In other words: Dictators do not condition the size of their donation on the way the game is selected. However, this conclusion rests on the acceptance of the null hypothesis. We therefore conduct a power analysis of the Tobit model described above. By design the smallest behavioral difference our experiment is capable to detect corresponds to a payoff difference of 50 Euro-Cents in the recipient's payoff between games (cf., Table 1). We chose this increment to make the results comparable to previous studies (e.g., Brosig et al., 2007). Additionally, we think that smaller increments may not be economically significant and may not be salient enough for subjects.

How large would the effect of intentions have to be, so it is reliably identified? To answer this question, we run simulations based on data sets with the same sample size as in our experiment that are generated based on the parameter estimates $\hat{\beta}_0$, $\hat{\beta}_1$ and $\hat{\beta}_2$, the observed error distribution and varying interaction effects. The data is generated so that the interaction effect β_3 corresponds to the increase in the recipient's payoff from game 3 to game 1. More precisely, we ran five simulations assuming that β_3 takes the values 0, 50, 100, 150 and 200. In each simulation run

we randomly generated the data set accordingly, ran the Tobit regression and recorded the observed *p*-value for the estimate $\hat{\beta}_3$. We repeated this process 1,000 times. The share of runs that reject the null hypothesis yields the estimated power 1-β of the one-sided test. Figure 2 displays the power estimates for the conventional significance levels $\alpha = 0.01$, $\alpha = 0.05$ and $\alpha = 0.10$. If applying a threshold of $\alpha = 0.05$, the regressions already yield a power of 0.77 for the smallest interaction effect of 50. Larger interaction effects are reliable identified with a power well above the 0.80 threshold that is typically applied.

How do recipients choose between the three games in the **Choice** treatment? If their choice is driven by the expectation of reciprocal dictator behavior, they should opt to maximize the dictator's attainable payoff and choose game 1. If their choice is driven by price considerations, they should choose game 3 in which giving is cheapest for dictators. Recipients choose game 2 most often (39 percent) and games 1 and 3 with the same frequency (30 percent) which is not significantly different from an equal distribution ($p = 0.840$, Chi-squared test).

4 Discussion

In this study we present a variation to modified dictator games that allows responders to select one of three dictator games as payoff relevant. By choosing the game they can increase or decrease dictators' maximum attainable payoff. It is a natural conjecture to regard the former as kind and the latter as unkind behavior. Reciprocal dictators would condition their donation on the choice of game and donate more if treated kindly and less if treated unkindly. However, donations are the same when the game is selected randomly and intentions cannot play a role. Moreover, recipients receive the same in all three games.

Our result is broadly in line with a number of studies that observe unkind moves to be punished less harshly when the strategy method is used in bargaining games (see, e.g., Brandts & Charness, 2003, Brosig et al., 2003, and the survey by Brandts & Charness, 2011). However, dictator game behavior is known to be highly sensitive to a number of subtle influences. In light of this evidence it is surprising that recipient behavior does not affect donations. In particular, the absence of any positive reciprocity is surprising. From the recipient's perspective game 3 (where the price for giving is lowest) seems to be a more promising choice than game 1 (where it is cheap for the dictator to be selfish). Therefore, choosing game 1 is a "nice" move by the recipient

that should be rewarded by a reciprocal dictator. The fact that we do not observe any corresponding pattern of rewarding behavior indicates that reciprocity does not seem be at work in our experiment. An alternative explanation would be that interpreting recipients' choices of games may not be straightforward for dictators. If the choice is neither interpreted as kind or unkind, there is no reason for a reciprocal response.

