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Cooperation beyond group boundaries is evaluated differently depending on the existence of intergroup competition

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Do reputational mechanisms hinder or promote cooperation beyond group boundaries? This study explores the possibility that individuals lose reputational benefits within their group when they cooperate beyond group boundaries. We examined the evaluations of those who cooperated only with ingroup members (i.e., ingroup favoring strategy) and those who cooperated with both ingroup and outgroup members (i.e., universalistic strategy) by manipulating the existence of intergroup competition through an incentivized behavioral experiment. The results show that individuals' reputations were evaluated differently depending on conditions. In the competitive condition, the ingroup favoring strategy was evaluated more positively than the universalistic strategy. In the non-competitive condition, the universalistic strategy was evaluated as positively as the ingroup favoring strategy. The reputational dynamics of indirect reciprocity are less likely to promote cooperation beyond group boundaries, particularly in the existence of intergroup competition.

KEYWORDS

reputation, cooperation, intergroup, indirect reciprocity, behavioral experiment

1 Introduction

With the progress of globalization, opportunities for interacting with others are increasing not only within one's group (country, ethnicity, race, etc.) but also beyond its boundaries (Buchan et al., 2009; Gross et al., 2023). For instance, the number of international migrants has increased in all UN regions (McAuliffe and Khadria, 2019), resulting in people of various nationalities and ethnicities living together in the same country. Furthermore, we can interact with people living on the other side of the world through the Internet. Thus, it is potentially beneficial for us to build cooperative exchange relationships with those we have not met before by taking advantage of technologies that did not exist 100 years ago. However, people often do not take advantage of such opportunities and confine themselves to existing relationships. Many studies have suggested that individuals tend to cooperate more with their own group members (ingroup members) than with other group members (outgroup members; Tajfel et al., 1971; Yamagishi et al., 1999; Yamagishi and Kiyonari, 2000; Balliet et al., 2014). This behavioral tendency is called "ingroup favoring behavior" and is observed across cultures (Romano et al., 2017, 2021). To resolve the discrepancy between the need for cooperation beyond

group boundaries and the behavioral tendency of ingroup favoring behavior, it is crucial to examine the factors by which cooperation beyond group boundaries is either hindered or promoted. This study aims to address this issue.

Yamagishi and colleagues proposed the bounded generalized reciprocity (BGR) hypothesis to explain why people cooperate more with ingroup members than with outgroup members (Yamagishi et al., 1999; Yamagishi and Kiyonari, 2000). According to the BGR hypothesis, people expect a generalized exchange system to exist only within a group. Using the terminology of social exchange theory, among three or more individuals, when one's giving is reciprocated not by the recipient but by another person, it is called a generalized exchange (Takahashi, 2005). The BGR hypothesis argues that within the group, each member gives their resources to another with the expectation that they will be reciprocated by someone within the group but not necessarily the person to whom they gave their resources. However, they do not expect indirect reciprocation beyond group boundaries. This is why they do not cooperate with outgroup members. Furthermore, Yamagishi and Mifune (2008) provided an additional explanation for ingroup favoring behavior, arguing that people are motivated to avoid acquiring a negative reputation and eventually being ostracized from their group.

Studies on the evolution of altruism by indirect reciprocity lie in the background of the BGR hypothesis. Unilateral resource giving can be adaptive if giving is reciprocated not by the recipient but by another person. Recent theoretical studies have shown that discriminating altruist, who gives their resources only to those who have earned a good reputation, can evolve, although how players process reputational information differs between strategies (Alexander, 1987; Nowak and Sigmund, 1998).[1] The common feature of the adaptive strategy is that individuals decide whether to give their resources to recipients conditional on their reputations (Nowak and Sigmund, 1998; Panchanathan and Boyd, 2003). Thus, in a system of indirect reciprocity, acquiring a negative reputation within a group can lead to exclusion. In other words, reputation works as currency in a system of indirect reciprocity. Both field and experimental studies have suggested that cooperative individuals are likely to acquire a positive reputation, and those with a positive reputation are more likely to receive resources from others than are those with a negative reputation (Gurven et al., 2000; Gurven, 2004; Wedekind and Milinski, 2000; Engelmann and Fischbacher, 2009; Feinberg et al., 2014; Wu et al., 2015, 2016, 2021).

