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ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rrsp20

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To cite this article: Hirotaka Imada, Atsuki Ito, Tim Hopthrow, Dominic Abrams, Dejah Yansen, Kevin Willcox & Ann Rumble (13 Aug 2024): Cooperation and crossed categorization in a minimal group context: testing the bounded generalized reciprocity and social identity accounts, Comprehensive Results in Social Psychology, DOI: 10.1080/23743603.2024.2388345

To link to this article: https://doi.org/10.1080/23743603.2024.2388345

Published online: 13 Aug 2024.

COMPREHENSIVE RESULTS IN SOCIAL PSYCHOLOGY
https://doi.org/10.1080/23743603.2024.2388345

Cooperation and crossed categorization in a minimal group context: testing the bounded generalized reciprocity and social identity accounts

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ABSTRACT

Individuals display the tendency to cooperate more with in-group members than they do with out-group members (i.e. in-group favoritism) across diverse contexts. While previous studies have thoroughly investigated in-group favoritism when a single social category is salient, they have understudied how individuals cooperate with others when multiple social categories are simultaneously salient. To bridge this gap, we conducted a study to examine cooperation under crossed categorization, in which two dichotomous social categories are orthogonally crossed. We then examined the psychological mechanisms potentially underlying intergroup cooperation, including reputational concern, expected cooperation, and social identification, drawn from the theoretical perspectives of bounded generalized reciprocity and social identity theory. Overall, we found that two in-group memberships additively increased cooperation. That is, cooperation with a double in-group member (a person with two in-group memberships) was higher than that with a partial in-group member (i.e. a person with one in-group membership and one out-group membership). We also found that cooperation with a partial in-group member was larger than that with a double out-group member (a person with two out-group memberships). In addition, we found some evidence that expected cooperation partially mediated the relationship between in-group membership and cooperation.

ARTICLE HISTORY
Received 7 February 2022
Accepted 6 June 2024

KEYWORDS
Bounded generalized reciprocity; cooperation; cross-categorization; in-group favoritism; social identity

Cooperation, the act of incurring personal costs to benefit others (Nowak, 2006), helps individuals and societies solve social dilemmas and maximize collective benefits (Strathman & Joireman, 2005; Van Vugt, 2009). Yet, people do not display cooperation towards everyone in the same manner; people are known to cooperate more with in-group members than out-group members, i.e. in-group favoritism[1] (for reviews, see Balliet

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et al., 2014). Previous studies have documented in-group favoritism in a wide range of intergroup contexts, including the minimal groups (Yamagishi & Mifune, 2008), morally conflicting groups (Imada et al., 2021), and national groups (Romano et al., 2021). Moreover, previous studies have documented in-group favoritism across diverse contexts (Fiedler et al., 2018; Romano et al., 2021) including both lab (Yamagishi et al., 1999) and field (Ruffle & Sosis, 2006) settings. Importantly, previous studies have consistently found that in-group favoritism in cooperation is constituted of increased cooperation towards in-group members rather than decreased cooperation towards out-group members (Balliet et al., 2014; Brewer, 1999; Imada & Mifune, 2024). Overall, in-group favoritism is a robust and universal phenomenon (Romano et al., 2021).

Previous studies on intergroup cooperation offer valuable insights into how one's knowledge about a single group membership of others shapes cooperation towards them. Yet, it remains largely unclear how people cooperate with others who hold multiple group memberships, particularly in contexts where both in- and out-group memberships exist across salient domains. One way that multiple group memberships can be simultaneously salient is when we take note of a person's appearance and accent (Gluszek & Dovidio, 2010). An English person, for instance, would be able to distinguish whether a stranger belongs to the same or different racial and linguistic groups. Given that people often belong to diverse social groups and know about multiple group memberships of others, it is of practical importance to understand cooperation when more than one social category is simultaneously salient.

To gain this understanding, in the present study, we investigated how people cooperated with others who held two distinct group memberships: two in-group memberships, one in-group membership and one out-group membership, and two out-group memberships. In addition, drawing upon the previous literature on in-group favoritism (Balliet et al., 2014; Everett et al., 2015a), we aimed to test potential psychological processes involved in intergroup cooperation involving two social categories informed by two distinct approaches: reputational concern and expected cooperation (the bounded generalized reciprocity perspective (BGR) (Yamagishi & Mifune, 2008; Yamagishi et al., 1999); and social identification (the social identity perspective (SIP) (Tajfel & Turner, 1979; Turner et al., 1979). All in all, our research will help us understand how two orthogonal group memberships shape cooperation.

Crossed categorization and Cooperation

Crossed categorization refers to the crossing of two dichotomous and orthogonal social dimensions and the resulting four subgroups (Crisp & Hewstone, 2016; Mullen et al., 2001): a double in-group (IN-in), two partial in-groups (IN-out/OUT-in), and a double out-group (OUT-out). To put it concretely, when sex (male and female) and race (Black and White) are crossed, Black females and White males are double in-group and double out-group members, respectively, for Black females. The remaining two subgroups, Black males and White females are partial in-group members.

Previous studies on crossed categorization have predominantly investigated how the crossing of two social categories would influence intergroup *attitudes* (for a review, see Crisp & Hewstone, 2016), but the current empirical literature is marked by a gap concerning the relationship between crossed categorization and intergroup

cooperation. As discussed by Yamagishi et al. (1999), in-group bias in evaluation and attitudes are psychologically different from in-group bias in cooperation. Cooperation refers to an act of incurring the cost of c to benefit another individual or a group by b ($c < b$; Nowak, 2006). In addition, it has been typically studied in social dilemmas, in which personal and collective interests conflict with each other. In this sense, unlike evaluation and attitudes, cooperation requires one to give up one's own immediate benefit to bring greater benefits to others. Unlike cooperation, holding in-group favoring attitudes is not costly at all. Jin et al. (1996), in fact, found that intergroup monetary allocation and intergroup evaluation were not consistent. Thus, the previous findings on the role of crossed categorization in intergroup attitudes cannot be generalized to understand intergroup *cooperation*. In-group favoritism under crossed categorization deserves empirical investigation, independent of attitudes.

Kumar et al. (2021) were the first to examine intergroup cooperation under crossed categorization. They focused on gender and nationality (Americans and Indians) as focal group memberships and discovered that individuals displayed in-group favoritism based on nationality but not on gender. They concluded that when gender and nationality were crossed, nationality was decisive in shaping intergroup cooperation. Yet, their findings might be specific to that particular combination of social categories (gender and nationality), and it remains unclear why nationality outweighed gender. In other words, experiments with two qualitatively different social categories do not allow us to investigate how crossed categorization itself influences in-group favoritism expressed through cooperation.

To address this limitation, we examine intergroup cooperation under crossed categorization with two orthogonal social categories of the same nature: minimal groups. More specifically, we create two minimal group categories (Category I: Group A vs. Group B; Category II: Group X and Group Y) and investigate how individuals cooperate with others varying in the number of shared social categories. This allows us to understand how two orthogonal social categories per se shape cooperation, which can help predict day-to-day cooperation in social lives where individuals hold multiple social categories and know about how others do so as well. Moreover, by focusing on two equally salient minimal groups, we offer a baseline finding in which we compare and discuss cooperation under crossed group categorization.

