Public Goods Games in Japan:
Cultural and Individual Differences in Reciprocity

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Abstract

Social dilemmas, in which individually selfish behavior leads to collectively deficient outcomes, continues to be an important topic of research because of their ubiquity. The present research replicates, with slight modifications, public goods games previous run in the United States with Japanese participants. In contrast to recent work showing profound cross-cultural differences, the results of two studies reported here show remarkable cross-cultural similarities. Specifically, results suggest that 1) as in the U.S., allowing incremental commitment to a public good is effective for eliciting contributions, 2) individual differences in trust affect contributions, 3) the distribution of player types in the U.S. and Japan are very similar, and 4) the dynamics of play in the public goods games used here are strikingly parallel in the new Japanese data relative to the previous American data. These results are discussed in the context of the relationship between cross-cultural differences and economic institutional environments.
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Cultural and Individual Differences in Trust and Reciprocity

INTRODUCTION

Social Dilemmas and Reciprocity

Cross-culturally, there are many cases in which people face a social dilemma, in which their interests are pit against the interest of the group. In such situations, if everyone behaves “cooperatively,” the group as a whole is better off. However, if people act selfishly, the group as a whole suffers (Dawes, 1980; Liebrand & Messick, 1996; Komorita & Parks, 1995; Messick & Brewer, 1983). Social dilemmas can be dyadic, involving only two players, or larger, involving groups of various sizes.

Because of the importance and ubiquity of social dilemmas, substantial theoretical work (e.g., in evolutionary biology; Trivers, 1971) and empirical work (experimental psychology; Komorita & Parks, 1995) has attempted to delineate the conditions under which people choose to act cooperatively and the strategies that people use when they are involved in repeated, or iterated, social dilemmas (e.g., Wilson & Sell, 1997).

Reciprocity, responding to cooperation with cooperation and to defection with defection, has been a focal point of research (see, e.g., Kelley & Thibaut, 1978; van Lange, 1999). Reciprocity has been shown to be theoretically plausible from an evolutionary standpoint (Trivers, 1971), successful in computer simulations (Axelrod, 1984), and prevalent, indeed, universal, cross-culturally (Brown, 1991; Gouldner, 1960). In groups (N>2), reciprocity is somewhat more complex than in dyads for two reasons, both of which we explore here. First, an individual playing reciprocally in an iterated social dilemma has an array of strategic options, cooperating, for example, if and only if the majority of others in the group cooperate. Many other strategic rules are possible. Second, recent evidence suggests that there are individual differences in reciprocity in at least some social dilemma settings (see below).
A standard method for investigating cooperation in groups, and the one used here, is the “public goods game” (Isaac, McCue, & Plott, 1985). In a typical experiment, people in randomly assembled groups of four to eight people must decide how to divide money provided by the experimenter into two accounts. The Private account yields a return of one to one, and money placed into it is kept by the investing individual. The Group account has an interest rate \( h > 1 \), known by all participants. Money placed in this account is increased by the interest rate and shared equally among all group members. For any given group size, \( h \) can be chosen so that investment in the Group account increases the aggregate group payoff but decreases the investing individual’s payoff, generating a social dilemma (Dawes, 1980). A player’s contribution to the Group account is therefore an index of cooperation. Substantial evidence suggests that many people are willing to endure costs to benefit the group as long as other members of the group are doing so as well (Granovetter, 1978; Schelling, 1960).

**Individual Differences and Group Dynamics**

When public goods games are repeated, and players observe the total contribution by the group in previous rounds, a frequently replicated result is that the total contribution to the Group account begins at roughly 50% of the total aggregate endowments, but decreases from round to round towards zero. One explanation for this pattern is that players decrease their contributions over time because their trust that others will contribute is not fulfilled. Consider players who begin the game by contributing relatively large fractions of their endowments to the Group account in early rounds because they believe others will also do so. As they observe that others do not (i.e., “free riding”), initially highly cooperative players decrease their contributions. This leads naturally to a spiraling down of contributions (e.g., Andreoni, 1995; Ledyard, 1995).

This implies that a crucial factor in understanding the dynamics of play in these games is individual differences. Recently, Kurzban and Houser (2005) developed a method to classify
players into three types: free riders, who tend not to contribute to the public good independent of others’ contributions, cooperators, who contribute a great deal to the public good independent of others’ contributors, and lastly, the majority of their participants, reciprocators, who contribute as a positive function of others’ contributions, a set of types which has been previously observed (Fishbacher, Gächter & Fehr, 2001). Crucial to the present discussion, the dynamics of contribution decisions over time could be extremely well predicted by the type composition of groups.