Adopting Yamagishi and his colleagues' perspective (Yamagishi et al., 1999; Yamagishi and Kiyonari, 2000; Yamagishi and Mifune, 2008), the current study defines the group as a container of a generalized exchange and focuses on examining how cooperative behavior toward "whom" affects reputation within the group. The BGR hypothesis assumes that ingroup members' reputations are determined by their interactions with other ingroup members. For instance, ingroup members who cooperate with other ingroup members acquire a positive reputation within the group. By contrast, those who do not cooperate with other ingroup members acquire a negative reputation. However, the BGR hypothesis does not consider the possibility that the reputation of ingroup members is determined by how they interact with outgroup members (i.e., whether a member of Group A cooperates with a member of Group B). How ingroup members evaluate their cooperation with outgroup members is empirically unknown. If ingroup members evaluate cooperation with outgroup members positively, those who cooperate with outgroup members can acquire a positive reputation and receive reciprocal benefits within the group. In this situation, cooperation with outgroup members can be promoted. Conversely, if ingroup members evaluate cooperation with outgroup members negatively, those who cooperate with outgroup members can acquire a negative reputation and may not receive reciprocal benefits within the group. In this situation, individuals may hesitate to cooperate with outgroup members and cooperation with them could be hindered. To summarize, not only behaviors toward ingroup members, but also behaviors toward outgroup members could affect the reputation and dynamics of cooperation.

Several theoretical studies have considered the possibility that interactions with outgroup members affect reputation within a group (Jusup et al., 2014; Matsuo et al., 2014). In a mathematical modeling study, Matsuo et al. (2014) examined the evolutionary dynamics of cooperation when cooperation with outgroup members was negatively evaluated within the group. In their model, a group includes two types of agents: agents who employ an ingroup favoring strategy (i.e., cooperating only with ingroup members) and those who employ a universalistic strategy (i.e., cooperating with both ingroup and outgroup members). Agents who employ the ingroup favoring strategy always negatively evaluate ingroup members who give their resources to outgroup members. Agents who employ the universalistic strategy positively evaluate ingroup members who give their resources to outgroup members when the outgroup members have positive reputations. Owing to the differences between the two strategies, the agents who employ the ingroup favoring strategy and those who employ the universalistic strategy evaluate each other negatively when there are opportunities to interact with outgroup members. Consequently, when the majority of the group employs the ingroup favoring strategy, the agents who employ the universalistic strategy are worse off than those who employ the ingroup favoring strategy and the former become extinct and vice versa. This result implies that, if the majority of group members employ the ingroup favoring strategy, cooperation beyond group boundaries (i.e., the universalistic strategy) is less adaptive.

As Matsuo et al. (2014) utilized mathematical modeling, it remains to be seen how people in the real world evaluate cooperation beyond group boundaries. In other words, we do not know whether people have evaluative and behavioral tendencies similar to those of the ingroup favoring strategy. To explore this possibility, we examined how people evaluated individuals who cooperated solely with ingroup members (i.e., ingroup favoring strategy) and those who cooperated with both ingroup

1 Nowak and Sigmund (1998) proposed the image scoring strategy, which determines behavior based on whether the current recipient gave their resources to their recipient when previously playing the role of a donor. Subsequently, more complicated strategies, which utilize not only the past behavior of the recipient but also the reputation of the current recipient's past recipient, have been proposed (Panchanathan and Boyd, 2003; Ohtsuki and Iwasa, 2006; Pacheco et al., 2006; Takahashi and Mashima, 2006).

and outgroup members (i.e., universalistic strategy). Only a few studies have so far investigated the reputations of members who cooperate beyond group boundaries (Killen et al., 2013; Tateishi et al., 2021), and these are vignette studies; specifically, Killen et al. (2013) depicted daily life scenarios, while Tateishi et al. (2021) described behaviors in an allocation task between ingroup and outgroup members. Both studies indicated that those who employ a universalistic strategy are evaluated more positively than those who employ an ingroup favoring strategy. However, drawing conclusions based on these findings may be premature. As such, several issues remain unresolved. First, the effect of intergroup competition on evaluations of cooperation among outgroup members has not been thoroughly investigated. Sherif and Sherif (1953) argued that competition for desired resources between groups enhances intergroup conflicts. De Dreu et al. (2022) suggested that resource scarcity makes individuals feel stressed and justifies the removal of resources from other groups. In a situation where intergroup competition exists, an ingroup member who cooperates with outgroup members can be regarded negatively by other ingroup members and ostracized from their group. To examine whether intergroup competition affects the reputation of the two types of individuals, we conducted a laboratory experiment that manipulated the existence of intergroup competition. Second, the relationship between people's behavioral tendencies and their evaluations of other ingroup members remains unclear. To reveal whether people have evaluative and behavioral tendencies similar to the ingroup favoring strategy, it is crucial to examine whether ingroup favoring behavior is negatively associated with the tendency to evaluate cooperation with outgroup members. Third, previous studies (Killen et al., 2013; Tateishi et al., 2021) were not incentivized. As previously mentioned, these were vignette studies in which respondents evaluated the target as a third party. In other words, they did not decide how much they would cooperate with the target or other ingroup and outgroup members. However, without this incentive, the impact of intergroup competition would be weak, and it would be difficult to measure actual cooperative behavior. To resolve these three issues, using a behavioral laboratory experiment, we investigated the evaluation of targets (i.e., ingroup favoring strategy and universalistic strategy) and the association between ingroup favoring behavior and evaluations of the target to shed light on whether individuals show patterns corresponding to the ingroup favoring strategy.