Intergroup cooperation under crossed categorization

While it is of practical importance to understand how people cooperate with others under crossed categorization, the elucidation of the psychological mechanisms underlying the phenomenon further allows us to learn how to encourage cooperation between individuals based on their shared group memberships. In the following sections, we review two major theoretical perspectives that have been found to explain intergroup cooperation in a simplistic context where there is only one intergroup category: BGR (Imada et al., 2024; Yamagishi & Mifune, 2008; Yamagishi et al., 1999) and SIP (e.g. Tajfel & Turner, 1979; Turner et al., 1979). Based on the two

perspectives, we generated hypotheses regarding how and why people cooperate under crossed categorization contexts.

Bounded generalized reciprocity (BGR)

The BGR account is an evolutionary approach to intergroup cooperation that focuses on indirect reciprocity (Nowak & Sigmund, 1998, 2005). It assumes that a shared group membership triggers the heuristic that in-group members, but not out-group members, are part of the system of indirect reciprocity, in which doing a favor for a member of the system is expected to be reciprocated by another member of the system (i.e. the group heuristic; Yamagishi et al., 1999). In the system, it is important that people cooperate with others and reciprocate cooperation; defection can lead to establishing a negative reputation and individuals with such reputations can be ostracized.

Based on the group heuristic, when reputation is at stake, people can expect that in-group members, but not out-group members, would cooperate with them, as in-group members are perceived to be in the same exchange system (Yamagishi & Kiyonari, 2000; Yamagishi et al., 1999). In addition, when one's reputation is at stake, they are compelled to maintain a positive reputation in front of other in-group members, but not out-group members, in order to avoid ostracism (Mifune & Yamagishi, 2015; Mifune et al., 2010; Yamagishi & Mifune, 2008). Thus, according to the BGR perspective, expected cooperation between in-group members and reputational concern both contribute to shaping in-group favoring tendencies. Several experiments and a large-scale meta-analysis supported the perspective, showing that in-group favoritism emerges only when one can expect cooperation from one's partner (e.g. when an interaction partner is aware of the shared in-group membership) or one's reputation is at stake[2] (e.g. Balliet et al., 2014; Yamagishi & Mifune, 2008; Yamagishi et al., 1999). Importantly, BGR does not predict that individuals decrease their cooperation towards out-group members. Rather, it suggests that in-group favoritism is solely a product of increased cooperation towards in-group members[3] (Aaldering et al., 2018; Balliet et al., 2014; Imada et al., 2021; Yamagishi et al., 1999).

According to BGR, an in-group membership of a target person implies that (1) the target person should be willing to cooperate as they are part of the same exchange system and (2) one should care about one's own reputation vis-à-vis this person. By contrast, the presence of an out-group membership does not imply anything; it does not activate any mechanisms, such as expected cooperation and reputational concern, and, therefore, it neither encourages nor discourages cooperation. As such, individuals should be encouraged to display an increased level of cooperation as long as a target person holds at least one in-group membership. When comparing a target with two in-group memberships and another with one in-group membership, from the BGR account, we therefore do not predict that individuals cooperate more with the former than the latter. First, based on the group heuristic account of BGR, an in-group membership simply acts as a cue for indirect reciprocity. Additionally, the theory does not offer a basis to assume that two group memberships have an additive effect on cooperation. Overall, individuals should be more cooperative towards others with in-group membership than those without, regardless of how many in-group memberships they have (see Figure 1). Accordingly, we have the following hypotheses:

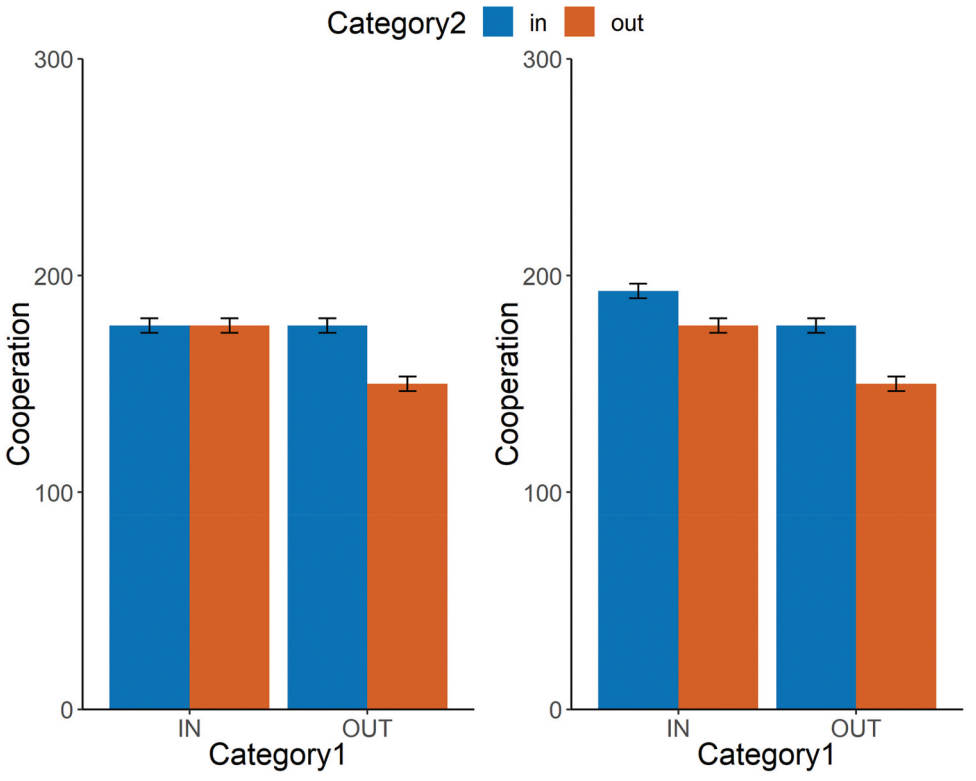

Figure 1. Visual representation of hypotheses 1-3. Note: Graphs on the left and right represent hypotheses predicted by the bounded generalized reciprocity and the social identity perspective, respectively.

H1: Cooperation towards a double in-group member will be higher than that towards a double out-group member.

H2: Cooperation towards partial in-group members will be higher than that towards a double out-group member.

H3a: Cooperation towards a double in-group member will not be higher than that towards partial in-group members.

Moreover, based on the previous studies on BGR (Mifune & Yamagishi, 2015; Yamagishi & Kiyonari, 2000; Yamagishi et al., 1999), we predicted that expected cooperation and reputational concern should explain the effect of shared group memberships on cooperation. Previous studies on in-group favoritism have, in fact, found that in-group favoritism is associated with reputational concern (Mifune & Yamagishi, 2015) and increased expected cooperation from partners (e.g. Yamagishi & Kiyonari, 2000; Yamagishi et al., 1999). We, thus, have the following hypotheses;

H4: The effect of group membership on cooperation is mediated by reputational concern.

H5: The effect of group membership on cooperation is mediated by expected cooperation.