This result implies that a rich understanding of cooperative group dynamics requires attention to individual differences (Messick & McClintock, 1968; van Lange & Semin-Goossens, 1998). The experiments reported here investigate differences both within and between participant populations. In particular, we report data from Japanese participants that constitutes a replication of two experiments first used in the United States (Kurzban & Houser, 2005; Kurzban, McCabe, Smith, & Wilson, 2001). Replicating these experiments is important for understanding whether the reciprocal strategies used in the West are idiosyncratic to that particular participant population or if there are important cross-cultural similarities. Although some evolutionary analyses imply that strategic similarity should be observed cross-culturally (e.g., Kurzban & Hauser, 2005), there are reasons to believe that cultural differences might have an important impact in these game environments (see below). The two experiments reported here show substantial cross-cultural similarity and what we take to be one important cross-cultural difference (in Study 2) which can be easily understood in the context of previously existing cross-cultural data.

STUDY 1

We used the “real time” public goods game first developed by Dorsey (1992) and extended by Kurzban et al. (2001). Under this method, players can continuously update their decisions in real time. Rounds last T seconds, where T is known to participants, during which
summary or individual information about others’ contributions is continuously updated and displayed. The player’s allocation to the public good at time T, if any, is taken to be her contribution for the round. The real time protocol is an appealing method for exploring reciprocity because it 1) allows players a range of reciprocal strategies, 2) permits easy manipulation of the information made available to participants, and 3) allows a look at group dynamics (Goren, Kurzban, & Rapoport, 2003; Goren, Rapoport & Kurzban, 2004; Kurzban et al., 2001).

Note that when players can adjust their contributions upward and downward during the round, information about others’ contributions amounts to little more than “cheap talk” – unenforceable communication about one’s intentions. However, when players can only increase their contribution to the public account, players can commit because once a player has raised his or her contribution to a particular level, they cannot reverse it. This mechanism allows players to make small commitments to the public good while allowing them simultaneously to limit their commitments so that they can control the extent to which they expose themselves to being “free ridden:” cooperating more than others. This fear of being taken advantage of appears to be a powerful motivation in these situations (e.g., Insko, Schopler, Hoyle, Dardis, & Graetz, 1990; Rapoport & Eshed-Levy, 1989). Consistent with this hypothesis, Kurzban et al. (2001) demonstrated that players (American participants) contributed more in the increase only (commitment) condition than in the increase/decrease (cheap talk) condition, in which people could not only increase but also decrease their contributions).

In addition to replicating Kurzban et al. (2001), Study 1 investigates the role of trust in this public goods environment. Trust has become an increasingly important research topic as its importance in a wide array of circumstances had come to be recognized (Fukuyama, 1995; Ostrom & Walker, 2003; Parks & Hurlbert, 1995). Trust, which has been variously defined, generally entails entering into arrangements – often exchanges of some type – in which one
incurs a cost without the other already having done so, often with the expectation of the delivery of a reciprocal benefit (see, e.g., Kurzban, 2003). Trust is valuable for any number of transactions, whether social or strictly economic, because it allows for mutually beneficial exchanges which could otherwise not take place. Even without guarantee mechanisms in place, for example, relatively anonymous bilateral transactions routinely occur through internet on such sites as E-Bay, presumably because buyers trust sellers to fulfill their part of the agreed-upon trade (Bolton, Katok, & Ockenfels, 2004).

Of course, extending trust is potentially costly. When interaction partners prove untrustworthy, one stands to lose the amount already invested in social or economic relationships, which can be considerable. If you trust me sufficiently to send me a check for $100 expecting that I will send you my vintage Mickey Mouse watch, if I prove untrustworthy and keep the watch, you are out $100.

The importance of trust is by no means limited to relatively small dyadic interactions. Indeed, trust has been found to be related to economic activity and growth at the level of national economies, with places with higher trust having higher rates of economic growth (Zak & Knack, 2001). It is therefore unsurprising that this topic has received a great deal of attention cross-culturally (e.g., Buchan, Croson, & Dawes, 2002), and the origins and consequences of differences in trust and trustworthiness represents an important research issue that cuts across disciplines.