This study examines how individuals evaluate ingroup members who employ either the ingroup favoring or universalistic strategy by manipulating the existence of intergroup competition. In each condition, the participants were divided into two groups. They determined how much to give their resources to ingroup and outgroup members. Participants then evaluated ingroup members, one of whom employed the ingroup favoring strategy and another who employed the universalistic strategy. To examine this evaluation, we measured the impressions of each ingroup member (i.e., evaluation items). In addition, we measured their willingness to provide resources to each ingroup member based on their choice of the target game. We also explored the relationship between their behavioral tendencies in the giving game and their evaluation of the target who employed ingroup favoring and universalistic strategies.

In the competitive condition, cooperation with outgroup members reduces the benefits of an ingroup member. Therefore, we predict that members who employ a universalistic strategy will be evaluated more negatively than those employing an ingroup favoring strategy. However, in the non-competitive condition, cooperation with outgroup members do not reduce ingroup members' benefits. Therefore, based on previous studies (Killen et al., 2013; Tateishi et al., 2021), we predict that members who employ a universalistic strategy will be evaluated more positively than those employing an ingroup favoring strategy.

2 Methods

2.1 Participants

We recruited 118 undergraduate students (52 men, 62 women, and four participants of unspecified sex) with a mean age of 20.9 years. Participants were recruited from a large participant pool that consisted of students from various departments on campus. Monetary rewards were emphasized as an incentive for participation in the recruitment announcement.

This study was approved by the Ethics Board of the authors' institution, and all participants completed a consent form.

2.2 Design

We used a 2 (existence of intergroup competition: competitive vs. non-competitive) × 2 (strategy of target: ingroup favoring vs. universalistic) design, with the former as a between-subjects factor and the latter as a within-subjects factor.

2.3 Procedure

Participants took part in a laboratory experiment that consisted of three main parts: the giving game, the evaluation task, and the choice of the target game.

Eight individuals participated in each session except for one session. Owing to a same-day cancellation by two participants, we conducted one session with six participants. Upon arrival, each participant was greeted individually by a receptionist, who assigned them an ID number to ensure anonymity. Following this, each participant was seated in a private booth in the laboratory and asked to complete a consent form. The presentation of instructions, as well as the participation in games and a task in the experiment, were conducted on the computers in the booths.

Once all participants had arrived, they started to read the experimental instructions. The instructions included the overall flow of the experiment, the rules for each task and game (i.e. the giving game, the evaluation task, and the choice of the target game). Participants were informed of the rules based on the condition they were assigned to and were unaware of the existence of the other condition. After reading the instructions, participants had to

successfully answer questions that tested their understanding of the rules and ability to calculate payoffs.

Then, participants were randomly divided into two equal groups by drawing lots.[2] Instead of using the minimal group task for group assignment (Tajfel et al., 1971), we conceptualized the group as a container of indirect reciprocity. Participants were instructed that their behaviors in the giving game would be shared only within their ingroup and that they would only evaluate ingroup members. Participants did not have access to information about the behaviors of outgroup members, nor did they evaluate outgroup members. Owing to this experimental setting, participants perceived that they were evaluating each other within their group. These manipulations established a group as a container of indirect reciprocity, which corresponds to the definition of BGR hypothesis.