Social identity perspective (SIP)

The SIP account assumes that people categorize themselves as members of certain groups and this mere categorization encourages people to favor in-group members so that they can establish a positive social comparison and maintain a positively distinct social identity (Tajfel & Turner, 1979; Turner et al., 1979). In addition, when individuals identify with a group, depersonalization processes take place, and they treat themselves and in-group members as interchangeable and their own interests become aligned with collective interests. Consequently, individuals place as much value on the payoffs for other in-group members as they do on their own payoffs (Brewer & Kramer, 1986; Everett et al., 2015a). As such, social identification motivates people to cooperate more with in-group members than out-group members.

According to SIP, it is not the expectation of cooperation or concern for one's reputation that drives in-group favoritism, but simply social identification. Thus, in a minimal group situation, the more strongly individuals identify with a group, the stronger in-group favoritism should be (Ando, 1999). There are situations where other norms, such as fairness or norms of non-discrimination, apply but the theory does not expect these to prevail by default, i.e. in minimal group situations (Jetten et al., 1997). In stark contrast to BGR, SIP assumes that in-group membership should always lead to in-group favoritism, regardless of whether expected cooperation or reputational concern is present. Some previous experiments supported SIP, reporting in-group favoritism under anonymity (e.g. Hackel et al., 2017) and a correlation between social identification and cooperation (Ando, 1999; Jackson, 2008). We would like to note, however, that there is meta-analytic and experimental evidence suggesting that social identification might not be the primary predictor of in-group favoritism (Balliet et al., 2014; Romano et al., 2017, 2021)

In a crossed category situation, the salience, clarity, and distinctiveness of an in-group membership wanes when there is an overlap between group memberships (i.e. if encountering a partial in-group member). This is especially the case when two group categories have the same level of comparative and normative fit to the context (i.e. when two group categories are equally likely to be most relevant, e.g. Crisp & Hewstone, 2000; Turner et al., 1987). In other words, in-group favoring tendencies driven by social identification should be weaker when individuals interact with partial in-group members than double in-group members. Consequently, cooperation should be highest towards a double-in-group target (IN-in) and the lowest towards a double out-group target (OUT-out), with partial in-group targets (IN-out/OUT-in) in-between (see Figure 1). Therefore, we have the following hypotheses;

H1: Cooperation towards a double in-group member will be higher than that towards a double out-group member (shared with the BGR perspective).

H2: Cooperation towards partial in-group members will be higher than that towards a double out-group member (shared with the BGR perspective).

H3b: Cooperation towards a double in-group member will be higher than that towards partial in-group members.

In addition, according to SIP, social identification should be positively associated with in-group cooperation. We would like to note, however, that Tajfel and colleagues never directly predicted a correlation between social identification and in-group biases in their original theory (Tajfel & Turner, 1979). This hypothesis is derived from the social attraction account within the social identity approach (Hogg, 1993; Hogg & Hains, 1996) which posits that shared category membership generates depersonalized attraction to members of the same category. Based on this, we propose the following hypotheses:

H6: The effect of group membership on cooperation is moderated by social identification such that the more strongly people identify with their in-group, the more cooperation they display towards a target person who shares the group membership.

The present study

The present study aimed to examine cooperation in a crossed categorization setting, going beyond the simplistic intergroup context where only one group membership of others is known. Kumar et al. (2021) focused on nationality and gender, but given that these two categories were qualitatively distinct, their study could not address the benchmark effect of crossed categorization per se, on cooperation. To better understand how crossed categorization influences cooperation, it is vital to equalize the salience and meaningfulness of the two categories. Thus, the present study used minimal groups to examine cooperation under crossed categorizations. As discussed previously, people belong to diverse social groups, many of which are simultaneously visible and audible (Fuertes et al., 2012). As such, in real social interactions, it is often the case that people can be aware of more than one group membership of a person with whom they are interacting. Therefore, the examination of intergroup cooperation in crossed categorization contexts offers practical implications for understanding how people cooperate with others in their daily lives.

In addition, our study aims to illuminate psychological processes underlying cooperation in a crossed categorization situation. Specifically, we test the role of three psychological factors informed by two distinct theories: reputational concern, expected cooperation, and social identification. This theoretically contributes to the previous literature on in-group favoritism; BGR and SIP have formed a rich body of research and scholarly discussions as to which psychological factors best explain intergroup cooperation (Aaldering et al., 2018; Balliet et al., 2014; Everett et al., 2015b). A large-scale meta-analysis by Balliet et al. (2014) yielded supporting evidence for BGR over SIP. Yet, there are a considerable number of empirical studies before and after the publication of the meta-analysis, which support the social identity perspective (Ando, 1999; Hackel et al., 2017; Jackson, 2008) and both SIP and BGR (Nakagawa et al., 2015). This experimental support for SIP calls for further investigations of conditions in which social identification can become a dominant force of increased in-group cooperation (Everett et al., 2015b). Our study offered a new and unique context to test the generalizability and explanatory

power of these two perspectives. It seems that when there is only one group category, BGR overall outperforms SIP. Yet, does this hold in a crossed category situation? Yamagishi and colleagues argued that a group membership activates the group heuristic, and this leads to increased cooperation towards an in-group member (Yamagishi et al., 1999). It is possible that when a partial in-group membership (one in-group and one out-group membership) fails to trigger the group heuristic in the first place, the BGR-based psychological mechanisms may not predict cooperation in crossed categorization situations. While our study does not directly test the two competing theories against each other, it added additional evidence to the debate from a new angle by extending the theories to multiple group contexts.

We would like to note that Kumar et al. (2021) did not measure reputational concern nor test the role of BGR-driven psychological mechanisms in shaping cooperation under crossed categorization situations. Yet, they measured social identification and found that while it predicted allocation in a dictator game, it was not associated with cooperation in a binary choice prisoners' dilemma. Their studies thus yielded mixed evidence. Our study with two minimal groups provides a suitable experimental setting to test the influence of the three psychological factors, controlling for potential effects of other psychological mechanisms specific to the gender × nationality contexts such as stereotypes (Swan & Wyer, 1997) and status-asymmetry (Nadler & Halabi, 2006).

Method

Data availability and open science

All materials associated with the article, including the preregistration of the study (study material, planned analysis codes, and the Stage 1 registered report), data and analysis codes can be found at https://osf.io/9m3p7/.

Participants and design

The present study followed a 2 (Category 1: in-group vs. out-group) × 2 (Category 2: in-group vs. out-group) within-subject design. We conducted a simulation-based power analysis (Lakens & Caldwell, 2021), and it revealed that 350 participants would be sufficient to test the main hypotheses (see our preregistration for more details). To account for data exclusions, we aimed to collect 400 undergraduate students at a public university in the United States, in exchange for partial course credit. The study was available for voluntary participation over two academic terms and 457 participants completed it (109 men, 335 women, $M_{age} = 19.17$, $SD = 2.33$).