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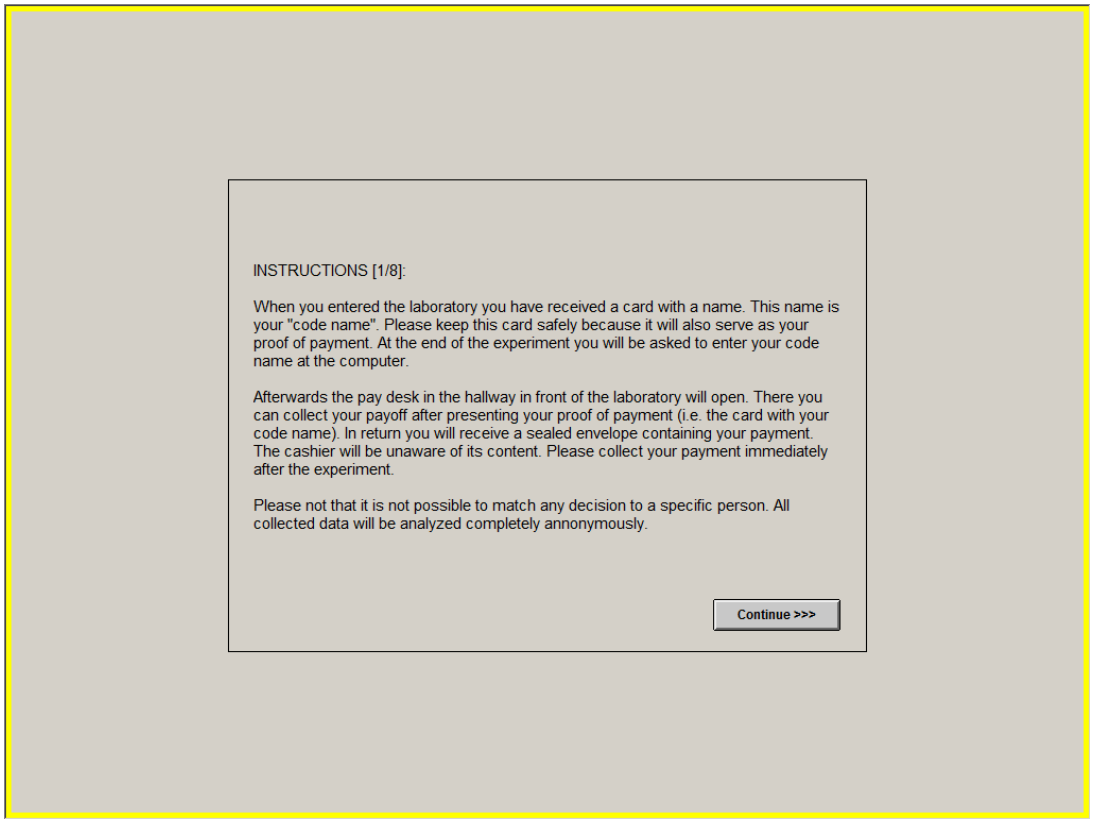
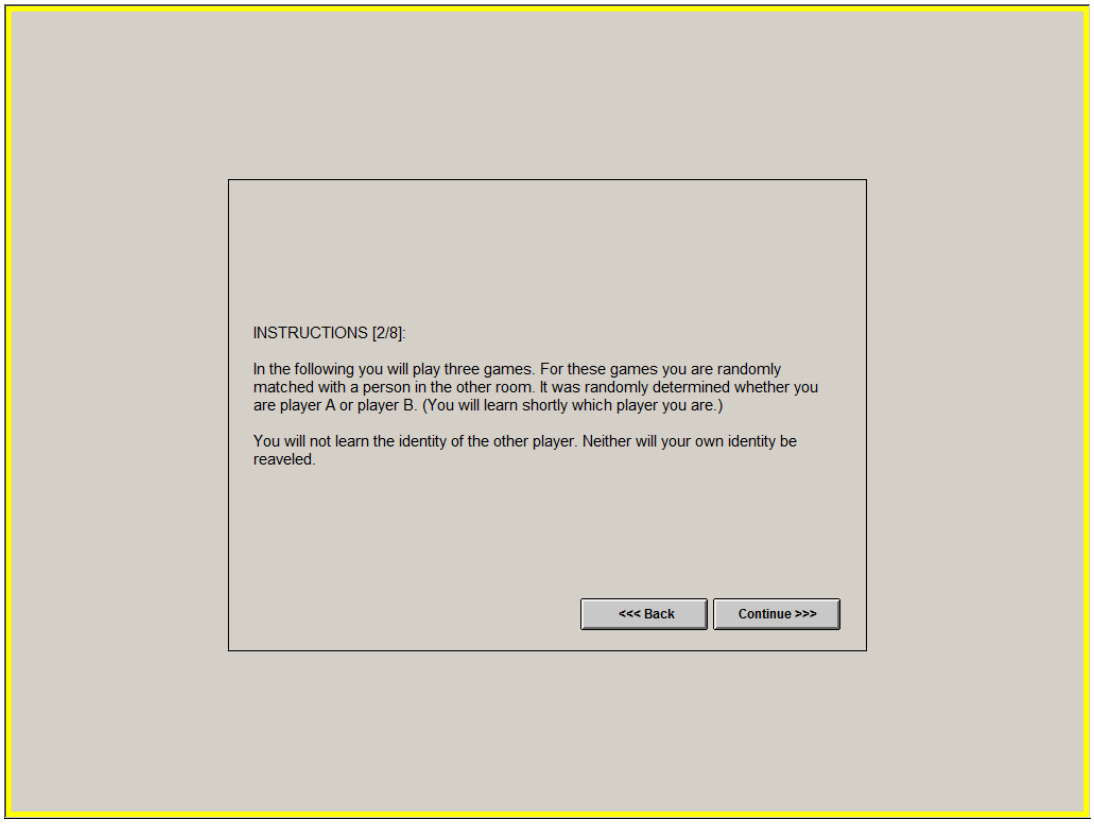
Online-Appendix: Screenshots Choice treatment (translated from German)

