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The Sharing Game: Fairness in resource allocation as a function of incentive, gender, and recipient types

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Abstract

Economic games involving allocation of resources have been a useful tool for the study of decision making for both psychologists and economists. In two experiments involving a repeated-trials game over twenty opportunities, undergraduates made choices to distribute resources between themselves and an unseen, passive other either optimally (for themselves) but non-competitively, equally but non-optimally, or least optimally but competitively. Surprisingly, whether participants were told that the anonymous other was another student or a computer did not matter. Using such terms as "game" and "player" in the course of the session was associated with an increased frequency of competitive behavior. Males were more optimal than females: a gender-by-incentive interaction was found in the first experiment. In agreement with prior research, participants whose resources were backed by monetary incentive acted the most optimally. Overall, equality was the modal strategy employed, although it is clear that motivational context affects the allocation of resources.

Keywords: distributive fairness, gender, human-computer interaction, monetary incentive, resource allocation, Sharing Game.

1 Introduction

Imagine being repeatedly given the choice between receiving $5 and $7. The obvious choice is to take the $7 every time. Now imagine that this choice comes with the following strings attached: if you select the $7 for yourself, then an anonymous other will receive $9, but if you take the $5, that anonymous other will instead receive $3. While consistently choosing the $7/$9 option is still the optimal choice (by "optimal," we mean the choice that yields the maximum amount for the chooser), might it be bothersome to know that this unknown person is receiving more than you for doing nothing? When this repeated choice was posed to members of our lab, not all of them elected to take the optimal path. One of our colleagues insisted that he would select the $5/$3 option every time, stating, "I'd want to make sure that I have more than the other guy." To this person, it was well worth it to sacrifice a couple of dollars to ensure having a relative advantage over the stranger. Another stated that she would take the unusual path of alternating between the options from trial to trial: "I'd get $7 and then $5, while he'd get $9 and then $3, so we'd both end up with the same amount — $12 each — after every other trial." This person had calculated that while such a strategy would not yield maximal amounts for either party, it would reduce any discrepancy in earnings between them. A third noted that his decisions may differ depending on how the situation was framed. The intent of this paper is to investigate the patterns of distributional choices made by people in a simple economic situation such as that described above, and to assess if (and to what extent) certain contextual variations affect these decisions.

Popular economic games examine how participants allocate resources. For example, two commonly studied games are the Ultimatum Game (UG; Güth, Schmittberger, & Schwarze, 1982) and the Dictator Game (DG; Forsythe, Horowitz, Savin, & Sefton, 1994). In the UG one student proposes a distribution of resources (for example, if $10, $6 for him and $4 for the other player). If the other player accepts, the $6 / $4 split becomes reality. If he rejects the offer neither gets anything (no negotiation is possible). In the DG whatever the proposing participant proposes becomes reality (the second "player" is passive). It is also instructive to ask participants to choose between two possible fixed allocations of resources between themselves and another player (e.g., Bazerman, Loewenstein, & White, 1992; Falk & Fischbacher, 2000). We report two such studies assessing college students' allocation of resources to themselves and another player where the allocations involve points either with or without monetary value.

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Half the participants are told that the other player is a person and half that the other player is a computer. According to the "Computers Are Social Actors" or "CASA" model (Nass, Steuer, & Tauber, 1994; Nass, Steuer, Tauber, & Reeder, 1993; Reeves & Nass, 1996), the social rules applying to human-human interaction apply equally to human-computer interaction, implying that participants in the Sharing Game might treat computer players the same way as "human" players. It was uncertain if such equality would be seen in our experiments though, due to the fact that participants in the Sharing Game do not directly *inter*act with the recipient; rather, their choices *act* upon the other in much the same way that proposers' decisions act upon recipients in DG. In no way does the recipient act upon the allocator in either game. In contrast, the participants and computers in the CASA experiments always performed some sort of two-way interaction with each other, whether the participants were told that the computer was running a program or was acting as the medium through which another person was communicating. We predicted that such lack of "personality" on the part of the computer in our experiments would influence our participants to choose optimally (i.e., to maximize one's earnings regardless of how much or how little the other gains in the process) more often when paired with a computer recipient.

For half the participants the points earned have monetary value; for the others they do not. This manipulation assesses a question, sometimes contentious between economists and psychologists, of whether comparable results can be obtained with and without monetary incentive (Camerer & Hogarth 1999; Fantino & Stolarz-Fantino, 2001; Hertwig & Ortmann, 2001). Finally, although all of our participants see their own cumulative scores throughout the game, half of the participants in one of our experiments see the other player's cumulative score as well, a factor that might increase the competitive flavor of the task and therefore increase choice of the smaller outcome. Messick and McClintock (1968) previously found there to be no significant difference between these two display conditions, but their results involved a game in which both participants had equal decision-making power.

Although van Lange, De Bruin, Otten, and Joireman (1997) assert that people generally exhibit stable preference patterns, De Dreu and McCusker (1997) and Fantino and colleagues have argued that contextual variables can and do affect persons' behavior in choice situations (Fantino, 2001; Fantino & Stolarz-Fantino, 2003a). The present study asks whether the distribution of the Sharing Game strategies is affected by the economic context in which the game is played. A corollary of this question concerns the extent to which the strategies are relatively stable as they might be if reflective of fundamental personality characteristics. We ask how choice is affected by monetary incentive and by other central aspects of the game (such as gender of participants, whether the other player is designated as being another person or a computer, and whether the competitive aspects of the game are made more salient).

In addition, the Sharing Game paradigm pits competing predictions from two leading types of social preference theories against each other.[1] Theories of inequality aversion (Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000) state that in economic situations, people tend to act to minimize the difference between their own and others' payoffs. These theories would predict Sharing Game allocators to choose so as to reduce or eliminate the difference between players' totals (which can be ideally accomplished by alternating between the payoff choices in each pair of trials). On the other hand, Charness and Rabin's (2002) theory of reciprocal fairness would predict that players would consistently choose the optimal option so as to maximize social welfare.

The issue of whether or not financial incentives affect decisions in economic games has been discussed extensively. Hertwig and Ortmann (2001) noted that the use of real financial incentives as opposed to hypothetical financial incentives often distinguished between the research of economists and psychologists, respectively: "Economists generally pay participants on the basis of clearly defined performance criteria; psychologists usually pay a flat fee or grant a fixed amount of course credit" (Hertwig & Ortmann, 2001, p. 383). Fantino and Stolarz-Fantino (2001) noted that several experiments from their laboratory failed to find performance differences as a function of real vs. hypothetical incentives (e.g., Goodie & Fantino, 1995, in a study of base-rate neglect and Case & Fantino, 1989, in a study of the reinforcing effectiveness of information). Subsequently, Stolarz-Fantino, Fantino, Zizzo, and Wen (2003) found no effect of immediate financial incentives on performance in a conjunction fallacy task. Camerer and Hogarth (1999) report that performance in certain types of economic game experiments is helped by financial incentives while performance in other types of economic games are not. The Sharing Game bears a similarity to the dictator game in that one participant is the sole decision maker with respect to how resources are to be allocated. In their survey of dictator game experiments that used hypothetical and varying amounts of real money as reinforcers, Camerer and Hogarth (1999, p. 24) reported that

> subjects usually kept substantially more when choices were real rather than hypothetical…

[1]The Sharing Game does not directly address a third leading category of social preference theories known as reciprocity (e.g., Rabin, 1993; Falk & Fischbacher, 2000).