After all participants had finished drawing lots for group assignment, they began playing the giving game. The rules of the giving game were as follows: all participants were simultaneously assigned as both donors and recipients. As a donor, each participant was given JPY 150. They decided how much of the JPY 150 to transfer to their recipient in increments of JPY 50 (i.e., 0, 50, 100, 150). The money transferred to their recipients was doubled and given to the recipient. This means that when donors decided to transfer more than 0, they incurred a cost to benefit their recipient. In addition, the benefit to a recipient is greater than the cost to a donor. Therefore, the amount of money transferred by the participants was a measure of cooperation. Participants played the giving game once with an ingroup member and once with an outgroup member. Each participant was given JPY 150 for each recipient—one from their ingroup and one from their outgroup. As recipients, participants also received money from a donor belonging to their ingroup and another from their outgroup.

Subsequently, the participants engaged in the evaluation task. They were informed that they could view the behaviors of other ingroup members in the giving game (i.e., the amount of money transferred to ingroup and outgroup recipients). In the evaluation task, the other ingroup members were referred to as "targets." However, these targets' behaviors were not the actual behaviors of other ingroup members; instead, we set three fictional targets. Each of the three targets employed one of three extreme strategies: the ingroup favoring strategy [gave the maximum amount (JPY 150) to an ingroup recipient and nothing to an outgroup recipient], the universalistic strategy [gave the maximum amount (JPY 150) to an ingroup recipient and an outgroup recipient], and the AllD strategy (gave nothing to either). In this evaluation task, the participants evaluated these three targets. The evaluation items were based on Tateishi et al. (2021) and were measured on a seven-point scale (see Table 1). As the current study aimed to compare participants' evaluations of the ingroup favoring and universalistic strategies, we focused mainly on the evaluations of these two strategies.

TABLE 1 Evaluation items.

	Evaluation items
Q1.	Dislikable - Likable
Q2.	Untrustworthy - Trustworthy
Q3.	Not beneficial to the group - Beneficial to the group
Q4.	Cannot read between the lines - Can read between the lines
Q5.	Have few friends - Have many friends
Q6.	Likely to be disliked by those around one - Not likely to be disliked by those around one
Q7.	Annoying - Not annoying
Q8.	Not wise – Wise
Q9.	I don't want to help Person A even if Person A is in trouble - I want to help Person A when Person A is in trouble
Q10.	I don't want to be in the same group with Person A if groups are reorganized - I want to be in the same group with Person A if groups are reorganized.
Q11.	I don't want to become a friend with Person A - I want to become a friend with Person A

After completing the evaluation task, the participants played the choice of the target game. In this game, participants were given JPY 100. They chose one of the three fictional targets (i.e., ingroup favoring strategy, universalistic strategy, AllD strategy) as their recipient to give JPY 100. They did not have the option of keeping the money. The JPY 100 did not double, which means that the recipient received JPY 100. To compare the evaluations of those who employed the ingroup favoring strategy and the universalistic strategy from the ingroup members' perspective, we used fictional information for the targets. To ensure that the use of fictional targets did not disadvantage the participant's benefit, after the choice of the target game, all participants were rewarded JPY 100.

After completing the choice of the target game, each participant's earnings were determined. Subsequently, participants completed a post-experimental questionnaire. Finally, each participant received their payment and left the laboratory separately. Participants received a debriefing after all experimental sessions had concluded.

2.4 Manipulation of intergroup competition: competitive vs. non-competitive condition

Intergroup competition was manipulated by the manner in which bonuses were provided. At the end of the experiment, in addition to individual earnings in the giving game, participants could receive a bonus. The bonus amount was determined through the following steps. First, we summed the total amount of money each group member received in the giving game before it was doubled. We called this "group resources." For example, if each member received the following amounts [Member A: JPY 200, Member B: JPY 300, Member C: JPY 200, Member D: JPY 100],

2 The instructions stated that each group would consist of four members. In the session with six participants, there was a discrepancy in the actual number; however, as each participant was individually escorted to a booth with a door, participants were unaware of the total number of participants per session.

the group resources would total JPY 800. An equal share of group resources becomes a bonus. In this example, the bonus amount was JPY 200 for each member.

However, whether all participants could receive a bonus or not differed depending on the condition. In the competitive condition, a bonus was given only to members of the group that accumulated more group resources than the other group. For example, if Group 1's resources were JPY 800 and Group 2's resources were JPY 600, only the members of Group 1 could receive the bonus (i.e., each member received JPY 200). By contrast, in the non-competitive condition, all members of both groups could receive a bonus.

3 Results

In the post-experimental questionnaire, four participants commented that the three targets might be fictional and that the targets' behaviors might have been controlled by the experimenter. Therefore, we excluded their data from the analysis (after exclusion: competitive condition, $n = 60$; non-competitive condition, $n = 54$).