Study 1 implements the increase only method in the real time game described above. One purpose of this current study was to examine whether the increase only mechanism would also be effective in Japan. This will help clarify a potentially important difference between participant populations in the U.S. and Japan. As Yamagishi (2003) recently put it, “research comparing the United States and Japan has repeatedly demonstrated that the level of general trust is much higher in American society than in Japanese society” (p. 352; see also Yamagishi,
Cook, & Watabe, 1998; Yamagishi & Yamagishi, 1994). If levels of trust in Japan are lower than in the United States, and trust plays an important role in decision-making in these games (e.g., Parks & Hurlbert, 1995), it should be possible to detect systematic differences in behavior in group cooperation games.

Note, however, that Yamagishi (2003) suggested that Japan has high “assurance” rather than high “trust.” That is, he argued that the Japanese are more trusting than their American counterparts if and only if there are institutional mechanisms in place that punish untrustworthy behavior. Japanese people, on this view, tend to “trust” only when it is in their interest to do so because of the (institutional or social) costs associated with being untrusting (Yamagishi, 1988).

Moreover, not only societal-level differences in trust, but also individual differences might be a crucial variable affecting behavior in these experimental games (Parks & Hurlbert, 1995). So, another purpose of Study 1 was to observe whether players’ different levels of trust would affect their contributions. In particular, participants were placed into groups based on their score on a self-report measure of trust (Yamagishi & Yamagishi, 1994), affording a comparison of groups with high trusters with low trusters. If it is the case that trust plays a significant role in play in public goods games, then differences should be observed under this sorting procedure.

Note that the increase only mechanism, which is helpful in preventing players from being free ridden, provides them with a kind of “assurance”. This suggests that, if Yamagishi’s (2003) argument is correct, then the mechanism should be more effective among Japanese than Americans. At the same time, the mechanism allows players immediately to see whether the other players behave reciprocally, allowing them to monitor if their expectations for the other players’ cooperation are fulfilled. Because high trusters are more likely than low trusters to cooperate by expecting others’ cooperation, high trusters can be predicted to contribute more
than low trusters at the beginning of the game. Once their expectations are fulfilled, high trusters should be more prompt than low trusters in contributing reciprocally in order to induce other players to increase their contribution.

In sum, our predictions were that 1) Japanese participants would contribute more, on average, than American participants in the previous study because of the assurance afforded by the increase only mechanism, 2) groups consisting of high trusters would contribute more over time than groups consisting of low trusters, 3) high trusters would show more reciprocal behavior than low trusters.

**Method**

**Participants.** Fifty Japanese undergraduates at Hokkaido University (6 females and 44 males) participated. They were prescreened based on average scores on the 6-item, 7-point trust scale developed by Yamagishi and Yamagishi (1994). Half of the participants were high trusters, who scored 4.6 and over on the trust scale, and the others were low trusters, who scored 3.4 and under. Five groups of 5 high trusters and 5 groups of 5 low trusters were run in each session.

**Procedure.** The procedure was identical to that used in the increase only and lowest contribution information condition in the real time public goods game conducted by Kurzban et al. (2001, Study 2). Each participant was seated in front of a computer in a booth in a laboratory room so that they could not see one another. The entire procedure was computerized. On the computer screen, participants were instructed that their task was to engage in 10 decision-making rounds and that they would receive cash depending on points they earned in these 10 rounds. In each round, participants were given 50 points and had to divide them between a Personal account and a Group account. Participants were told that their earnings would be determined by the number of points that they placed in the Personal account plus one-third of the sum of points placed by them and any members of their group in the Group account.

Each round started with 50 points in the Personal account and 0 points in the Group
account. Participants could only increase their contribution to the Group account during the round, which lasted 90 seconds. Points placed in the Group account during a round could not be replaced into the player’s Personal Account.

During each round, the current lowest contribution to the Group account was displayed in the center of the computer screen and updated as this value changed. The time left in the round was also displayed. When each round finished, participants received feedback about the total contribution to the Group account and how many points they earned. When all members indicated that they were ready to proceed, the next round started. After all 10 rounds were complete, participants were asked to complete a questionnaire exploring participants’ beliefs about the game.

Because pre-testing showed that participants had difficulty understanding that contributions by members of their group to the Group account increased their payoff, participants were told, unlike in Kurzban et al. (2001), that the sum of points in the Group account was multiplied by 5/3 first and then divided equally among members. The incentive structure here is thus equivalent to the previous study, but explained slightly differently.