> we can interpret subjects as having some non-financial goal — to appear... generous... — which is partially displaced by profit-maximization when incentives are increased. This kind of incentive effect is fundamentally different from the effect of incentives in inspiring greater effort, clearer thinking, and better performance.

If our Sharing Game participants have a similar goal of wishing to appear generous, then we can expect them to behave competitively less often when points are not backed by real money. In addition, Hertwig and Ortmann (2001) call for "learning more about the specific conditions under which payoffs improve, do not matter to, or impair task performance." From a theoretical perspective it appears important to further clarify the conditions under which financial incentives affect performance, as Hertwig and Ortmann (2001) have argued. It is also important from a pragmatic standpoint: if certain studies of economic games produce the same results with hypothetical and real incentives, then a great deal of human participant money may be saved.

The Sharing Game task used in the present experiments shares a characteristic with the popular Prisoner's Dilemma Game (e.g., Rachlin, 1997; Fantino, Gaitan, Meyer, & Stolarz-Fantino, 2006) in that both games constrain the choices of participants and present them with conflicting options. In that regard the Sharing Game differs from the popular UG and DG in that on any given choice the participant must choose between getting more for oneself (and still more for the other participant) or less for oneself (and still less for the other participant). Choices on the UG and particularly the DG are relatively unconstrained. The Sharing Game forces the participant to choose between an outcome that is optimal for both participants and one that is competitive (giving a relative, but non-optimal advantage to the allocator). An equitable choice is absent. However, the trials are arranged so that it is possible for the participants to respond equitably over trials. Thus, as mentioned above, participants behaving according to inequality aversion theories (e.g., Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000) may be expected to alternate choices, thereby maintaining equal payoffs for both participants. The distribution of choices should permit the characterization of participants' choices as optimal, equitable, or competitive. The possible effects of other variables (such as monetary incentive and whether the other participant is a person or computer) should enable us to determine the extent to which these distributions of choices are stable or are influenced by these variables.

Would participants allocate resources optimally in this task by always selecting the larger payoff for themselves and the other player? If not, how would the frequency of non-optimal choices (choosing the smaller payoff) be affected by each of the three variables (nature of other player, monetary incentive, and display of the other player's cumulative score)? Would participants who do not consistently choose optimally consistently choose the "competitive" outcome (lower payoffs, with the participant receiving the larger share)? Or would they equalize the payoffs for the two players?

2 Experiment 1

In this experiment the effects of the three variables discussed above were investigated in the context of instructions which had a competitive (game-oriented) flavor. Within this instructional context, we were interested in assessing the role of monetary (versus non-monetary) incentive, the role of the nature of the other player (person or computer), and the role of presentation (or not) of the other player's cumulative score.

2.1 Method

2.1.1 Participants

A total of 238 (182 F, 56 M) young adult (M=20.4, SD=2.0 years) undergraduate students served as participants. 38 were dropped from the study for either misinterpreting the instructions or (in the conditions involving a putative second person) for indicating in debriefing that during the session, they believed with certainty that the second person did not exist.[2] Statistical analyses were carried out with the remaining 200 participants, as well as with all 238. The same conclusions and statistical findings occurred whether or not these students' data were included. Half of the remaining participants received course credit for volunteering their time; the other half received monetary compensation. Students learned which they were to receive just prior to their sessions. All participants reported being fluent English speakers, free of neurological or psychiatric disorders, and having normal or corrected-to-normal vision.

2.1.2 Design and stimuli

The economic game developed for this study employed a single-player, multiple-trial, two-alternative forced-choice paradigm in which the player's allocation decision determines both that player's payoff and that of another

[2] Participants' data were retained 1) if they stated that they were not completely certain if the other person existed, but were willing to give the experimenter the benefit of the doubt, or 2) if they stated that they only became certain that there was no other person *after* completing the allocation session.

(unseen, passive, and, in fact non-existent) participant. Each trial offered participants an opportunity to choose between two options. One option gave the participants a smaller point reward and gave the other player even less. The second option gave participants a larger point reward and gave the other player even more. To illustrate, a typical choice might be:

Player One receives 7 and Player Two receives 9

or

Player One receives 5 and Player Two receives 3

Table 1 lists the five sets of choices presented to participants. In each trial, the participant was presented with a choice between one of the alternatives in the table's left hand column and its corresponding alternative in the right hand column. The two options for each choice were always numerically symmetrical in that the absolute value of the difference between the outcomes for Player 1 and Player 2 was the same for both alternatives. Regardless of the particular point amounts offered, participants always had a choice between the optimal alternative (e.g., "Player One receives 7 and Player Two receives 9") and the competitive alternative (e.g., "Player One receives 5 and Player Two receives 3"). Over 20 trials, the choices were always presented in pairs (e.g., the 7 and 9 versus 5 and 3 alternatives were presented twice in a row) to afford participants a third option: to readily match their earnings with those of the second player. By alternating between the top (optimal) and bottom (competitive) alternatives, both players would complete the game with equal (though non-maximal) earnings. For example, when given the 7 and 9 versus 5 and 3 alternatives twice in a row, the allocator could a) choose 7 and 9 both times, resulting in totals of 14 for him- or herself and 18 for the other; b) choose 5 and 3 both times, resulting in respective totals of 10 and 6; or c) choose 7 and 9 once and 5 and 3 once, resulting in totals of 12 for each. Each choice pair was presented in random order. Once all five had been presented (comprising the first ten trials), the choice pairs were re-randomized and presented again to comprise the remaining ten trials.

The participants who received monetary compensation were paid $0.07 USD for every point attained, and were told that Player Two would be paid in the same fashion. Participants were also informed that it was possible to earn up to approximately $10 for themselves. (They were not told how much the other participant could potentially earn). Those who chose competitively through all 20 trials earned $6.72 for themselves and $3.36 for the other. Participants who chose optimally every time earned $10.08 for themselves and $13.44 for the other. Those who equalized both participants' earnings (particularly those who alternated their choices from trial to trial) earned $8.40 for both parties. Average earnings for the allocator and recipient in the real money conditions in Experiment 1, respectively, were $8.67 and $9.22.

Half of the participants were told that the second player was an anonymous person in an adjoining room, while the rest were informed that the second player was represented by the computer running the game program. Table 2 displays the random assignment of men and women across the conditions of incentive and Player 2 type. Finally, during the game for half the participants, the computer displayed a running tally of both players' point totals. For the other half, the computer displayed the running tally only for the first player. The dependent variable was the percentage of trials in which the participant chose the optimal option, which afforded the maximum amount of points for the participant (and, incidentally, for the second player).