Procedure

Once consent was obtained, participants were informed, as a cover story, that the study was designed to understand the relationship between artistic preferences, estimation strategies, and economic decision-making. Accordingly, they were told that the study consisted of three main parts: an artistic preference task, a dot estimation task, and decision-making tasks. In the artistic preference task, participants were presented with six paintings and asked to rate how much they liked the images, using

a 6-point Likert scale (*1 = dislike very much* to *6 = like very much*). Participants then proceeded to the dot estimation task, in which they were presented with six fleeting images varying in number of dots and asked to estimate the number of dots they saw. After completing these tasks, participants received bogus feedback detailing that individuals could be categorized into either Group A or B (artistic preference) and either Group X or Y (dot estimation). All participants, regardless of their responses, were informed that they belonged to Groups A and Y based on their artistic preferences and dot estimations, respectively. These tasks were not designed to measure artistic preferences nor dot estimation strategies, but instead to create two experimental and orthogonal intergroup contexts (Group A vs. Group B and Group X vs. Group Y) with equal salience. To ensure participants correctly understood their group memberships, they answered two questions directly asking them to indicate their group memberships. Participants were then administered two 6-item scales measuring social identification (Leonardelli & Brewer, 2001; e.g. "I feel that Group A/Group Y is an important reflection of who I am"), one for Group A and the other for Group Y, using a 5-point Likert scale ranging from *1 = strongly disagree* to *5 = strongly agree*. Within the social identification measurements, we inserted one attention check which asks participants to select *disagree*, which was used as one of the preregistered exclusion criteria.

After comprehension was established, participants were asked to imagine a scenario where they were paired with another individual to make decisions and earn money. More specifically, in the scenario, each individual was given 300 cents by an experimenter and had to decide how much they would like to transfer to their partner, knowing that each cent they sent would be doubled before it was given to their partner. This scenario is often referred to as a continuous prisoner's dilemma, one of the established measures of dyadic cooperation (Verhoeff, 1993; Wahl & Nowak, 1999) and has been used in previous studies on intergroup cooperation (e.g. Imada et al., 2021). For example, if both participants decide to send 100 cents, they each end up possessing 400 cents (due to keeping 200 cents and receiving 200 (100×2) more cents from their partner). The amount of money participants decided to send to their partner was our measure of cooperation. Once participants correctly answered a comprehension check question, they were redirected to actual decision-making tasks. Participants were told that they would complete the scenario several times with different partners. It was emphasized that these scenarios were hypothetical, and participants would not be rewarded based on their decision. It is tempting to assume that the absence of the actual incentive would substantially influence cooperative behavior, but previous studies suggest that the impact is minimal (Balliet et al., 2014; Romano et al., 2021).

In the decision-making task, participants completed the scenario with the following four hypothetical participants in a randomized order: an individual who belonged to Groups A and X (the IN-out condition), an individual who belonged to Groups A and Y (the IN-in condition), an individual who belonged to Groups B and X (the OUT-out condition), and an individual who belonged to Groups B and Y (the OUT-in condition). After each round, participants indicated how much they believed their partner transferred and answered four questions measuring how much they were concerned about how their partner sees them (e.g. "It's important to me that my partner has a positive evaluation about me;" Wu et al., 2015), using a scale ranging from *1 = strongly disagree* to *5 = strongly agree*. After completing

each continuous prisoner's dilemma and expectation and reputation measure, participants provided demographic information (age and sex). They were then debriefed and dismissed.

Results: preregistered

Deviations from the preregistration

We pre-registered to exclude participants who failed to correctly answer an attention check question where they were prompted to select "2 = disagree." Originally, we proposed to use a 7-point Likert scale ranging from *1 = strongly disagree* to *7 = strongly agree*. Yet, during the revision and discussion with reviewers, we agreed that it was sensible to use a 5-point scale, and we dropped two scale points (disagree/agree). However, we did not change the attention check question, and participants could not select "disagree." We thus decided to exclude those who did not select strongly disagree or slightly disagree. We correspondingly amended the analysis code in the final version. This was the sole deviation from preregistration.

Data exclusion and preliminary analyses

Following the preregistration, we excluded those whose study completion time was either more or less than the median completion time by three median absolute deviations (Leys et al., 2013; Miller, 1991). In addition, we excluded those who incorrectly answered the attention check question (see the previous section for more detail). This left us 367 participants (82 men, 275 women, $M_{age} = 19.17$, $SD = 2.10$) for subsequent analyses. Our hypothesis testing was thus sufficiently powered. We summarize descriptive statistics, Cronbach's α_s, and correlations of social identification, reputational concern, and expected cooperation in Table 1.

Hypotheses 1–3: cooperation

We conducted a 2 (Category 1: A = in-group vs. B = out-group) × 2 (Category 2: Y = in-group vs. X = out-group) within-subjects ANOVA on cooperation (see Figure 2 for the visualization of descriptive statistics). The main effects of the target group membership were both

Table 1. Overall descriptive statistics and correlations.

	α	*M*(*SD*)	1	2	3	4	5	6	7	8	9	10
1. Category 1 Identification	.71	3.30 (0.64)	–									
2. Category 2 Identification	.72	3.15 (0.63)	.63*	–								
3. Reputational Concern: IN-in	.73	3.53 (0.89)	.23*	.27*	–							
4. Reputational Concern: IN-out	.78	3.40 (0.91)	.13*	.18*	.77*	–						
5. Reputational Concern: OUT-in	.78	3.40 (0.90)	.16*	.20*	.74*	.77*	–					
6. Reputational Concern: OUT-out	.78	3.34 (0.93)	.15*	.20*	.69*	.75*	.78*	–				
7. Expected Cooperation: IN-in	.	200.58 (77.65)	.07	.05	.04	.05	.02	.01	–			
8. Expected Cooperation: IN-out	.	152.66 (73.68)	0.001	.02	−.10*	−.06	−.05	.003	.43*	–		
9. Expected Cooperation: OUT-in	.	164.80 (72.41)	0.05	.10	−.03	.02	.03	.01	.48*	.54*	–	
10. Expected Cooperation: OUT-out	.	144.97 (77.75)	0.06	−.03	−.17*	−.10	−.05	−.03	.35*	.52*	.51*	–

Note. *indicates $p < .05$; M: Mean; SD: Standard Deviation.

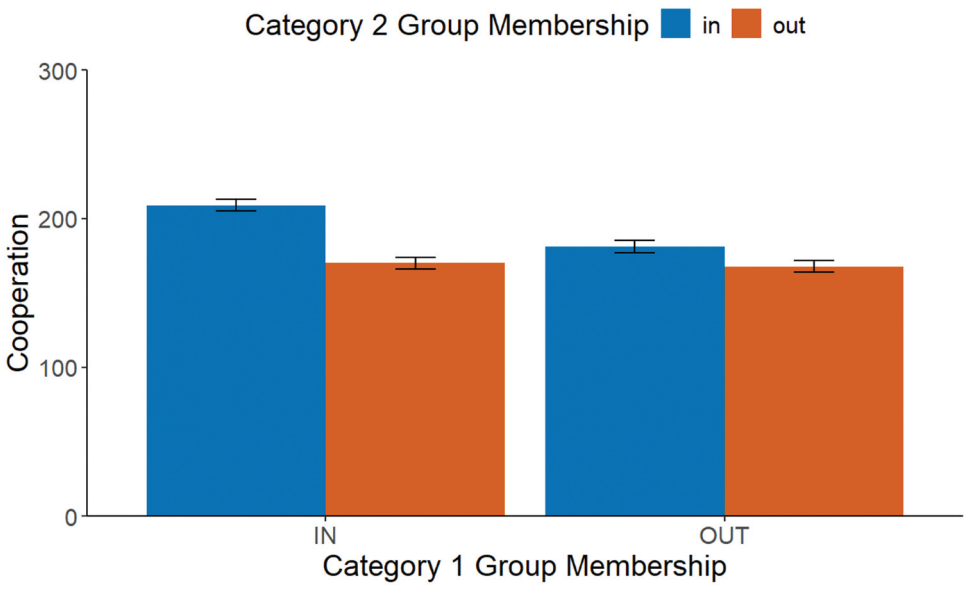

Figure 2. Means and standard errors of cooperation by condition.

significant, $Fs > 32.17$, $p < .001$, $\eta^2_{ps} > .08$. These significant effects were further qualified by a significant two-way interaction, $F(1, 366) = 28.08$, $p < .001$, $\eta^2_p = .07$.