Results

Trust and contribution levels. We conducted a 2 (levels of general trust) x 10 (round) repeated measures ANOVA on participants’ final contribution to the group account at the end of each round. There was a significant main effect of trust ($F(1, 48) = 4.79, p < .05$). High trusters contributed more than low trusters to the group account ($M_s = 29.5$ vs. 21.2). The ANOVA also revealed a significant main effect of round ($F(9, 432) = 5.10, p < .0001$). The trust by round interaction was not significant ($F(9, 432) = 1.44, p > .15$). As seen in Figure 1, contributions in both groups did not decline over the course of rounds, replicating the results of Kurzban et al. (2001). Moreover, contributions by high trusters always exceeded those in low trusters and somewhat increased over the course of the game. This stands in stark contrast to typical public
goods results in which contributions are lower, and decrease over time (Ledyard, 1995).

----- Insert Figure 1 about here ----- 

To evaluate differences in contribution levels between high and low trusters, we also analyzed contributions during the course of rounds. Three groups that showed high levels of contributions (2 high trusters’ groups and 1 low trusters’ group) achieved complete cooperation in at least one round. As seen in Figure 2, and observed in Kurzban et al. (2001), a kind of ratchet effect appeared because all members adjusted their contributions given the information of the lowest contribution, providing at least one point to the Group account very shortly after the information was updated. This suggests that, for at least some groups, participants are sensitive to the lowest contribution and provide points to the group account gradually, keeping their contributions close to the value of the lowest current contribution.

----- Insert Figure 2 about here ----- 

A straightforward prediction is that those who are high on the trust scale should be sensitive to the lowest contribution and willing to increase their contributions faster than their less trusting counterparts. To test the prediction that high trusters increased their rates of cooperation faster during the course of a round, we looked at the lowest contribution at the end of each 10-second interval (10, 20, …, 90 seconds) in each round and conducted a 2 (trust) X 9 (time) X 10 (round) repeated measures ANOVA. There was a significant main effect of trust (F(1, 80) = 4.21, p < .05). The lowest contribution level was higher in high trusters than in low trusters (Ms = 14.0 vs. 9.36). Moreover, the level increased over time (F(8, 640) = 106.6, p < .0001). Importantly, the Trust x Time interaction was also significant (F(8, 640) = 4.40, p < .0001), with the lowest contribution increasing faster for high trusters. These interactions are illustrated in Figure 3).

----- Insert Figure 3 about here ----- 

Questionnaire results indirectly indicated that high trusters behaved more reciprocally
than low trusters. High trusters were more likely than low trusters to think that their contribution to the group account encouraged other people’s contribution, $M_s = 5.60$ vs. 4.16 (on a 7-point scale in which 1 = “didn’t think at all,” 7 = “strongly thought;” $F(1, 48) = 10.98, p < .005$). High trusters were also more likely than low trusters to think that other people also thought that their contribution to the group account encouraged other people’s contribution ($M_s = 5.40$ vs. 4.56 (a 7-point scale in which 1 = didn’t think at all, 7 = strongly thought; $F(1, 48) = 4.31, p < .05$).

**Cultural differences in contribution levels.** To understand potential cross-cultural differences in contribution levels, we compared the current Japanese data with the American data in Kurzban et al. (2001, Study 2). Collapsing across levels of trust among the Japanese and comparing with the American data, a $2 \times 10$ (round) repeated measures ANOVA on contributions showed a significant main effect of culture ($F(1, 73) = 4.06, p < .05$). Contributions among Japanese ($M = 25.4$) were larger than among Americans ($M = 18.8$). The interaction between culture and round was also significant ($F(9, 657) = 3.17, p < .001$). This interaction is driven by the fact that the increase in contributions over the course of rounds was larger in Americans than Japanese.

We also conducted a $2 \times 9 \times 10$ (time x round) repeated measures ANOVA on the lowest contribution to the group account at the end of each 10-second interval. No effects including culture were significant. This implies that there was no cultural differences in the increase in the lowest contribution over time.