Table 2: Distribution of men and women across incentive and Player 2 type in Experiment 1

	Men (n = 50)	Women (n = 150)
Monetary	26	74
Non-monetary	24	76
Human	25	75
Computer	25	75
Monetary/Human	11	39
Monetary/Computer	15	35
Non-monetary/Human	14	36
Non-monetary/Computer	10	40

2.2 Procedure

Participants were assessed individually in a room with normal lighting, were seated 50 cm from a personal computer running the game program, and were informed that they were to take part in an economic game involving resource allocation. The experimenter told participants that the computer would display multiple trials of different point amounts that the participants could allocate to themselves and to Player 2 (P2), but did not reveal exactly how many trials there would be or that the choices would be presented in pairs. The experimenter verbally described how a typical trial would appear, but neither suggested any strategy nor explained how the top and bottom options were considered optimal and competitive, respectively. It was at this time that the experimenter explained to half of the participants that P2 was an anonymous person in the adjoining room waiting for the session to begin (the other half were informed that P2 was the computer). The participant was told that, as Player 1

Table 1: Choices presented to allocators (Player 1) in the Sharing Game.

First (optimal) alternative		Second (competitive) alternative	
Player 1 (participant) receives	Player 2 (putative other or computer) receives	Player 1 (participant) receives	Player 2 (putative other or computer) receives
6	8	4	2
6	7	5	4
7	9	5	3
8	11	5	2
9	13	5	1

(P1), only he or she had the ability to choose how much both players received in each trial. Participants who were to receive monetary compensation for their involvement in this study were told at this time that each player would receive $0.07 USD for each point they had individually accumulated, and that it was possible for P1 to earn up to approximately $10 USD (the experimenter did not reveal how much P2 could potentially earn). Once the experimenter had determined that the participant understood the verbal instructions, P1 was prompted to read the instructions displayed on the computer screen. A transcript of the computer-provided instructions is included in the appendix. If participants were in a condition in which they were told that P2 was human, the experimenter left the room for approximately 10 s and returned under the pretense of ascertaining that Player 2 was ready. After making certain that the participant had no questions and was ready to begin, the experimenter left the participant alone to begin the session.

2.3 Results and Discussion

Participants' choices produced a trimodal distribution with the three modes corresponding to the three straightforward strategies: equalizing payoffs, the primary mode, at 50% on Figure 1a; always selecting the optimal option by choosing the larger payoffs, the second mode at 100% on Figure 1a; always selecting the competitive option by choosing the smaller payoffs, the third mode at 0% on Figure 1a. When the participants are divided according to whether or not points represented monetary reward a different picture emerges. Figure 1b, for participants with monetary incentive, shows a bimodal distribution with optimal responding now the primary mode, though more participants overall continue to approximate equalizing payoffs than maximizing payoffs. The third mode from Figure 1a, at 0% representing extreme competition, is absent. Figure 1c shows that when only participants without monetary incentive are considered a third pattern emerges. Again we have a bimodal distribution but now the modes are at 50% (equalizing payoffs) and at 0% (extreme competition). The mode at 100%, seen in Figures 1a and 1b representing optimal choice, is absent.

A corollary of these results is that participants chose significantly more optimally in the monetary condition. This result is shown in Figure 2a, for all participants, and in Figure 2b separately for male and female participants. A three-factor (2 Compensation by 2 Identity of P2 by 2 Display salience) analysis of variance was significant, $F(7, 192) = 4.4$, $p=.0002$. The points+money participants' tendency to choose optimally was significantly higher than that of the points-only participants, $F(1, 192) = 25.1$, $p<.0001$. Participants whose points were backed by money chose optimally 59% of the time, while their counterparts only did so in 39% of their trials.

It mattered not at all whether the other participant's cumulative points were displayed for the participant (48% optimal choices) or not (49%), $F(1, 192) = 0.1$, *ns*. When the analysis revealed that salience had no bearing on percentage of optimal choices made, but visual inspection showed that gender may influence behavior, a different three-factor (2 Compensation by 2 Identity of P2 by 2 Gender) analysis of variance was conducted. This second analysis was significant overall, $F(7, 192) = 5.4$, $p<.0001$. Main effects of gender ($F(1, 192) = 5.3$, $p<.03$) and incentive ($F(1, 192) = 29.7$, $p<.0001$), as well as a gender-by-incentive interaction ($F(1, 192) = 4.2$, $p<.05$) were revealed. No other significant effects were found. Overall, men (n=50) chose optimally 58% of the time while women (n=150) did so 46% of the time. Males were more influenced by the nature of the incentive. As can be seen in Figure 2c, both genders behaved similarly under the points-only condition (38% and 39% for females and males, respectively) and both increased their optimality in the points+money condition, but males (74%) chose optimally significantly more often than females (54%). Surprisingly, the nature of the other participant did not matter in the slightest ($F(1, 192) = 0.8$, *ns*): when participants were told the other participant was a person

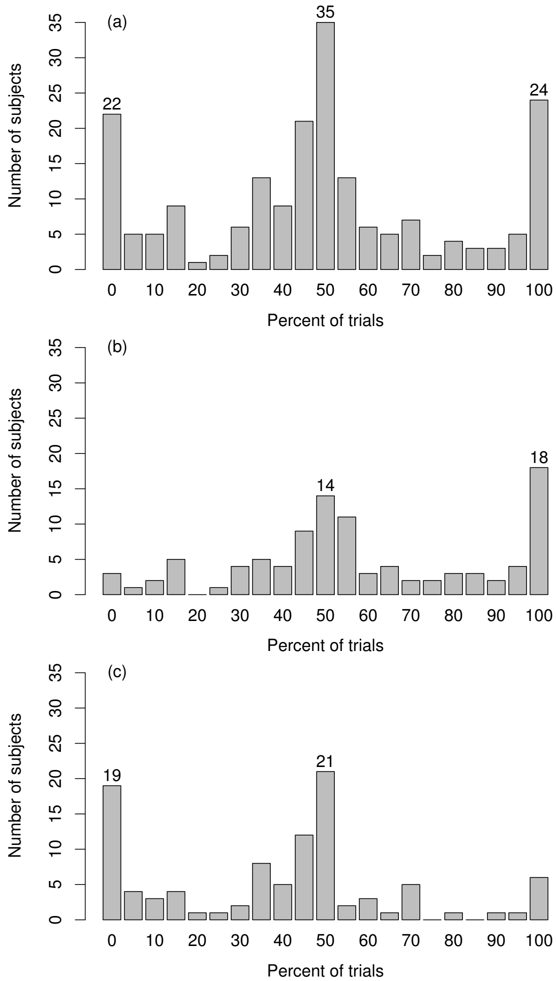

Figure 1: Number of participants and the percentage of the trials in which they chose the optimal option in Experiment 1. 0% indicates never choosing the optimal choice (i.e., acting purely competitively); 100% indicates perfect optimal behavior. 50% indicates choosing optimally in half of all trials, resulting in non-maximal, but equal (or nearly equal) scores for both players. (a) Data for all 200 participants. (b) Data for participants whose points were backed by money (n = 100). (c) Data for participants whose points were not backed by money (n = 100).

they chose optimally on 49% of trials; when they were told the other participant was the computer they chose optimally on 48% of the trials. This unexpected similarity held across both incentive conditions — those in the monetary/human and monetary/computer conditions each chose optimally 64% of the time, while those in the non-monetary/human and non-monetary/computer conditions chose optimally 41% and 37% of the time, respectively.