We utilized Bayesian estimation in regression analysis for two reasons. First, as the target was a within-subject factor in this study, using a mixed model was essential for the analysis. Bayesian estimation was considered preferable to Maximum Likelihood Estimation (MLE) when applying a mixed model, as MLE tends not to provide uniquely determined estimates. Additionally, in contrast to MLE, Bayesian estimation via Markov Chain Monte Carlo (MCMC) methods is advantageous in reducing estimation bias, particularly when sample sizes are small (McNeish and Stapleton, 2016). Second, we did not conduct sample size planning prior to the experiment; instead, the sample size was determined based on available funds for participant fees. As significance testing without proper sample size planning is not advisable, we chose Bayesian analysis, which is less affected by sample size limitations.

3.1 Evaluation

Exploratory factor thanalysis with an oblimin rotation of 11 items yielded the expected factor. We selected items that loaded high (above 0.5) on a factor and constituted a positive evaluation scale (Q1, Q2, Q3, Q4, Q7, Q8, Q9, Q10, and Q11: Cronbach's $\alpha = 0.89$). Q5 ("Have many friends") and Q6 ("NOT likely to be disliked by those around one") did not load high enough to be included in this factor; thus, we decided to exclude them from the scale and analyze them individually. We mainly report the positive evaluation scale here; the results of Q5 and Q6 are reported in the Data availability statement.

We conducted a Bayesian linear mixed model analysis on the positive evaluation scale. The response variable was the positive evaluation scale. The explanatory variables were the strategy of the target (within-subjects factor: ingroup favoring strategy, universalistic strategy), the existence of intergroup competition (between-subjects factor: competitive, non-competitive), and the interaction between these variables. The statistical model was as follows. We set the participants as a random effect

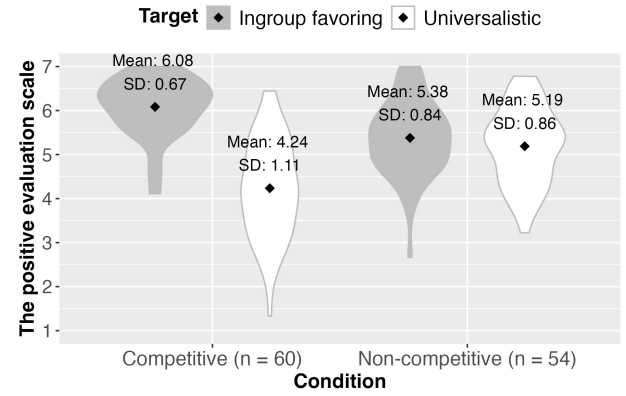

FIGURE 1
Violin plot of the positive evaluation scale.

(r_i). The reference category for the condition was the non-competitive condition (0) and the reference category for the target was the universalistic strategy (0). To interpret the interaction effect, we divided the cases into those in which condition = 0 (non-competitive condition) and condition = 1 (competitive condition). In case (i), where condition = 0, we can assess the effect of the target's strategy on the non-competitive condition by referring to parameter b_2. In case (ii), where condition = 1, we can assess the effect of the target's strategy on the competitive condition by referring to parameter $b_2 + b_3$.

$$
\begin{aligned}
Y_i &= b_0 + r_i + b_1{*}condition + b_2{*}target \\
&\quad + b_3{*}condition{*}target + e \\
&= b_0 + r_i + b_1{*}condition + \left(b_2 + b_3{*}condition\right){*}target + e \\
&\left(Y_i|target = 1\right) - \left(Y_i|target = 0\right) = b_2 + b_3{*}condition \\
&(i)\ condition = 0\ (non - competitive):\ b_2 \\
&(ii)\ condition = 1\ (competitive): b_2 + b_3
\end{aligned}
$$

This model was analyzed using brms (Bürkner, 2017), an R package that interfaces with probabilistic programming language STAN to estimate the posterior distribution using MCMC algorithms. Models were fitted using weakly informative priors, Normal (0, 5) on beta coefficients, and Student's t (3, 0, 2.5) on the standard deviation of varying effects (i.e., participants). The parameters were estimated using four MCMC chains, each with 2,000 iterations and 1,000 warmups. The convergence of the MCMC was confirmed. We interpreted the effect of each factor based on the means and standard deviations of the estimates, as well as the widths of the Bayesian credible intervals.