To test H1–3, we conducted post-hoc pairwise comparisons with Tukey *p*-adjustment. We first found that cooperation in the double in-group condition ($M = 209.07$, $SD = 78.41$) was significantly higher than the double out-group condition ($M = 167.76$, $SD = 75.24$), supporting H1, $t(366) = 9.50$, $p < .001$. However, we obtained inconsistent evidence as to whether the partial in-group members received more cooperation than the double out-group members. More specifically, while participants were more cooperative towards the member of B and Y (OUT-in: $M = 181.24$, $SD = 76.01$) than the double out-group member ($t(366) = 3.71$, $p = .001$), they did not significantly discriminate between the member of A and X (IN-out: $M = 170.04$, $SD = 74.64$) and the double out-group member ($t(366) = 0.67$, $p = .91$). Thus, we collated mixed evidence for H2. The results suggested that the two orthogonal group categories might have different levels of salience (i.e. Category 2 was more salient than Category 1, so only the shared in-group membership in Category 2 resulted in increased cooperation). We explored the possibility in Results: not preregistered. Finally, we compared cooperation in the partial-in-group conditions with that in the double in-group condition. We found that people were significantly more cooperative towards double in-group member than the partial in-group members, $t_s > 8.94$, $p_s < .001$, supporting H3b. The result thus favored the social identity perspective over the BGR perspective.

Hypotheses 4–6

We conducted multilevel structural equation modeling (M-SEM) using a Bayesian framework with Mplus 8.5 (Muthén & Muthén, 1998–2017), which allowed us to test a moderated mediation model with the within-subjects design experimental data. For

Bayesian estimations, we used non-informative priors and Markov chain Monte Carlo (MCMC) methods. We used two MCMC chains. In each chain, a hundred thousand simulated draws from the posterior were obtained for each parameter. The simulated draws were preceded by 50,000 burn-in draws, which was half of the total simulated draws. To minimize temporal autocorrelation among the draws, we included one out of every five simulated draws and thinned the MCMC chains, leaving 20,000 simulated posterior observations. We then determined convergence by the Gelman-Rubin convergence criterion (Gelman & Rubin, 1992)

Figure 3 shows our model simultaneously testing H4 – H6. At the within level, we had Category 1 (−0.5 = out-group, 0.5 = in-group), Category 2 (−0.5 = out-group, 0.5 = in-group), and Category 1 × Category 2 interaction. We modeled the indirect effects of reputational concern and expected cooperation. These mediation paths served to test H4 and H5. In addition, we specified the paths representing the direct effects of Category 1 and Category

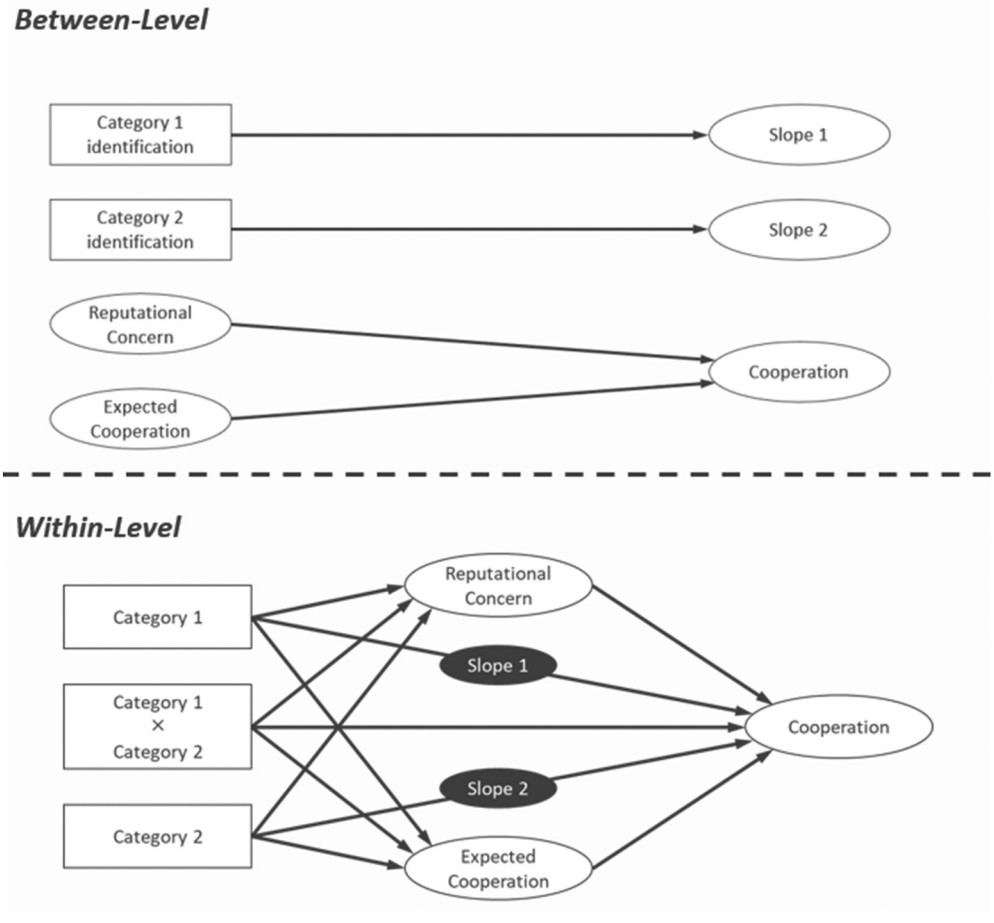

Figure 3. The multilevel structural equation model to test H4–6. Note: Residual covariances were not included for readability. Yet, we modeled residual covariances (i) between reputational concern and expected cooperation at the within level and (ii) among cooperation, Slope 1 and Slope 2 at the between level. See online supplementary results for full detail.

2 on cooperation as random slopes (we call them Slope 1 and Slope 2, respectively, in Figure 2), such that they were treated as between-level variables (i.e. effects of Category 1 and Category 2 on cooperation at the within level vary across participants). At the between level, we regressed identification with Group A (Category 1) on Slope 1 and identification with Group Y (Category 2) on Slope 2, which served to test H6. In addition, we regressed reputation concern and expected cooperation on cooperation. We also modeled a residual covariance between reputational concern and expected cooperation at the within level as well as those among cooperation, Slope 1, and Slope 2 at the between level. For hypothesis testing, we preregistered to refer to 95% credible intervals.