Instructions





INSTRUCTIONS [3/8]:

In the three game player A has to make decisions of the following kind:

1) We endow player A and player B with an amount of 5 Euro, respectively.

2) Player A can reduce player B's payment of 5 Euro and thereby increase his own payment. However, money is not always transferred with a ratio of 1:1. That means: When reducing player B's payment by 1 Euro, player A may receive more or less than 1 Euro.

3) In the end, player B will select one of the three games without knowing the decisions of player A. The decisions in this game will determine the payments of player A and player B.

4) Finally you will be informed about your payment and the selected game.

<<< Back | Continue >>>

INSTRUCTIONS [4/8]:

We now present you with the three games described before.

In the column of the following table there are 11 different payment distributions. For each of these distributions you will find the payment of player A in the second line (A). You will find the corresponding payment of player B below in the third row (B). Player A has to select one of the 11 payoff distributions in each of the games.

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INSTRUCTIONS [5/8]:

In the first game player B's payment is reduced by 50 Cent with each payment distribution further to the right. At the same time the payment to player A is increased by 75 Cent.

Game 1	1	2	3	4	5	6	7	8	9	10	11
A	500	575	650	725	800	875	950	1025	1100	1175	1250
B	500	450	400	350	300	250	200	150	100	50	0

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INSTRUCTIONS [6/8]:

In the second game player B's payment is reduced by 50 Cent while the payment to player A is increased by 50 Cent.

Game 2	1	2	3	4	5	6	7	8	9	10	11
A	500	550	600	650	700	750	800	850	900	950	1000
B	500	450	400	350	300	250	200	150	100	50	0

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INSTRUCTIONS [7/8]:

In the third game player B's payment is reduced by 25 Cent while the payment to player A is increased by 50 Cent.

Game 3	1	2	3	4	5	6	7	8	9	10	11
A	500	525	550	575	600	625	650	675	700	725	750
B	500	450	400	350	300	250	200	150	100	50	0

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INSTRUCTIONS [8/8]:

In the following you will be player A.

If you have questions at any time, please open your cabin door or raise your hand.