Figure 1 shows a violin plot of the positive evaluation scale and Table 2 shows the estimated results. As per Table 2, there was a substantial interaction effect on the positive evaluation scale [b_3 =1.65, CI (1.19, 2.12)]. In the non-competitive condition, the target who employed the universalistic strategy was positively evaluated to the same extent as the one who employed the ingroup favoring strategy [$b_2 = 0.19$, CI (−0.14, 0.54)]. In the competitive condition, the ingroup favoring strategy was positively evaluated

TABLE 2 Estimated result of the positive evaluation scale.

	Means	SD	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
b1 [condition]	−0.95	0.17	−1.28	−0.62	1.00	2,170	2,595
b2 [target]	0.19	0.17	−0.14	0.54	1.00	2,065	2,510
b3 [condition × target]	1.65	0.24	1.19	2.12	1.00	1,741	2,252
b2 + b3	1.84	0.16	1.54	2.15	-	-	-

compared to the universalistic strategy [$b_2 + b_3 = 1.84$, CI (1.54, 2.15)].[3]

3.2 The choice of target game

We analyzed the choice of target game to measure the strategy that was more likely to obtain resources from others. We conducted Bayesian logistic regression analysis of the frequency at which each target was chosen. The response variable was the frequency with which each target was chosen, in other words, the number of participants who chose each target. The reference category for the target was the universalistic strategy (0). The explanatory variable was intergroup competition (between-subjects factor: competitive, non-competitive). The reference category for this condition was non-competitive (0). This study aimed to compare the willingness to provide resources between the ingroup favoring strategy and the universalistic strategy; thus, we present the data for these two strategies while excluding the data for the AllD strategy (competitive condition, $n = 2$; non-competitive condition, $n = 3$). The settings of the brms were the same as those used in the evaluation model. The convergence of the MCMC was confirmed. We interpreted the effect of each factor based on the means and standard deviations of the estimates, as well as the widths of the Bayesian credible intervals.

Figure 2 shows a bar plot of the strategies selected by the participants under each condition. In the non-competitive condition, both targets were selected at the same rate, whereas targets employing the ingroup favoring strategy were more likely to be selected in the competitive condition. As shown in Table 3, there was a statistical trend toward a positive effect of the condition [$b_1 = 0.70$, CI (−0.06, 1.48)], though the effect was not substantial.

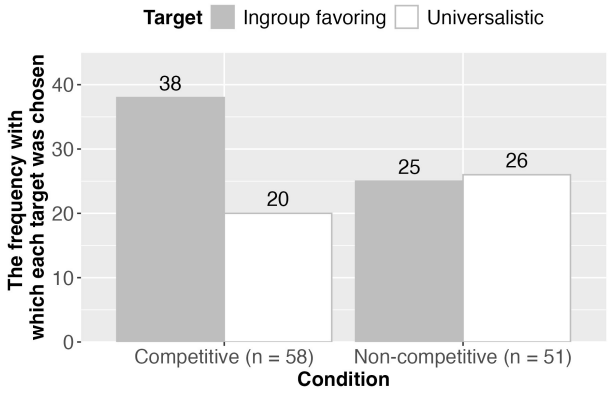

FIGURE 2
Bar plot of the frequency with which each target was chosen.

3.3 Giving game

We conducted a Bayesian linear mixed model analysis to examine whether the amount transferred in the giving game differed depending on the recipient's group and condition. The response variable was the amount transferred by participants in the giving game. The explanatory variables were the existence of intergroup competition (between-subjects factor: competitive, non-competitive), group (within-subjects factor: ingroup, outgroup), and the interaction between these variables. The following statistical model was used. We set participants as random effects (r_i). The reference category for this condition was the non-competitive condition (0) and the reference category for the group was the ingroup (0). To interpret the interaction effect, we divided the cases where (i) group = 0 (ingroup) and (ii) group = 1 (outgroup). In case (i), where group = 0, we can assess the effect of the condition on behavior toward an ingroup member by referring to parameter b_1. In case (ii), where group = 1, we can assess the effect of the condition on behavior toward an outgroup member by referring to parameter $b_1 + b_3$. The settings of the brms were the same as those used in the evaluation model. The convergence of the MCMC was confirmed. We interpreted the effect of each factor based on the means and standard deviations of the estimates, as well as the widths of the Bayesian credible intervals.

$$
\begin{aligned}
Y_i &= b_0 + r_i + b_1{*}condition + b_2{*}group + b_3{*}condition{*}group + e \\
&= b_0 + r_i + b_2{*}group + \left(b_1 + b_3{*}group\right){*}condition + e \\
&\left(Y_i|condition = 1\right) - \left(Y_i|condition = 0\right) = b_1 + b_3{*}group \\
&(i)\ group = 0\ (ingroup) : b_1\ \ (ii)\ group = 1\ (outgroup) : b_1 + b_3
\end{aligned}
$$