H4: group membership ➔ reputational concern ➔ cooperation

The M-SEM results are summarized in Table 2. First, we tested whether the two BGR-related mediation hypotheses (H4 and H5) were supported. Regarding H4, both the categories had a significant main effect on reputational concern (Category 1: $b = 0.10$, 95% CI [0.05, 0.14]; Category 2: $b = 0.10$, 95% CI [0.05, 0.14]), but their interaction effect on reputational concern was not significant ($b = 0.08$, 95% CI [−0.01, 0.17]). Therefore, we examined the mediating roles of reputational concern in the associations between each category and cooperation separately. We found that reputational concern did not mediate neither the effect of Category 1 ($b = 0.48$, 95% CI [−0.07, 1.21]) nor the effect of Category 2 ($b = 0.47$, 95% CI [−0.07, 1.20]). Thus, H4 was not supported. That is, reputational concern did not mediate the relationship between group membership and cooperation.

Table 2. Results of the multilevel structural equation model to test H4–6.

Focal Path	b	95% CI	
Between-Level			
Category 1 Identification → Slope 1	2.15	[−5.20, 9.51]	
Category 2 Identification → Slope 2	3.59	[−4.23, 11.52]	
Reputational Concern → Cooperation	−2.37	[−7.76, 2.93]	
Expected Cooperation → Cooperation	0.95	[0.86, 1.04]	*
Intercept (Slope 1)	5.40	[0.73, 10.13]	*
Intercept (Slope 2)	11.38	[6.15, 16.74]	*
Within-Level			
Reputational Concern → Cooperation	5.16	[−0.73, 11.08]	
Expected Cooperation → Cooperation	0.42	[0.37, 0.47]	*
Category 1 × Category 2 → Cooperation	13.24	[4.45, 22.01]	*
Category 1 → Reputational Concern	0.10	[0.05, 0.14]	*
Category 2 → Reputational Concern	0.10	[0.05, 0.14]	*
Category 1 × Category 2 → Reputational Concern	0.08	[−0.01, 0.17]	
Category 1 → Expected Cooperation	21.72	[16.10, 27.29]	*
Category 2 → Expected Cooperation	33.87	[28.17, 39.51]	*
Category 1 × Category 2 → Expected Cooperation	28.04	[16.85, 39.22]	*
Indirect Effect			
Category 1 → Reputational Concern → Cooperation	0.48	[−0.07, 1.21]	
Category 2 → Reputational Concern → Cooperation	0.47	[−0.07, 1.20]	
Category 1 → Expected Cooperation → Cooperation (Category 2 = in)	15.08	[11.45, 19.03]	*
Category 1 → Expected Cooperation → Cooperation (Category 2 = out)	3.25	[−0.11, 6.69]	
Category 2 → Expected Cooperation → Cooperation (Category 1 = IN)	20.20	[16.31, 24.57]	*
Category 2 → Expected Cooperation → Cooperation (Category 1 = OUT)	8.37	[4.91, 11.98]	*

Note: asterisks indicate corresponding 95% credible intervals do not include 0.

H5: group membership ➔ expected cooperation ➔ cooperation

Regarding H5, both the categories had a significant main effect on expected cooperation (Category 1: $b = 21.72$, 95% CI [16.10, 27.29]; Category 2: $b = 33.87$, 95% CI [28.17, 39.51]). In addition, their interaction was significant ($b = 28.04$, 95% CI [16.85, 39.22]). Therefore, we examined the mediating role of expected cooperation considering the effect of crossed group membership. We found that Category 1 had a significant indirect effect via expected cooperation when partners were in-group members of Category 2 dimension ($b = 15.08$, 95% CI [11.45, 19.03]), while it was not significant when partners were out-group members of Category 2 ($b = 3.25$, 95% CI [−0.11, 6.69]). This suggests that in order for Category 1 in-group membership to increase expected cooperation, Category 2 in-group membership was necessary. Contrastingly, Category 2 had a significant indirect effect via expected cooperation when partners were in-group members of Category 1 ($b = 20.20$, 95% CI [16.31, 24.57]), and it had a significant, yet smaller effect when partners were out-group members of Category 1 ($b = 8.37$, 95% CI [4.91, 11.98]). We thus collated mixed evidence as to whether the mediating effect of expected cooperation is conditional to whether two shared in-group memberships are necessary or one is sufficient. According to BGR, as hypothesized earlier, an in-group membership should be sufficient to increase cooperation and should indirectly influence cooperation via expected cooperation. As such, the results regarding Category 1 membership were somewhat inconsistent with the BGR perspective.

H6: SIP

Finally, we tested H6. Neither was the effect of Category 1 identification on Slope 1 ($b = 2.15$, 95% CI [−5.20, 9.51]) nor the effect of Category 2 on Slope 2 ($b = 3.59$, 95% CI [−4.23, 11.52]) significant. Therefore, H6 was not supported.

Results: not preregistered

Social identification

Our preregistered analyses revealed that participants were more cooperative in the OUT-in condition than in the OUT-out condition. However, cooperation in the other partial in-group condition (the IN-out) condition was not significantly higher than in the double out-group condition. In addition, we found that the indirect effect of Category 2 on cooperation via expected cooperation was not conditional to Category 1 group membership, but that of Category 1 was conditional to Category 2 group membership. These suggested that Category 2 was somewhat more salient than Category 1. To probe this possibility, we compared social identification with Group A (Category 1 in-group) with social identification with Group Y (Category 2 in-group). Unexpectedly, participants identified with Category 1 in-group ($M = 3.30$, $SD = 0.64$) more strongly than Category 2 in-group ($M = 3.12$, $SD = 0.63$), $t(366) = 5.41$, $p < .001$, *Cohen's* $d = 0.28$ 95% CI [0.19, 0.38]. Thus, identity salience was not a plausible explanation for the asymmetric effects between Category 1 and Category 2.

Double In-group versus partial In-group versus double out-group

We unexpectedly found that Category 2 group membership somehow exerted stronger influences on cooperation. We thus collapsed the two partial in-group conditions into one condition and conducted a 1 × 3(group: double in-group vs. partial in-group vs. double out-group) within-subjects ANOVA on cooperation to revisit H1-H3. There was a significant effect of the group on cooperation, $F(1.69, 617.15) = 72.22$, $p < .001$, $\eta_p^2 = .17$. We followed it up with pairwise comparisons using estimated marginal means (p values were adjusted with the Tukey method). Cooperation with the double in-group member ($M = 209.07$, $SE = 4.09$) was significantly larger than that with the partial in-group members ($M = 175.64$, $SE = 3.53$) and the double out-group member ($M = 167.76$, $SE = 3.93$), supporting H1, $t_s > 9.50$, $p_s < .001$. In addition, cooperation with the partial in-group members was significantly higher than that with the double out-group member, supporting H2, $t(366) = 7.88$, $p = .03$. Supporting H3b, we found that participants cooperated more with the double in-group targets than the partial in-group target, $t(366) = 9.74$, $p < .001$. Overall, we found that people treated the double in-group members more favorably than the partial in-group members, supporting the SIP.