The first central finding is that participants' choices were not consistently optimal even though they have unfettered determination of the resource allocation in this study, a result consistent with prior research (van Lange, 1999). However in this game that choice also optimizes the payoff for the second participant (the putative human or computer in fact receives more than the participant does). Even if our criterion for optimality generously encompasses choosing the optimal payoff on 75% or more of the trials, only 41 of 200 participants acted optimally. This tendency held even when resources were being shared with an inanimate other. Even when monetary incentive was provided, the other participant was the computer, and the computer's cumulative score was not displayed for the participant (the condition in which selecting non-optimally made least sense of all), non-optimal choices were made on 41% of the trials.

Our second central finding is that a plurality of our participants tended to equalize the points allocated to the participant and to the other person or computer. Strict alternation between the payoffs occurred for 35 of the participants and 84 of the participants chose optimally on between 40% and 60% of trials inclusively. While this selection pattern is hardly optimal, it is consistent with notions that we have learned rules of fairness (Zizzo & Oswald, 2001).

The instructions for this experiment clearly had a game-playing flavor that may well have contributed to the degree of competitive, non-optimal choices made. Indeed, during debriefing, 46 participants spontaneously reported that hearing and/or reading the word "game" and/or "player" influenced their decision to choose competitively. Thus, Experiment 2 repeated the experiment with more neutral instructions. The replication would also afford the opportunity to ascertain whether monetary rewards would again lead to more optimal decisions and whether participants' decisions would again be unaffected by the nature of the other player (person or computer). Since the running tally of the other participant's score (the "salience" variable) proved to have no effect in Experiment 1, and since the significant effect of gender was of greater interest to us, we replaced the salience variable with gender in Experiment 2, equalizing the number of males and females in each condition.

3 Experiment 2

3.1 Method

3.1.1 Participants

A total of 156 (84 F, 72 M) young adult (M=20.5, SD=2.1 years) undergraduate students served as participants. Sixteen women and four men were dropped from the study for either misinterpreting the instructions or for being unconvinced that another person was involved in the exper-

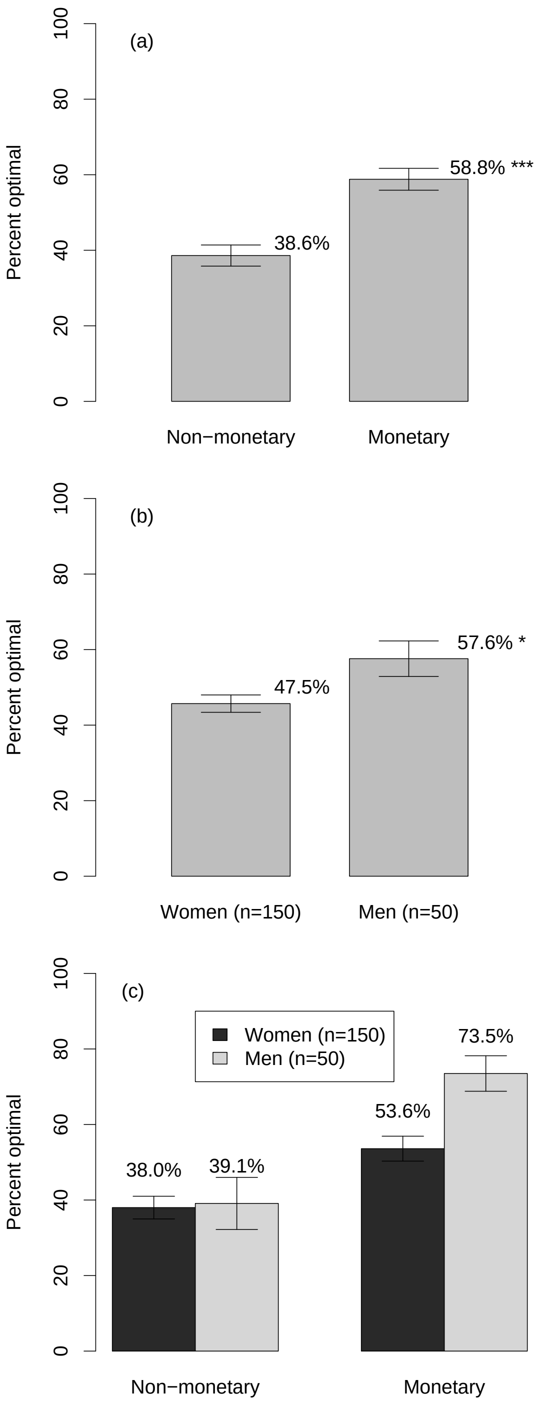

Figure 2: Percentage of trials in which participants chose the optimal over the competitive option as a function of a) reinforcement, b) gender, and c) reinforcement by gender in Experiment 1. (Table 2 lists the distribution of men and women across the conditions displayed in 2c.) Error bars are ± SEM. * p < .05. *** p < .0001.

iment (as determined during debriefing), leaving 68 of each gender evenly distributed in all conditions. Specifically, 17 participants of each gender were randomly assigned to the following conditions: a) monetary/human; b) monetary/computer; c) non-monetary/human; d) non-monetary/computer. As in Experiment 1, statistical analyses were carried out with the remaining 136 participants, as well as with all 156. The same conclusions and statistical findings occurred whether or not these students' data were included. All participants received course credit for volunteering their time; half received monetary compensation for the points they had earned in the course of their session. Students learned which condition (point backed by money or points alone) they were in just prior to their sessions. All participants reported being fluent English speakers, free of neurological/psychiatric disorders, and having normal or corrected-to-normal vision.

3.1.2 Design, stimuli, and procedure

The design, stimuli, and procedure for Experiment 2 were virtually identical to those used in Experiment 1, with the following exception: all terminology that could be considered as provoking competitive behavior on the part of the participant was eliminated. When presenting verbal instructions to the participants, the experimenter referred to the economic game only as a "scenario" or "activity," and to the other player as the "other participant," the "other person," or "the computer" (where appropriate). In addition, all computer-displayed information was re-written to reflect the same non-provocative language: "game" was replaced by "scenario," and "player" by "person" or "participant." A transcript of the computer-provided instructions is included in the Appendix.