We also looked for potential cross-cultural differences in how players responded to others’ contributions by looking at the differences between each player’s contribution and the information they observed. To look at this, the difference between each member’s contribution and the lowest contribution at each second was computed. The averaged value for each round was used as a dependent measure. We conducted a $2 \times 10$ (Round) repeated measures
ANOVA. There was a significant main effect for culture, F(1, 130) = 31.98, p < .0001. The value for the American sample (M = 2.74) was much smaller than for the Japanese sample (M = 6.92). This suggests that Americans were more likely than Japanese to adjust their contribution levels to the current lowest contribution.

Discussion

The current study demonstrated that when people can incrementally increase their contribution to a public good without the possibility of removing contributions and observe the current lowest contribution, contributions to public goods were elicited among Japanese participants in a way that parallels the effect shown among American participants (Kurzban et al., 2001). In contrast to typical public goods results (Ledyard, 1995), contributions were sustained over the course of 10 rounds. This suggests that this mechanism, perhaps by virtue of its ability to allay contributors’ fear that they are being “free ridden,” can sustain cooperation even in very different cultures (Triandis, 1995).

Although this mechanism generated relatively high levels of contributions for Japanese participants independent of their level of trust, high trusters did contribute more, on average, than low trusters. This difference in contributions was apparent from the beginning rounds of the game and increased gradually. Moreover, the lowest contributor in the high trust group contributed more than the lowest contributor in the low trust group, with this value increasing faster for high trusters. The lowest contribution increasing faster for high trusters suggests that high trusters were more sensitive than low trusters to other people’s contributions and were more willing to increase their contribution depending on others contribution. This provides indirect evidence that high trusters behaved more reciprocally. Results from the questionnaire were consistent with this suggestion.

Comparing the current data with the American data in Kurzban et al. (2001), contributions among Japanese participants was somewhat larger. These higher levels of
contributions implies either greater cooperation in general among the Japanese participants or that the commitment mechanism was more effective among the Japanese. In light of arguments about the role of assurance in Japan (Yamagishi et al., 1998; Yamagishi & Yamagishi, 1994), it is plausible that the commitment mechanism among Japanese was effective because of its ability to limit the extent to which individuals who cooperate are not being taken advantage of by less cooperative individuals. The limitation on free riding might provide the type of institutional structure that fits with Japanese preferences regarding cooperation (Yamagishi, 1988).

The lack of a decline in contributions over the course of the ten rounds of play contrasts both with the standard result and the result in the American sample, in which contributions significantly increased over rounds. So, while the increase only/low information does lead to behavior different from that typically observed in the simultaneous version of the voluntary contribution mechanism, the effect differs in terms of the between-round dynamics observed in the U.S.. The differences in our measures of reciprocity also show U.S.-Japanese differences, particularly with respect to variation in within-round reciprocity. Broadly, these findings point to differences in reciprocal behavior — both within and between rounds of play — which point to potentially important directions for future research.

Specifically, the relatively flat curve for Japanese participants might reflect a tendency to maintain a given rate of contribution throughout the course of the session. This might explain the greater variation in the differences between observed information and contribution decisions among Japanese participants compared with American participants. That is, Japanese participants might be behaving, broadly, less reciprocally within a round (Cook et al., 2005).

**STUDY 2**

Study 1 revealed close correspondence between the behavior of American and Japanese participants. One possible reason for this is the strength of the institutional mechanism; perhaps
the increase only/low information elicits behavior that will be similar across contexts in the
same way that, for example, price mechanisms operate cross-culturally. That is, it is not
surprising to find that Japanese and Americans buy less of a good as the price of that good
increases because people across cultures share the ability to execute the relevant cost/benefit
computations. The mechanism in Study 1 might evoke homogeneity in behavior for essentially
the same reason: the underlying computations, a willingness to contribute at a level slightly
above the least cooperative member of a group, are the same cross-culturally.

Study 2 investigates if similar results can be obtained in a different environment, but
differs importantly from Study 1 in two key respects. First, Study 2, replicating Kurzban and
Houser (2005), uses a “circular” public goods game instead of the real time game. In the
circular game, participants simultaneously decide how many points of their endowment to
invest in the group exchange. Each game has a number of rounds after this initial decision. In
each round, one participant in each group is given an opportunity to change the number of
points invested in the group exchange. In making a decision, participants are allowed to
observe the current aggregate contribution to the group exchange. The game ends at a
predetermined random point. Contributions to the group fund at the point that the game ends
determine the payoffs for that game. Participants are informed of neither the number of rounds
each game has nor the number of opportunities they have to change their contributions in each
game. Each player is told that she will be given at least one opportunity to change her
contribution to the group exchange in each game. The circular game might be a “weaker”
mechanism – for example, the “increase only” restriction is not implemented in this game. This
leaves open the possibility that participants in Japan will play the game very differently from in
the U.S.