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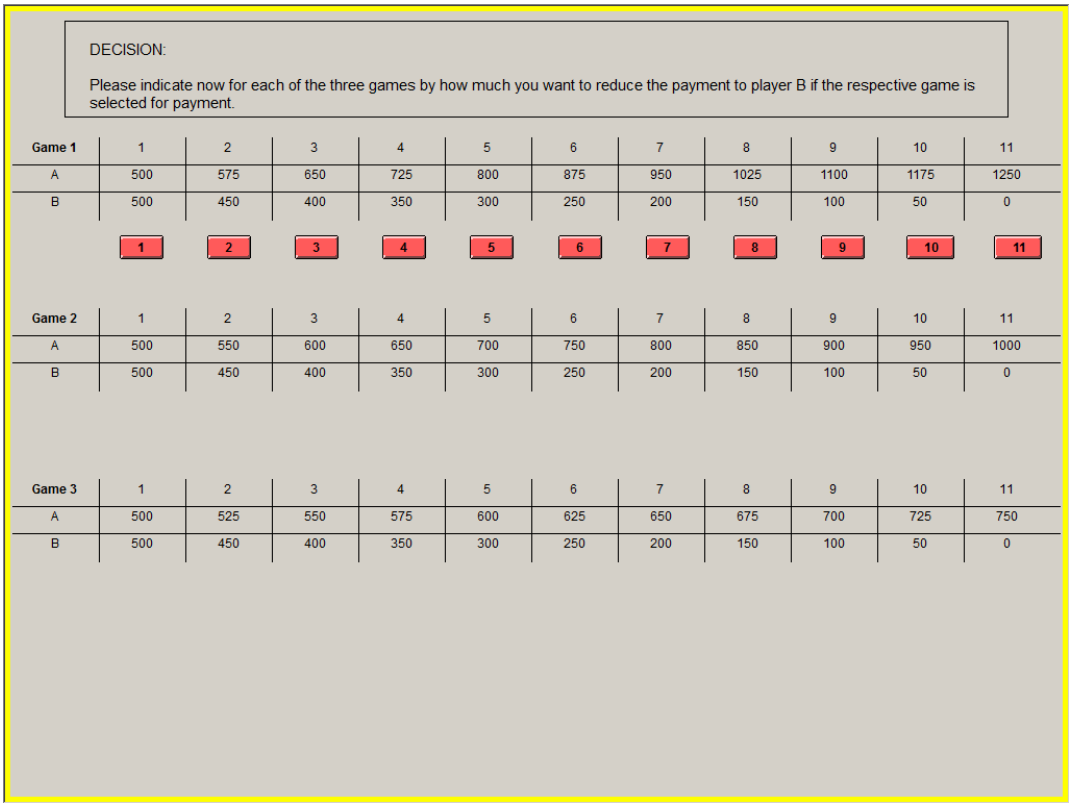
Dictator Decisions



EXPECTATION:

You are player A. Please indicate which decision you expect from player B: Which of the three games will he select?

You and player B will receive the payment that results from your decision in the game selected by player B.

Continue

EXPECTATION:

Please select a game by clicking on it:

Game 1	1	2	3	4	5	6	7	8	9	10	11
A	500	575	650	725	800	875	950	1025	1100	1175	1250
B	500	450	400	350	300	250	200	150	100	50	0

Game 1

Game 2	1	2	3	4	5	6	7	8	9	10	11
A	500	550	600	650	700	750	800	850	900	950	1000
B	500	450	400	350	300	250	200	150	100	50	0

Game 2

Game 3	1	2	3	4	5	6	7	8	9	10	11
A	500	525	550	575	600	625	650	675	700	725	750
B	500	450	400	350	300	250	200	150	100	50	0

Game 3

Recipient Decisions

GAME SELECTION:

Please select a game by clicking on it:

Game 1	1	2	3	4	5	6	7	8	9	10	11
A	500	575	650	725	800	875	950	1025	1100	1175	1250
B	500	450	400	350	300	250	200	150	100	50	0

Game 1

Game 2	1	2	3	4	5	6	7	8	9	10	11
A	500	550	600	650	700	750	800	850	900	950	1000
B	500	450	400	350	300	250	200	150	100	50	0

Game 2

Game 3	1	2	3	4	5	6	7	8	9	10	11
A	500	525	550	575	600	625	650	675	700	725	750
B	500	450	400	350	300	250	200	150	100	50	0

Game 3

EXPECTATION:

Please indicate for each of the three games which decision by player A you expect in this game: By how much will he reduce your payment if this game is selected for payment?

Continue

EXPECTATION:

Please indicate now for each of the three games which decision by player A you expect in this game: By how much will he reduce your payment if this game is selected for payment?

Game 1	1	2	3	4	5	6	7	8	9	10	11
A	500	575	650	725	800	875	950	1025	1100	1175	1250
B	500	450	400	350	300	250	200	150	100	50	0

1 2 3 4 5 6 7 8 9 10 11

Game 2	1	2	3	4	5	6	7	8	9	10	11
A	500	550	600	650	700	750	800	850	900	950	1000
B	500	450	400	350	300	250	200	150	100	50	0

Game 3	1	2	3	4	5	6	7	8	9	10	11
A	500	525	550	575	600	625	650	675	700	725	750
B	500	450	400	350	300	250	200	150	100	50	0