4 Results and Discussion

Recall that, in Experiment 1, participants' choices produced a trimodal distribution with the three modes corresponding to the three straightforward strategies: equalizing payoffs; always selecting the optimal option by choosing the larger payoffs; always selecting the competitive option by choosing the smaller payoffs (Figure 1a). In Experiment 2, however, the trimodal distribution was replaced by a bimodal one as shown in Figure 3a. By eliminating the instructions suggesting a game, we also eliminated the mode above 0% indicating extreme competitiveness. As in Experiment 1 the primary mode was at 50%, suggesting a tendency to equalize payoffs. A secondary mode is seen at 100%, indicating choice of the optimal option. As in Experiment 1, the nature of the incentive made an important difference. As shown in Figure 3b, when points were exchangeable for money, a unimodal negatively skewed distribution emerged, with the mode at 100% (i.e., choosing optimally in every trial). When earned points were not exchangeable for money

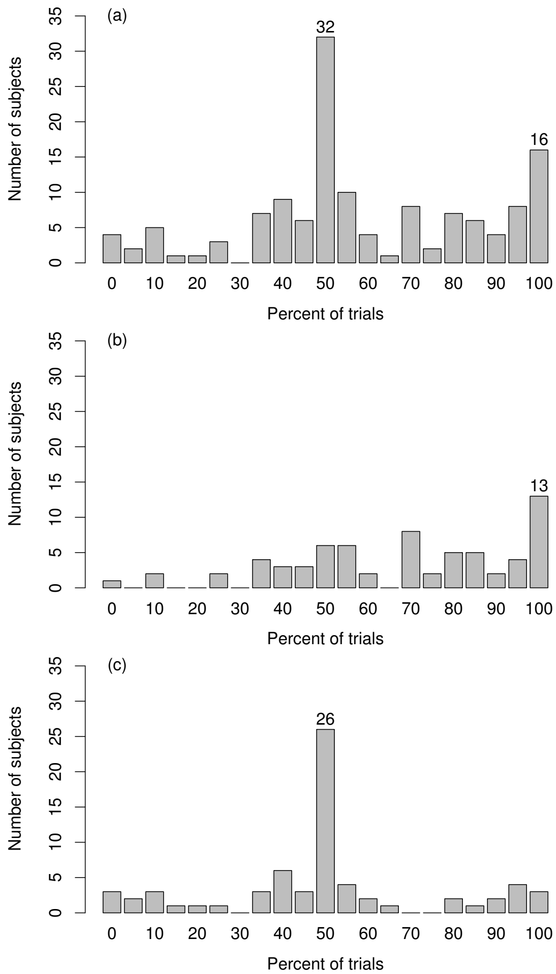

Figure 3: Number of participants and the percentage of the trials in which they chose the optimal option in Experiment 2. 0% indicates never choosing the optimal choice (i.e., acting purely competitively); 100% indicates perfect optimal behavior. 50% indicates choosing optimally in half of all trials, resulting in non-maximal, but equal (or nearly equal) scores for both players. (a) Data for all 136 participants. (b) Data for participants whose points were backed by money (n = 68). (c) Data for participants whose points were not backed by money (n = 68).

there was a unimodal distribution, with the mode at 50% (Figure 3c). A three-factor (2 Compensation by 2 Identity of P2 by 2 Gender) analysis of variance was significant, F(7,128) = 3.3, p<.003. Main effects of incentive (F(1, 128) = 16.6, p<.0001) and gender (F(1, 128) = 5.0, p<.03) were revealed, but there were no significant interactions. No other significant effects were found. In a pattern very similar to that seen in Experiment 1, participants whose points were backed by money chose optimally 68% of the time, while their counterparts only did so in 50% of their trials (see Figure 4a). Once again, men chose optimally more frequently (64% of trials) than women (54%); this result is displayed in Figure 4b. However, the significant incentive/gender interaction found in the prior experiment did not replicate: men were not significantly more influenced by the nature of the incentive, F(1, 128) = 0.2, *ns*. As can be seen in Figure 4c, males' and females' means in the points condition were 54% and 46%, respectively, while their means in the points+money condition were 74% and 62%, respectively.

As in Experiment 1 there was no difference in the results as a function of the nature of the other participant (person or computer). When participants were told that the other participant was a person they chose optimally on 61% of trials; when they were told that the other participant was the computer they chose optimally on 57% of the trials. This difference was not significant (F(1, 128) = 1.1, *ns*) and was in the opposite direction of what we had expected (more optimal decisions when the other participant was a computer). As with the previous experiment, this similarity held across both incentive conditions — those in the monetary/human and monetary / computer conditions, respectively, chose optimally 70% and 66% of the time, while those in the non-monetary/human and non-monetary / computer conditions chose optimally 52% and 47% of the time, respectively.

Thus, the results of Experiment 2 replicated those of Experiment 1 in all important respects, including the significant effects of monetary incentive and of gender, the tendency of a plurality of students to equalize payoffs, and the lack of an effect based on the nature of the other participant (person or computer). However, the nature of the instructions differed for the two experiments and this difference markedly affected the results. Specifically, when aspects of the instructions suggesting a game were removed, the likelihood of competitive choices was altered dramatically (compare Figures 1a and 3a, left sides).

5 General discussion

The sharing task studied in the present experiments offered participants repeated binary choices in which the payoffs for one outcome pair were higher for both players (and the chooser received the smaller payoff) and the payoffs for the other outcome were lower for both players (and the chooser received the larger payoff). On any given trial the participant was constrained to select between these two outcomes. Unlike the well-established Ultimatum and Dictator games, which do not constrain participants' choices in this way, the Sharing Game allows us to delineate between those who prefer to maximize their earnings and those who prefer a maximized relative advantage over the other.