Figure 3 shows a bar plot of the amount of money transferred in the giving game and Table 4 presents the estimated results. Participants transferred more money to an ingroup member than

3 Among the evaluation scales, item 3, "Not beneficial to the group—Beneficial to the group," might function merely as a manipulation check in the competitive condition. In other words, it is easily expected that the universalistic strategy in the competitive condition would receive low scores on this item. Therefore, we excluded item 3 from the positive evaluation scale and reanalyzed it. The results were almost identical to those of the positive evaluation scale. For detailed results, see the Data availability statement (i.e., Supplementary_file_Evaluation.html).

TABLE 3 Estimated result of the frequency with which each target was chosen.

	Means	SD	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
Intercept	−0.04	0.29	−0.60	0.51	1.00	3,494	2,531
b1 [condition]	0.70	0.39	−0.06	1.48	1.00	3,169	2,775

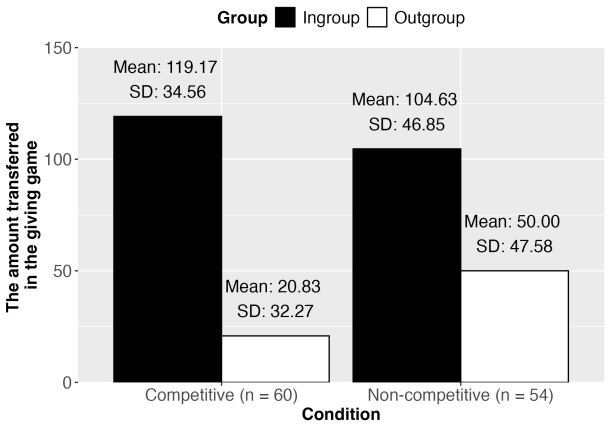

FIGURE 3
Bar plot of the amount given to recipients.

an outgroup member in both conditions [$b_2 = -27.91$, CI (−36.16, −19.58)]. There was a substantial interaction effect on the amount of money [$b_3 = -18.72$, CI (−27.34, −10.20)]. The amount given to an ingroup member did not differ between conditions [$b_1 = 0.83$, CI (−7.13, 8.37)]. By contrast, the amount given to an outgroup member was larger in the non-competitive condition than in the competitive condition [$b_1 + b_3 = -17.89$, CI (−28.19, −7.98)]. In summary, ingroup favoring behaviors were observed in both the competitive and non-competitive conditions but were likely to be stronger in the competitive condition.

3.4 The correlation between evaluations and behavior

We present the polyserial correlations between participants' evaluations of the targets and their ingroup favoring behavior in the giving game (see Table 5). We used the score of the positive evaluation scale of the ingroup favoring strategy and the universalistic strategy as the measurement of evaluations. The degree of ingroup favoring behavior was measured as the difference between the amounts given to an ingroup member and an outgroup member in the giving game.

The degree of ingroup favoring behavior was positively correlated with participants' positive evaluations of the target who employed the ingroup favoring strategy, particularly in the non-competitive condition. Conversely, the degree of ingroup favoring behavior was negatively correlated with participants' positive evaluations of the universalistic strategy, especially in the competitive condition. These results demonstrate that ingroup favoring behavior is related to positive evaluations of the ingroup favoring strategy and negative evaluations of the universalistic strategy.

4 Discussion

This study explored how people evaluate cooperation with outgroup members within a system of indirect reciprocity. Previous studies have shown that individuals who employ a universalistic strategy are evaluated more positively than those who employ an ingroup favoring strategy (Killen et al., 2013; Tateishi et al., 2021). However, little is known about whether a universalistic strategy is positively evaluated when intergroup competition exists. Furthermore, the association between the degree of ingroup favoring behavior and the evaluation of the strategies (i.e., universalistic strategy, ingroup favoring strategy) was unclear. We predicted that members who employ a universalistic strategy will be negatively evaluated when intergroup competition exists. Therefore, we examined the reputations of members who employed either a universalistic or an ingroup favoring strategy through a behavioral laboratory experiment with incentives.