Second, in Study 2 we make a stronger prediction than in Study 1. Kurzban and Houser
(2005) used an algorithm (see “Type Classification,” below) to separate players in this game
into three “types,” Strong Cooperators, Free Riders, and Reciprocators. Based on evolutionary game theory and simulations, they suggested that there might be an observable mix of types. This implies that a similar distribution of types can be expected to be observed among Japanese participants. If so, this would be particularly interesting in the context of the possibility that groups in different places might equilibrate at similar distributions of these types.

However, given the discussion above regarding the possibility that Japanese participants are less likely to be trusting without an institutional enforcement mechanism, it could also be that the relatively limited number of Strong Cooperators found in the American sample might not be observed in the Japanese sample because Japanese participants can be expected to give their trust unilaterally less frequently.

**Method**

Sixty Japanese undergraduates at Hokkaido University (11 females and 49 males; see note regarding sex differences) participated in this study. They were run in five groups of 12 people. The procedure was identical to that used in Kurzban and Houser (2005). Each participant was seated in front of a computer in a booth in a laboratory. Except for the instructions, the entire procedure was computerized. Participants were told that the study was concerned with investment behaviors of an individual and a group. The instructions informed them that each participant would be assigned to a group consisting 4 people, and that their task was to divide 50 points initially given between an individual exchange and a group exchange. Participants were told that they would earn 1 yen per one point from the individual exchange, whereas each participant in the group would earn 0.5 yen per point from the group exchange. There were 10 games in the study though the number of games was not told to participants. Participants were randomly shuffled and reassigned to a group of 4 people in every game.

The circular game was implemented as described above. The numbers of rounds in the 10 games (excluding the initial decision stage) were as follows: 16, 7, 23, 32, 32, 34, 4, 17, 31,
8. When each game finished, participants received feedback about the total contribution to the group exchange and how many points they earned. When all members indicated that they were ready to proceed, the next game started with new groups of 4 people. After all 10 games were complete, participants were asked to complete a questionnaire, paid, and dismissed.

Results

*Aggregate contributions.* Final aggregate contributions to the group exchange in each round were averaged. As shown in Figure 4, the mean contributions decreased over the course of rounds from about 70% to about 30%. This pattern was the same that Kurzban and Houser (2005) found in the US.

*Type classification.* Kurzban and Houser classified behaviors of participants into three types (free-riding, unconditional cooperation, and conditional cooperation) by using a participant’s linear conditional-contribution profile (LCP). In order to compute each participant’s LCP, they regressed her/his contribution decisions to the group exchange on the aggregate contribution that s/he could see in making the decision. They defined each participant’s LCP as the outcome of the regression. Because the intercept can be considered an index of willingness to contribute regardless of contributions the other members made, it should be low among free-riders, whereas it should be high among unconditional cooperators. Moreover, because the slope of this regression indicates how responsive an individual was to other members’ contributions, it should be positive among conditional cooperators. Kurzban and Houser classified a participant as free-rider if her/his LCP was everywhere below 25, which means that her/his contribution was always less than half of the other members’ contributions to the group exchange. On the other hand, a participant was classified as an unconditional cooperator if her/his LCP was everywhere above 25. Finally, a participant was classified as a conditional cooperator if her/his LCP had a positive slope and was both above and below 25. We used the same procedures to classify participants into the three types based on their behavior in the first seven games (see
below). As a result, 15 out of 60 participants (25%) were classified as free-riders, 2 (3%) as unconditional cooperators, and 43 (72%) as conditional cooperators. Replicating Kurzban and Houser (2005), the number of conditional cooperators was the largest, whereas the number of unconditional cooperators was the smallest. The number of free-riders fell between the two groups. However, the proportion of unconditional cooperators differed marginally significantly from that in the American sample (11 out of 84 participants, 13%; Chi-square (1) = 3.45, p < .10).