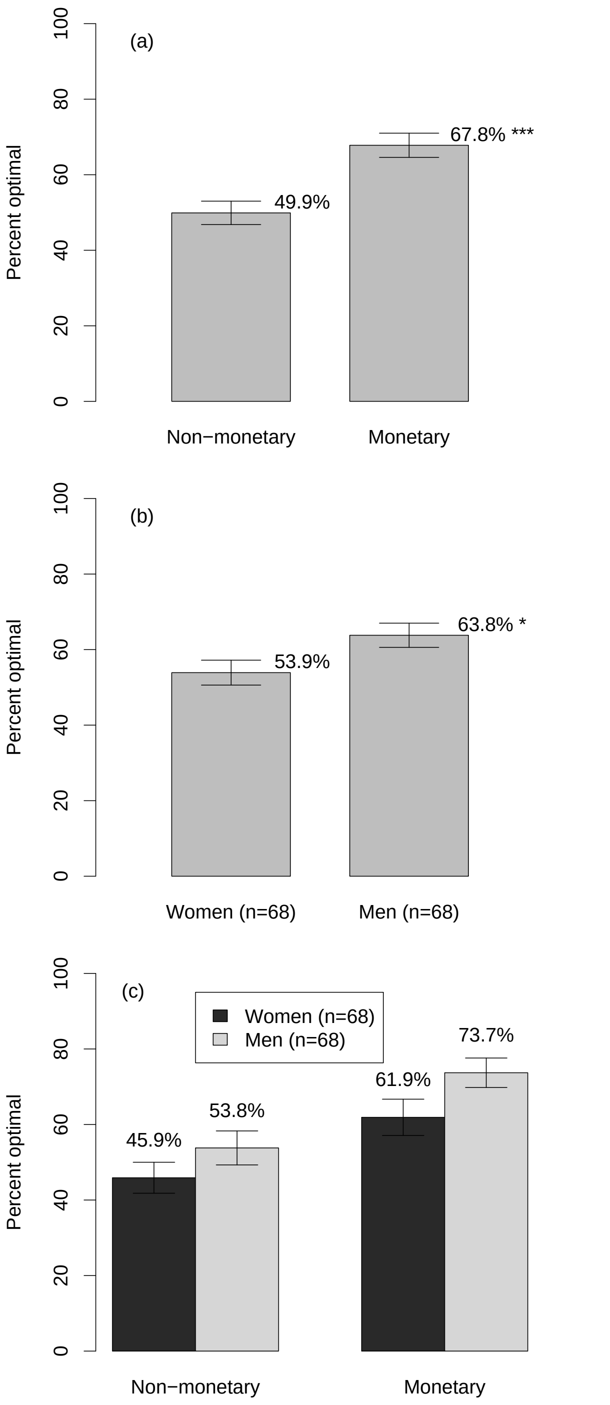

Figure 4: Percentage of trials in which participants chose the optimal over the competitive option as a function of a) reinforcement, b) gender, and c) reinforcement by gender in Experiment 2 (there are 34 participants in each of the four conditions displayed in 4c). Error bars are ±1 SEM. * $p < .05$. *** $p < .0001$.

Across both experiments, whether participants were told that the anonymous other was another student or a computer did not matter. Using such terminology as "game" and "player" in the in the first experiment was associated with an increased frequency of competitive behavior relative to the second experiment, which employed more neutral language. Males chose optimally more frequently than females (a gender-by-incentive interaction was revealed in the first experiment), and in agreement with prior research, participants in the monetary conditions acted more optimally than those in the non-monetary conditions. Overall, equality was the modal strategy employed.

Participants in our experiments did not show a difference in the way they treated a P2 they believed to be human versus a P2 they knew to be represented by a computer. The Computers Are Social Actors paradigm (alternately known as Social Responses to Computer Technologies, or SRCT) posits that people respond to computers in a social manner nearly equal to how they respond to other humans, and our results appear to support this. However, previous studies involved having the computer as more of an active partner rather than a silent observer serving mostly as a data input port. The computer partners used to study the CASA model were also programmed to display some aspect of human personality, be it a male or female voice (Nass, Moon, & Green, 1997), an animated face of a certain ethnicity (Nass, Isbister, & Lee, 2000), or emitting humorous remarks during the course of a task (Morkes, Kernal, & Nass, 1999). Unlike the computers in the aforementioned studies, our computers did not truly *inter*act with their users, nor were they programmed to simulate any personality characteristics: they did nothing beyond displaying textual instructions, visual information of what choices were available, how much was earned, and when the session was finished.

Although our results do not answer the question of why people respond to a computer the same way as to another person, they at least suggest that a computer need not imitate an overt aspect of human personality to elicit similar responses to it (probably the most personable thing our computers did was to preface its text instructions with the word, "Welcome!"). Despite these differences, the results are consistent with prior studies in showing no difference between how a participant acts upon the other participant (human or computer).[3]

Note also that deception cannot be an explanation of

[3] Of those in the monetary/computer conditions, 18 participants from Experiment 1 and 10 from Experiment 2 ended up with a greater number of points than the computer. In Experiment 1, 15 of those 18 explicitly stated that they wanted more points than the computer, but only 5 of them indicated that the "game" and "player" language influenced them to behave that way. In Experiment 2, 6 of the 10 directly indicated that they wanted to have a relative advantage over the computer. For example, one participant said, "I didn't want the computer getting more than me." Another, in the monetary/human condition said that if she were paired with a computer instead, she "would not care about its feelings; I would just want to beat it."

the result that some subjects sacrificed their own gains in order to achieve a relative advantage over the computer, since no deception was involved for participants in the computer conditions.

The lack of difference between the computer and human conditions could arguably be due to participants not believing that the other was really there, but among those in the human conditions, 72 of the 100 in Experiment 1 and 32 of the 68 in Experiment 2 did not indicate during debriefing that they even suspected that the other person was not real. The remaining 28 from the first experiment and 36 from the second stated that although they weren't absolutely certain that they were paired with another, they allowed for the possibility of such, and made their choices accordingly (participants who stated that they were certain that no other person was involved were dropped). Additionally, of those in the human recipient conditions, 21 from Experiment 1 and 38 from Experiment 2 stated that had their human recipients been computers instead, they would have made different allocation choices, suggesting that they did perceive the other as a real person. Excluding those who showed any doubt as to the other person's existence from our analyses did not affect the (non-)significance of the human/computer result in either experiment.

In their meta-analysis of gender and competition, Walters, Stuhlmacher, and Meyer (1998) stated that the contention that women behave more cooperatively than men had support, albeit limited: overall, "gender accounted for less than 1% of the variance (r^2) in negotiator competitiveness." The authors went on to state that in studies wherein partners had little contact with each other and the negotiations did not proceed beyond making choices to cooperate or compete, gender differences were virtually zero. This stands in contrast to the results of our studies, in which men consistently behaved more optimally (in an strictly economic sense) than women, who were more prone to sharing equally. However, their meta-analysis concentrated on matrix games such as the Prisoner's Dilemma, in which each player makes moves that directly influence both people's welfare. While our experiments were similar to those analyzed by Walters and colleagues with respect to the lack of contact between players (our second person was nonexistent), our participants made all the decisions that influenced both partners' welfare. It should be noted that Walters et al. (1998) emphasized their finding that the gender differences they revealed were, although significant, quite small, and prone to attenuation or even reversal, depending on the conditions of the study. Our own results are in keeping with this conservative outlook; although we found consistent gender differences in our studies, we also revealed that context can influence one to act more or less competitively in an allocation scenario.

It is conceivable that the gender/incentive interaction observed in Experiment 1 may be part of a larger, three-way interaction involving "game" terminology; i.e., being primed by the words "game" and/or "player" might influence men in the monetary conditions to act more optimally, or influence women in the same conditions to act less so. While there was no significant interaction in the neutral-language Experiment 2, the data were trending in the same direction as in the first experiment. Since a direct statistical comparison between the different uses of language is not feasible in the current experiments, it could be quite informative to conduct a future Sharing Game study incorporating gender, incentive type, and terminology as the independent variables.