We found that the evaluation of the two strategies was affected by intergroup competition. In the competitive condition, a target who employed the ingroup favoring strategy was evaluated more positively than that who employed the universalistic strategy. This finding supports the prediction of the competitive conditions. By contrast, in the non-competitive condition, targets who employed the universalistic strategy were evaluated as positive as those who employed the ingroup favoring strategy. Therefore, the prediction for the non-competitive condition was not supported. This finding differs from those of previous studies that used vignettes (Killen et al., 2013; Tateishi et al., 2021). Previous studies have shown that people who employ the universalistic strategy consistently acquire positive reputations. However, we found that people who employed the universalistic strategy were not always evaluated positively, even in the non-competitive condition. In a vignette study, participants may evaluate a target from a third-party perspective; however, when participants' earnings are affected by the target's behavior, they may evaluate the target as an interested party. Altogether, in situations where people interact with each other, their evaluations of the universalistic strategy tend to be more negative and their evaluations of the ingroup favoring strategy more positive.

Furthermore, we examined the relationship between participants' behavioral tendencies and their evaluations of the target. The participants who exhibited ingroup favoring behavior evaluated the ingroup favoring strategy positively but tended to evaluate the universalistic strategy negatively. Therefore, there is consistency between their behaviors and evaluations of the target. This behavioral assessment pattern is analogous to the model of the ingroup favoring strategy of Matsuo et al. (2014). In Matsuo et al. (2014), the ingroup favoring strategy always regards

TABLE 4 Estimated result of the amount given to recipients.

	Means	SD	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
b1 [condition]	0.83	3.96	−7.13	8.37	1.00	4,378	2,658
b2 [group]	−27.91	4.26	−36.16	−19.58	1.00	4,800	3,029
b3 [condition × group]	−18.72	4.35	−27.34	−10.20	1.00	3,963	2,430
b1 + b3	−17.89	5.10	−28.19	−7.98	-	-	-

TABLE 5 Polyserial correlations between participants' ingroup favoring behavior in the giving game and their evaluations of the targets.

	Ingroup favoring strategy	Universalistic strategy
Degree of an ingroup favoring behavior	Competitive condition	
	0.16	−0.32
	Non-competitive condition	
	0.37	−0.17

outgroup members and ingroup members who cooperate with outgroup members as enemies and do not cooperate with them. Although the assessment pattern shown in this study is not as radical as that of Matsuo et al. (2014), we found that behavioral and assessment rules are correlated, even among real people.

Our results have important implications for research on reputation and cooperation. This study implies that the dynamics of reputation may not hinder cooperation beyond group boundaries when intergroup competition is absent. However, it is noteworthy that the reputational benefit of employing a universalistic strategy is not significantly higher than that of employing an ingroup favoring strategy. Previous studies have shown that people typically choose social collaborators and interact with those who have acquired good reputations (Barclay, 2013, 2016). Barclay (2013, 2016) argued that selecting social partners creates a biological market in which people prefer to associate with those who confer benefits. If people who employ the universalistic strategy are not chosen as social partners in a biological market, they hesitate to behave universalistically, which incurs costs.

This study has two limitations. First, it only investigated the evaluation items and whether the targets were chosen as recipients. However, social exchange has several other roles, such as providing resources to donors, group leaders, and colleagues. For example, Horita (2010) investigated the reputation of a punisher and showed that the punisher is likely to be selected as a donor, but not as a recipient. These results imply that people think that these two strategies play different roles. In future studies, we will investigate which of the two strategies is selected for the various roles in social exchange. Second, the study was conducted in Japan. Societal differences may exist in the reputations of those who employ universalistic and ingroup favoring strategies. Yamagishi (2011) argued that Japan was a typical example of an ingroup favoring society in which people cooperate primarily within groups. By contrast, North America is a typical example of a universalistic society in which people are willing to cooperate beyond group boundaries. These societal differences may affect the reputations of those who employ universalistic and ingroup favoring strategies. As such, examining societal differences in reputational dynamics would be interesting in future studies, as those who employ a universalistic strategy might acquire more positive reputations in North America than in Japan.

In conclusion, we experimentally demonstrated that cooperation beyond group boundaries tarnishes one's reputation when intergroup competition exists. Even when intergroup competition is absent, cooperation beyond group boundaries is unlikely to earn additional reputational benefits in incentivized situations. The reputational dynamics in indirect reciprocity enhance within-group cooperation but are less likely to enhance cooperation beyond group boundaries, especially when intergroup competition exists.

Data availability statement

The datasets presented in this study can be found in online repositories. This data can be found here: https://osf.io/ycd83/?view_only=5754311e2f4c45beaa39e1c3de50e600.

Ethics statement

The studies involving humans were approved by Center for Experimental Research in Social Sciences, Hokkaido University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

WT: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. NT: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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