In order to check whether group contributions were significantly different among the three types, we conducted a median test on the median contributions per game and found a significant difference (Chi-square (2) = 6.55, p < .05). The median group contributions of free-riders, conditional cooperators, and unconditional cooperators were 0, 30, and 50 points, respectively. We also conducted a median test on the median earnings per game among the three types. In spite of substantial differences in the group contributions, there was no significant difference in their earnings (Chi-square (2) = 2.32, n.s). The median earnings of free-riders, conditional cooperators, and unconditional cooperators were 72.5, 70, and 50 points, respectively. The standard deviation of the earnings for free-riders, conditional cooperators, and unconditional cooperators were 21.9, 20.0, and 22.3 points, respectively. These patterns were identical to those found by Kurzban and Houser (2005) in the US.

We used the type classification – which used only first seven games – to investigate whether these individual differences were stable across the entire experimental session. We refer to these first seven games as “in-sample” because they were used to assign players to types. We use the in-sample games to see if the information derived from them can be used to predict play in the last three games, which we refer to as “out-of-sample.” If play is stable across the experimental session, then the dynamics observed in the first seven games should resemble the dynamics of play in the last three, using the type composition of groups as the unit
of analysis.

Following Kurzban and Houser (2005), we attempted to distinguish groups by using an index of cooperativeness score. In order to compute a group’s cooperative score, Kurzban and Houser assigned 0 to each free-rider in a group, 1 to each conditional cooperator and 2 to each unconditional cooperator, and summed the scores of four members in each group. We used the same procedure and obtained group scores ranging from 1 to 5. Because participants were randomly matched in every game, by chance there was neither a group which included only free-riders nor a group which included more than one unconditional cooperator. Final aggregate contributions to the group exchange for the first seven (in-sample) games and the last three (out-of-sample) games in each cooperativeness score are plotted in Figure 5. Final aggregate contributions for both samples increased as a function of cooperativeness scores. This suggests that cooperativeness scores predict not only final aggregate contributions in-sample, but also contributions out-of-sample. Moreover, as shown in Figure 5, out-of-sample aggregate final contributions were within two standard errors of the in-sample aggregate final contributions. The tendency was also seen if final contributions over the course of rounds are plotted (Figure 6). Consistent with Kurzban and Houser (2005), we found that there was a predictable relationship between temporal patterns of group cooperation and the makeup of groups. That is, the dynamics of play obtained from the first 7 (in-sample) games replicated themselves to a substantial extent when similar groupings were formed in the last three (out-of-sample) games, suggesting that participants were relatively consistent in their play across the ten games, leading to similar dynamics within each arrangement of the three types within a group.

**Discussion**

A similar distribution of free riders, reciprocators, and unconditional cooperators was found in this Japanese sample. This distribution was free to vary with essentially no bounds, so the observation of such similarity might be taken to support the view that there are similar
mixed equilibria of types across populations, though there are of course many different possible avenues by which such equilibria might come to pass (Kurzban & Houser, 2005). Additional work in still other cultural contexts would be very valuable to see if the close correspondence of types in the U.S. and Japan is coincidental, or something more robust.

Further, as in the U.S. sample, player strategies were sufficiently consistent over the course of multiple games that when individuals were placed into new groups, the dynamics of play could be well predicted from the dynamics of similarly-composed groups in the first seven games. This suggests that people who play in these games both in the U.S. and Japan choose a strategy and use it throughout the session.

The very small number of unconditional cooperators – 2 in a sample of 60 – is suggestive. Though contributing independent of others’ contribution is not identical to Yamagishi’s (2003) suggestion that there is a cultural difference in giving trust without assurance, the paucity of players who are unwilling to cooperate independent of others’ willingness is interesting in this regard. Of course, given the marginal significance of this results, it should be interpreted with appropriate caution.

**GENERAL DISCUSSION**

The work reported here connects with the growing interest in how people respond to behavioral economics environments cross-culturally (e.g., Roth, Prasnikar, Okuno-Fujiwara, & Zamir, 1991), with recent research extending this work to a very wide variety of human cultures (Henrich et al., 2005, 2006). Broadly, this recent work, based primarily on the Ultimatum Game, has shown profound between-group differences. Cross-cultural variability surrounding cooperation versus selfishness is not new. A number of psychologists have argued, for example, that “collectivism” versus “individualism,” characterizes Eastern and Western societies respectively (Triandis, 1995), and that this has important implications for propensities toward cooperative versus selfish behavior (Smith, Dugan & Trompenaars, 1996; Wagner,
1995), with those in “collectivist” societies expected to be more cooperative than those in “individualist” societies. Recently, however, it has been proposed that the dimension of collectivism versus individualism is neither strong nor systematic (e.g., Oyserman, Coon, & Kemmelmeier, 2002).