Discussion

Previous studies predominantly focused on how crossed categorization influences intergroup attitudes, but its impact on cooperation has been relatively understudied. To fill this gap, we examined cooperation in the crossed categorization context and explored the psychological mechanisms underlying this. More specifically, we tested the predictions from the two competing theories, BGR and SIP. Overall, we found that people cooperate less with double out-group members than those with one or two in-group memberships. In addition, people cooperate more with double in-group members in comparison to partial in-group members. This result was consistent with the SIP, as in-group memberships additively increased cooperation. However, further investigation into the psychological underpinnings revealed that the strength of social identity was *not* associated with cooperation. Rather, partly consistently with BGR, we found that in-group membership indirectly increased cooperation via increased expected cooperation. Yet, we note that Category 1 in-group membership increased cooperation via increased expected cooperation only when Category 2 in-group membership was also present. Below, we discuss the implications of our findings for crossed categorization, BGR, and SIP research.

Implications for crossed categorization research

People belong to multiple social groups, many of which are physically apparent. As such, social psychological work on intergroup processes has moved beyond investigating a single group context (Crisp & Hewstone, 2007). Yet, there have been only a few studies that examined the influence of crossed categorization on intergroup behaviors (i.e. cooperation) rather than attitudes (Kumar et al., 2021; Uğurlar et al., 2023). Kumar et al. (2021) investigated cooperation when gender and nationality were crossed and demonstrated that people were more cooperative with national in-group members than national out-group members, irrespective of the gender of their

interaction partners. In addition, the strength of national identification was positively associated with prosocial giving to national in-group members. In other words, in the context of nationality × gender crossed categorization, they observed the dominance pattern; one group membership dominates the other. More recently, Uğurlar et al. (2023) conducted a study in which they employed two equally meaningless and salient minimal groups (preferred shape: triangle vs. square; preferred color: blue vs. green) and examined cooperation in prisoners' dilemma games. Consistent with our results, they found that in-group memberships additively increased cooperation, as participants cooperated more with partial in-group members than double out-group members, but not as much as they cooperated with double in-group members. Moreover, they replicated the pattern with two different natural group contexts (ethnicity and political ideology; religious affiliation and political orientation).

We conclude that intergroup relations research will benefit from examining crossed categorization contexts, as different behavioral trends arise from interactions between various group memberships such as the dominance pattern found when emphasizing nationality and gender (Kumar et al., 2021) or the additive cooperation when focusing on ethnicity and political ideology (Uğurlar et al., 2023). Future research should focus on further explaining why some group memberships dominate others, and forming theories that can systematically account for the effect of two (or more) in-group memberships in a wide range of social contexts.

While we shared the motivations, conducted research in similar experimental settings, and reached complementary conclusions as Uğurlar et al. (2023), our study goes beyond their research by testing the psychological mechanisms informed by two theoretical perspectives, BGR and SIP. More specifically, we hypothesized that in-group memberships increase cooperation via increased reputational concern (H4) and/or expected cooperation (H5) and that the strength of social identification moderates the effect of shared in-group memberships on cooperation (H6). We did not find support for H4 and H6. However, we obtained partial support for H5, revealing that in-group memberships increase cooperation via expected cooperation. However, note that while Category 2 in-group membership increased cooperation via expected cooperation regardless of Category 1 group membership, Category 1 in-group did so only when Category 2 membership was classified as in-group. Our data does not allow us to further discuss why Category 1 membership (based on artistic preferences) and Category 2 membership (based on dot estimations) had somewhat different effects, but our results suggest that overall, it is expected cooperation that is responsible for increased in-group cooperation.

Previous studies on intergroup cooperation have discussed the psychological mechanisms of in-group favoritism in single-group contexts with belief-based (expected cooperation) and belief-based (expected cooperation) explanations (Everett et al., 2015a). The former explains in-group favoritism by emphasizing the roles of expectations about in-group members' behavior and the consequences of one's own behavior. The latter does so as caused by unconditional and innate motivations to favor in-group members over out-group members. The large-scale meta-analysis offered evidence in favor of the latter (Balliet et al., 2014) and consistent with this, our results suggest that the belief-based explanation better delineates intergroup cooperation in crossed categorization contexts.

Implications for BGR

According to the BGR perspective, people are more cooperative with in-group members than out-group members because they experience a stronger level of reputational concern and/or they expect more cooperation when interacting with in-group members than out-group members (Imada et al., 2023, 2024). Based on BGR, we hypothesized that individuals would cooperate no more or less with double in-group targets than partial in-group targets, because they believe that those targets both share a system of indirect reciprocity with them. As such, it should be sufficient for them to display a fixed amount of increased cooperation. However, we did not obtain support for the hypothesis.

Recent studies have pointed out that the group heuristic (i.e. the assumption of bounded indirect reciprocity) is a default game strategy and can be easily overridden by other contextual cues, such as future indirect benefits (Imada et al., 2023; Romano et al., 2017). More recently, Imada et al. (2024) suggested that studies with a within-subjects design (in which participants complete multiple decision-making tasks with in-group and out-group members) may reduce the impact of the group heuristic (also see Everett et al., 2015a). Thus, the within-subjects nature of our experiment might have weakened the impact of the BGR-based psychological mechanisms.

In addition, the crossed categorization context itself might take an active role in overriding the group heuristic. Unlike a simple intergroup context with one salient group membership, crossed categorization contexts involve two group memberships and can likely make group boundaries obscure, presumably more so in minimal group contexts. The presence of multiple group memberships may also imply that intergroup mobility is high by reminding individuals that they belong to several social groups. These unique features of crossed categorization contexts might lead people to rely less on the group heuristic.

That said, we found partial support for H5 (the expected cooperation hypothesis), revealing that expected cooperation mediated the relationship between shared in-group memberships and cooperation. It is noteworthy that, in line with this, recent studies have found that the proximate mechanism underlying in-group favoritism in one-shot, single-group contexts is expected cooperation rather than reputational concern (Imada et al., 2023, 2024). To recapitulate, while we suggest that BGR is not sufficient as a theoretical framework in predicting intergroup cooperation when multiple group memberships are present, we argue that expected cooperation (which is derived from BGR) is an important psychological mechanism underpinning the behavior. To our knowledge, our study is the first to apply BGR to multiple group contexts, and future research may reveal boundary conditions for BGR to take an active role in explaining intergroup cooperation in multiple group contexts.

Implications for SIP

Social identity theory has been a cornerstone theory in social psychological research on intergroup relations, and social identification has been found to be a robust correlate of intergroup attitudes (Hewstone et al., 2002; Hogg & Abrams, 1988; Hogg et al., 2004). However, since Jin et al. (1996), studies have found that the strength of social identification is not associated with in-group cooperation (e.g. Imada et al.,

2024; Romano et al., 2017). Consistent with this, our study found that the strength of social identification did not influence the effect of in-group memberships on cooperation. The lack of association between the strength of social identification and cooperation suggests that social identity-related processes played a limited role in explaining intergroup cooperation in our study. Nevertheless, we found support for SIP in predicting cooperation, suggesting that SIP is still a useful theoretical framework to understand intergroup cooperation.