Although it could be argued that presenting the same choice twice in a row may have induced people to make one choice first and the other one second, we suggested no such strategy (nor any other strategy) to our participants, nor did we tell them that each choice would be repeated. Also, while 44 participants in Experiment 1 and 39 participants in Experiment 2 expressed a desire for equality, only 22 and 15, respectively, alternated their choices to achieve this goal. Additionally, of those who alternated, none of them reported doing so simply because of the pattern being presented to them. They may have stated that they saw the pattern, but they also stated that they were seeking equality anyway. Zero participants said that the alternation pattern they had discovered influenced them to choose equitably.

Bazerman et al. (1992) reported data from somewhat related allocation decisions, albeit ones in which an equitable option was included. In a typical item participants were asked to choose between \$500 for themselves and another person or between \$600 for themselves and \$800 for the other person. In several conditions in each of two studies they found strong preferences for the more optimal outcome (here, \$600 / \$800). There was little evidence in their studies of the preference for equitable outcomes found in the present studies. There are several differences between their experiment and ours including the following: their participants were business students and accounting firm managers, whereas ours were undergraduates; they provided scenarios with their questions whereas we did not; they did not repeat the same trials whereas we did; the reward amounts they employed were approximately one hundred-fold in magnitude greater than ours; they used only hypothetical rewards whereas we used both hypothetical and actual monetary rewards. The results of the present experiment point to the role of procedural and contextual factors in the allocation decisions of our participants (for example, the nature of the incentives and the instructions). In that light and in light of the many differences in the procedures of the studies of Bazerman et al. (1992) and of the present studies, it is not surprising that the pattern of allocation decisions differ in the two sets of studies.

Allocation patterns from the current experiments also differ from those in Handgraaf, van Dijk, Wilke, and Vermunt (2003), which support social utility theory (Blount, 1995; De Dreu, Lualhati, & McCusker, 1994; Loewenstein, Thompson, & Bazerman, 1989; Messick & Sentis, 1985; van Dijk & Vermunt, 2000). Social utility theory predicts that participants given multiple allocations from which to choose would focus on the intrapersonal differences between the payouts (i.e., the difference in personal gain between one choice and its alternatives, regardless of what another person may gain in any of those outcomes), implying that in our paradigm, participants would choose optimally more often. Overall, our participants in Exp. 1 behaved optimally 49% of the time, while those in Exp. 2 did so 59% of the time, suggesting that, as a group, subjects devoted nearly equal attention to the interpersonal differences between the payouts as to the intrapersonal ones (numerous post-session interviews lend further credence to this interpretation). Thus, whereas our results differ from those of Handgraaf et al. (2003) quantitatively, in the sense of finding more equitable and less optimal choices, they support Handgraaf and colleagues' contention that both intrapersonal and interpersonal (i.e., the difference between one's own gain and that of any others within a given alternative) differences between payoffs help determine students' allocation decisions.

The results from the present experiments indicate that participants' choices in the Sharing Game were affected by the presence or absence of real monetary incentives as well as by whether or not the instructions lent a competitive flavor to the sharing task. Monetary incentives drove participants to be more optimal.[4] Because of the nature of the choices offered, more optimal choices were also less competitive since the other participant received an even larger payoff. When the instructions had a competitive flavor, including words such as "game" and "player", participants chose less optimally and more competitively. Together these findings suggest that while participants may conform to categorizations such as "competitor", "prosocial", or "individualist" (e.g., van Lange, 1999; van Lange et al., 1997), their conformity to these categories is by no means fixed, since their categorization appears to depend on situational context provided, for example, by the nature of incentives or instructions (e.g., Fantino & Stolarz-Fantino, 2003b).

It should also be noted that anecdotally, participants provided varying reasons for employing similar (and in some cases identical) choice patterns. For instance, among those whose scores were equal (or nearly equal) to those of Player 2, many claimed that sharing equally was indeed their goal, while some with the same scores stated that they were definitely competing with and wanted to "beat" the other player, but the margin for which they were trying did not have to be by more than a few points. Even though all of these participants' behavioral patterns categorize them as prosocial, it is likely that a number of those participants would contend that prosociality was *not* their intent.

Although choosing optimally and alternating can be respectively explained by reciprocal fairness and inequality aversion, neither type of social preference theory can readily explain the competitive behavior pattern observed. Although not directly addressed by the Sharing Game, the theories of reciprocity (e.g., Rabin, 1993; Falk & Fischbacher, 2000) may offer a possible explanation. Reciprocity theories state that people will act to help (hurt) those who help (hurt) them, or those who are *perceived* as potentially being helpful (harmful). Even though Player 2 could not act or react upon the participant, it is possible that the *perception* of the recipient as an opponent of sorts was enough to influence participants to act so as to hurt Player 2. This conjecture is supported by the fact that approximately 22% of the participants in Experiment 1 (in which potential competition-inducing language was used) acted competitively toward Player 2, while only about 9% of those in Experiment 2 (in which such language was absent) did so.

The results are also of interest in showing that a common response to the sharing task was to distribute the resources equitably (though non-optimally). Thus, the modal response for participants in both experiments combined was to maintain equal sums for themselves and the other participant. Across both experiments, 83 participants (25% of the total sample) expressed preferences for sharing equally, and 40 of these (12% of the total sample) strictly alternated their choices to achieve this goal. This tendency to arrange equitable payoffs is consistent with inequality aversion theories such as those of Fehr and Schmidt (1999) and Bolton and Ockenfels (2000). The fact that participants' responses were characterized by bimodal (and in one case a trimodal) distributions also supports social-value orientation theories that predict that participants' responses will fall into several categories or classes (e.g., van Lange et al., 1997). In support of De Dreu and McCusker's (1997) findings, the current experiments' results seem to indicate that these classes' response distributions were influenced by contextual differences. In conclusion, motivational context matters in the Sharing Game: the present results show that under certain conditions a typical participant may carry out an equitable selection strategy over either more optimal or more competitive strategies and that the allocation distribution produced will depend critically on the presence or

[4] This result held equally whether the other player was a person or computer. Interactions were not close to significant.

absence of both monetary incentives and of instructions suggesting that the task is a game. However, the produced allocation distribution will not depend on whether a second participant is perceived as another person or as a machine.

References

Bazerman, M. H., Loewenstein, G. F., & White, S. B. (1992). Reversals of preference in allocation decisions: Judging an alternative versus choosing among alternatives. *Administrative Science Quarterly, 37*, 220–240.

Bolton, G. E., & Ockenfels, A. (2000) ERC: A theory of equity, reciprocity, and competition. *American Economic Review, 90*, 166–193.

Blount, S. (1995). When social outcomes aren't fair: The effect of causal attributions of preferences. *Organizational Behavior and Human Decision Processes, 63,* 131–144.

Camerer, C. F., & Hogarth, R. M. (1999). The effects of financial incentives in experiments: A review and capital-labor-production framework. *Journal of Risk and Uncertainty, 19*, 7–42.

Case, D., & Fantino, E. (1989). Instructions and reinforcement in the observing behavior of adults and children. *Learning and Motivation, 20*, 373–412.

Charness, G., & Rabin, M. (2002). Understanding social preferences with simple tests. *Quarterly Journal of Economics, 117*, 817–869.