We found some evidence for such a cultural difference in Study 1 in the form of differences in cooperation rates between Japanese and American participants. However, this difference was quantitatively small and the general patterns of results were similar, as were the dynamics of play. We observed a similar “ratchet effect”, suggesting a similar underlying use of behavioral strategies in the two populations. Study 2 illustrated similar cross-cultural patterns, including in the dynamics of play. These observations lead naturally to the question of why some researchers find profound differences (e.g., Yamagishi, 1988), while we find such similarities.

Henrich et al. (2005) suggested one source for a possible explanation: the ambiguities of behavioral economics experiments, which are, by design, conducted with minimal context to limit the impact of framing effects (e.g., Batson & Moran, 1999). As a result, the stylized setting of these experiments might lead to a certain degree of confusion (Andreoni, 1995; Houser & Kurzban, 2002; Kurzban, 2001), leading participants to try to map the unfamiliar and somewhat unusual experimental procedures presented to them onto something with which they are familiar. If this is the case, the more stripped of meaning the experimental context, the more the experiment is really addressing the way that participants map the experiment onto something familiar, and the less the experimenter is asking the same question about the preferences and strategies of people in different cultural environments.

A second possibility, alluded to above, is that the between-culture similarities observed here are due to a stronger pull of economic incentives. In the trivial case in which contributions to the public good are transparently a net gain for participants, it is reasonable to suspect that
behavior would be homogeneous, as the alignment of individual and group incentives would lead to universal or nearly universal contributions (Isaac & Walker, 1988). The institutional mechanism implemented in Study 1 is richer than an ultimatum game and simultaneously changes the incentive structure depending on the priors of the participants: if players have beliefs that others will contribute at levels just above the lowest current contributor, and believe that others believe this, pure self-interest will generate the ratchet pattern observed. In this case, the similarity derives from the relatively straightforward preference for pursuit of self-interest in both populations. This argument is more difficult to sustain in the context of Study 2, though there is no clear, objective metric for characterizing the “strength” of institutional arrangements.

The similarities in the findings reported here, compared with the “surprising” variation in the Ultimatum Game results reported by Henrich et al. (2005) point up the usual difficulties in evaluating differences in cross-cultural research. The fact we observe here striking similarities in games more complex than the Ultimatum Game in what have historically been considered very different cultures should alert us to the possibility that cross-cultural differences in behavior might mask important underlying similarities. This is not, of course, meant to minimize cultural differences, but rather to emphasize the importance of careful consideration of inferences that can be drawn from cross-cultural research (Burnham & Kurzban, 2005). Cross-cultural differences can come from many sources, including noise, translation problems, methodological variation, and, of course, differences in underlying concepts and preferences. Similarities, however, while plausibly having different causal antecedents, are potentially more informative as they speak to the likelihood of underlying similarity in psychological processes (Brown, 1991). In this case, the close resemblance in distributions of types in Study 2 opens up intriguing possibilities regarding the equilibration of different strategic types across different cultural contexts.

More generally, Japan represents an appealing country for replicating behavioral
economics experiments. Because of its technological sophistication, many experiments can be run in Japan that would be difficult or impossible in settings in which computer technology is less pervasive. At the same time, Japan has received a great deal of attention because of large and purportedly important differences compared to the West (Benedict, 1946). As such, additional collaborative work between the East (e.g., Japan, China, and Korea) and West using the relatively clean methods of behavioral economics might be extremely useful in mapping the details of individual and cross-cultural differences in social preferences.
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Notes

1 This biased sex ratio of participants is due to the pool from which they were drawn. Findings that sex differences in social dilemmas are limited (Sell, 1997) suggests that there is little reason to be concerned that this limits generalizability. See Simpson, 2003, for a recent discussion.

2 Collapsing levels of trust in Japanese and comparing with American data is potentially problematic because Japanese participants were not randomly selected, as American participants were. While aware of this difficulty, we nonetheless conducted the analysis because it is potentially informative regarding potential cross-cultural differences in behavior in public goods games.
Japan

US (Kurzban et al., 2001, Figure 4.)
A: Groups with cooperativeness scores = 2

B: Groups with cooperativeness scores = 3

C: Groups with cooperativeness scores = 4
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