De Dreu, C. K., & McCusker, C. M. (1997). Gain-loss frames and cooperation in two-person social dilemmas: a transformational analysis. *Journal of Personality and Social Psychology, 72,* 1093–1106.

De Dreu, C. K., Lualhati, J. C., & McCusker, C. M. (1994). Effects of gain-loss frames on satisfaction with self-other outcome-differences. *European Journal of Social Psychology, 24*, 497–510.

Falk, A., & Fischbacher, U. (2000). A theory of reciprocity (Working Paper No. 6). University of Zurich: Institute for Empirical Research in Economics.

Fantino, E. (2001). Context: a central concept. *Behavioural Processes, 54,* 95–110.

Fantino, E., Gaitan, S., Meyer, S., & Stolarz-Fantino, S. (2006). Self-control in a prisoner's dilemma game: the role of trial spacing and an interfering task. *Journal of Behavioral Decision Making, 19,* 273–284.

Fantino, E., & Stolarz-Fantino, S. (2001). Behavioral and economic approaches to decision making: a common ground. *Behavioral and Brain Sciences, 24*, 407–408.

Fantino, E., & Stolarz-Fantino, S. (2003a). Context and its effect on transfer. *Greek Economic Review*, *22*, 11–26.

Fantino, E., & Stolarz-Fantino, S. (2003b). Experience and decisions. *Behavioral and Brain Sciences, 26*, 160.

Fehr, E., & Schmidt, K. (1999). A theory of fairness, competition, and cooperation. *Quarterly Journal of Economics, 114*, 817–868.

Forsythe, R., Horowitz, J. L., Savin, N. E., & Sefton, M. (1994). Fairness in simple bargaining experiments. *Games and Economic Behavior, 6*, 347–369.

Goodie, A., & Fantino, E. (1995). An experientially derived base-rate error in humans. *Psychological Science, 6*, 101–106.

Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum games. *Journal of Economic Behavior and Organization, 3*, 367–388.

Handgraaf, M. J. J., van Dijk, E., Wilke, H. A. M., & Vermunt, R. C. (2003). The salience of a recipient's alternatives: Inter- and intrapersonal comparison in ultimatum games. *Organizational Behavior & Human Decision Processes, 90*, 165–177.

Hertwig, R., & Ortmann, A. (2001). Experimental practices in economics: a methodological challenge for psychologists? *Behavioral and Brain Sciences, 24*, 383–451.

Loewenstein, G. F., Thompson, L., & Bazerman, M. H. (1989). Social utility and decision making in interpersonal contexts. *Journal of Personality & Social Psychology, 57*, 426–441.

Messick, D. M., & McClintock, C. G. (1968). Motivational bases of choice in experimental games. *Journal of Experimental Social Psychology, 4*, 1–25.

Messick, D. M., & Sentis, K. P. (1985). Estimating social and nonsocial utility functions from ordinal data. *European Journal of Social Psychology, 15*, 389–399.

Morkes, J., Kernal, H. K., & Nass, C. (1999). Effects of humor in task-oriented human-computer interactions and computer-mediated communication: A direct test of SRCT theory. *Human-Computer Interaction, 14*, 395–435.

Nass, C.I., Isbister, K., & Lee, E.-J. (2000). Truth is beauty: Researching conversational agents. In J. Castells (Ed.), *Embodied conversational agents.* Cambridge, MA: MIT Press.

Nass, C., Moon, Y., & Green, N. (1997). Are machines gender neutral? gender-stereotypic responses to computers with voices. *Journal of Applied Social Psychology, 27*, 864–876.

Nass, C.I., Steuer, J., & Tauber, E. (1994). Computers are social actors. *Proceedings of the CHI conference,* Boston, MA.

Nass, C.I., Steuer, J., Tauber, E., & Reeder, H. (1993). Anthropomorphism, agency and ethopoeia: computers as social actors. *Proceedings of the International CHI Conference,* Amsterdam.

Rabin, M. (1993). Incorporating fairness into game theory and economics. *American Economic Review, 83*, 1281–1302.

Rachlin, H. (1997). Self and self-control. In J. G. Snodgrass & R. L. Thompson (Eds.), *The self across psychology: Self-recognition, self-awareness, and the self concept.* New York, NY: Annals of the New York Academy of Sciences.

Reeves, B., & Nass, C. (1996). *The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places.* Cambridge: Cambridge University Press.

Stolarz-Fantino, S., Fantino, E., Zizzo, D., & Wen, J. (2003). The conjunction effect: New evidence for robustness. *American Journal of Psychology 116*, 15–34.

van Dijk, E., & Vermunt, R. (2000). Strategy and fairness in social decision making: Sometimes it pays to be powerless. *Journal of experimental social psychology, 36*, 1–25.

van Lange, P. A. M. (1999). The pursuit of joint outcomes and equality in outcomes: An integrative model of social value orientation. *Journal of Personality & Social Psychology, 77*, 337–349.

van Lange, P. A. M., De Bruin, E. M. N., Otten, W., & Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: Theory and preliminary evidence. *Journal of Personality & Social Psychology, 73*, 733–746.

Walters, A. E., Stuhlmacher, A. F., & Meyer, L. L. (1998). Gender and negotiator competitiveness: A meta-analysis. *Organizational Behavior & Human Decision Processes, 76*, 1–29.

Zizzo, D. J., & Oswald, A. (2001). Are People Willing to Pay to Reduce Others' Incomes? *Annales d'Economie et de Statistique, 63–64*, 39–65.

Appendix: Instructions displayed by the computer at the beginning of each session

Sample instructions from Experiment 1, for participants in the condition with points backed by money and a human P2

Welcome! You will be playing a brief game in which you will have a chance to earn actual money for yourself and for a second player. The task is fairly straightforward: on the screen you will be presented with two choices of point amounts to assign to yourself (Player 1) and Player 2. Click the box next to the set of numbers corresponding to your choice. Then click the 'OK' button at the bottom to update both players' earnings and proceed to the next trial.

PLEASE NOTE: As Player 1, YOU have sole control over not only how many points (and eventually dollars) you will attain, but ALSO how many points (and dollars) player 2 will attain. For both players, points will be converted to dollars on a 1 : 0.07 basis such that for every 1 point attained, $0.07 will be earned. All earned money will be paid out individually at the conclusion of the experiment.

Sample instructions from Experiment 2, for participants in the condition with points not exchangeable for money and a computer P2

Welcome! You will be taking part in a brief scenario in which you will have a chance to earn points for yourself and for a second participant (which will be represented by the computer). The task is fairly straightforward: on the screen you will be presented with two choices of point amounts to assign to yourself (Participant 1) and the computer (Participant 2). Click the box next to the set of numbers corresponding to your choice. Then click the 'OK' button at the bottom to update both participants' earnings and proceed to the next trial.

PLEASE NOTE: As Participant 1, YOU have sole control over not only how many points you will attain, but ALSO how many points Participant 2 will attain.