Beyond the dichotomy

In our studies, we pit the BGR and SIP approaches against each other because they diverge in their predictions regarding whether in-group favoritism emerges under complete anonymity (i.e. when people are aware that their partner does not know who they are). BGR predicts that in-group favoritism is conditional to the belief that indirect reciprocity is bounded by group membership and people would not display in-group favoritism under anonymity where reputational concern and expected cooperation are suppressed. Contrastingly, according to SIP, internal motivations (e.g. depersonalized attraction and the need to establish a positively distinct social identity) foster in-group cooperation, and therefore in-group favoritism should not be conditional to anonymity. Previous experimental and meta-analytic evidence supported BGR, demonstrating that in-group favoritism is overall conditional to anonymity (Balliet et al., 2014, but see; Everett et al., 2015b; Imada et al., 2024). BGR, however, does not explicitly deny that factors other than reputation and expected cooperation can influence the extent to which individuals display in-group favoritism when their decision is not anonymous. As such, these two perspectives are not necessarily conflicting explanations for in-group favoritism in non-anonymous situations. In our research, SIP better predicted *cooperation* than BGR. On the other hand, BGR offered a better explanation as expected cooperated but not social identification was correlated with cooperation; the results suggest that both BGR and SIP contribute to a fuller understanding of cooperation under non-anonymity. This evidence calls for further theoretical development that goes beyond the dichotomy and potentially integrates the two.

Limitations

We would like to first note that Balliet et al. (2014) large-scale meta-analysis revealed that studies with more male participants reported a greater degree of in-group favoritism. Since 75% of the participants were female in our study, future studies with a more balanced sample could detect stronger differences in cooperation in crossed categorization contexts. Second, we did not fully incentivize participants in the experiment but asked them to imagine they played the game. As such, the results may be influenced by social desirability bias in a way that cooperation in the experiment was inflated. However, Romano et al. (2021) investigated the impact of financial incentives on in-group favoritism in three countries (Brazil, India, and Poland) and revealed that participants in the hypothetical and incentivized prisoners' dilemma games did not display different levels of in-group favoritism. Thus, while it is sensible to employ a strong incentive to minimize the potential impact of biases, our results still offer valuable evidence.

We used two commonly used minimal group induction methods to create two orthogonally crossed minimal group memberships: the artistic preference and dot estimation tasks. Unexpectedly, we found that the minimal group memberships based on the two tasks had somewhat different effects. More specifically, while people more strongly identified with the in-group based on the former than the latter, cooperation with a partial in-group member was larger when the shared in-group membership was based on the latter than the former. Our data does not allow us to disentangle why we observed the different effects of the two group memberships but suggests that it is sensible to choose minimal groups that are more similar to each other, like the ones used in Uğurlar et al. (2023, Study 1).

Conclusion

In the present research, we investigated cooperation under crossed categorization and its psychological underpinnings, drawn from two theoretical perspectives, BGR and SIP. Consistent with SIP, we found that two in-group memberships additively increased cooperation in the crossed categorization context. Regarding psychological mechanisms, partly consistent with BGR, we found that the increase in cooperation due to shared in-group membership was accompanied by expected cooperation. Intergroup cooperation has been widely studied, but it has been understudied in crossed categorization contexts which often represent day-to-day intergroup interactions. Our study contributes to the literature by extending previous findings and theoretical perspectives in the one group membership context into understanding crossed categorization contexts. Despite that, we did not find clear-cut evidence to support one theoretical approach (BGR or SIP) over the other in crossed categorization contexts. This leaves promising future directions that will further help us elucidate intergroup cooperation under crossed categorization and develop a new theoretical account.

Notes

1. In-group favoritism and in-group bias can manifest in diverse forms including, cooperation, evaluation, and affect (Balliet et al., 2014; Hewstone et al., 2002). Our research is concerned solely with cooperation and we mean in-group favoritism in cooperation by "in-group favoritism."
2. Importantly, the BGR account can explain in-group favoritism in one-shot interactions; even in one-shot interactions, individuals can at least expect their in-group partner to cooperate with them, as long as reputation is at stake. One may wonder why the group heuristic predicts cooperation even when it is obvious that people cannot expect to have future interactions with in-group members at all (i.e. when reputation does not matter much). Based on the error management theory (e.g. Haselton & Buss, 2000), Yamagishi et al. (1999) argued that it is more costly for people to erroneously assume that their reputation does not matter when it actually does, compared to erroneously assuming that their reputation does matter when it actually does not. The group heuristic makes people always assume that in-group members are in the same system of the exchange (even when there is no future interactions and they cannot benefit from the exchange system at all), and it minimizes the possibility of making the former, more costly error. Yamagishi et al. (1999) hold that the group heuristic is thus ultimately adaptive and can be activated by shared group membership even in one-shot interactions.

3. Previous studies typically focused on cooperation towards in-group members, out-group members or a person whose group membership is unknown (i.e. a stranger). A stranger functions as a baseline; when people cooperate more with an in-group member than a stranger, this suggests the presence of increased in-group cooperation (often referred to as "in-group love"). When people cooperate less with an out-group member than a stranger, this suggests the presence of decreased out-group cooperation (often referred to as "out-group derogation"). Previous studies have robustly offered evidence for increased in-group cooperation but not for reduced out-group cooperation, in diverse intergroup contexts (for a review, see Balliet et al., 2014).

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

Aaldering, H., Ten Velden, F. S., van Kleef, G. A., & De Dreu, C. K. W. (2018). Parochial cooperation in nested intergroup dilemmas is reduced when it harms out-groups. *Journal of Personality & Social Psychology*, *114*(6), 909–923. https://doi.org/10.1037/pspi0000125

Ando, K. (1999). Social identification and a solution to social dilemmas. *Asian Journal of Social Psychology*, *2*(2), 227–235. https://doi.org/10.1111/1467-839X.00036

Balliet, D., Wu, J., & De Dreu, C. K. W. (2014). Ingroup favoritism in cooperation: A meta-analysis. *Psychological Bulletin*, *140*(6), 1556–1581. https://doi.org/10.1037/a0037737

Brewer, M. B. (1999). The psychology of prejudice: Ingroup love or outgroup hate? *The Journal of Social Issues*, *55*(3), 429–444. https://doi.org/10.1111/0022-4537.00126

Brewer, M. B., & Kramer, R. M. (1986). Choice behavior in social dilemmas. Effects of social identity, group size, and decision framing. *Journal of Personality & Social Psychology*, *50*(3), 543–549. https://doi.org/10.1037/0022-3514.50.3.543

Crisp, R. J., & Hewstone, M. (2000). Crossed categorization and intergroup bias: The moderating roles of intergroup and affective context. *Journal of Experimental Social Psychology*, *36*(4), 357–383. https://doi.org/10.1006/jesp.1999.1408

Crisp, R. J., & Hewstone, M. (2016). Differential evaluation of crossed category groups: Patterns, processes, and reducing intergroup bias. *Group Processes and Intergroup Relations*, *2*(4), 307–333. https://doi.org/10.1177/1368430299024001

Crisp, R. J., & Hewstone, M. (2007). Multiple social categorization. In *Advances in experimental social psychology* (Vol. 39, pp. 163–254). Academic Press. https://doi.org/10.1016/S0065-2601(06)39004-1

Everett, J. A. C., Faber, N. S., & Crockett, M. (2015a). Preferences and beliefs in ingroup favoritism. *Frontiers in Behavioral Neuroscience*, *9*(FEB), 1–21. https://doi.org/10.3389/fnbeh.2015.00015

Everett, J. A. C., Faber, N. S., & Crockett, M. J. (2015b). The influence of social preferences and reputational concerns on intergroup prosocial behaviour in gains and losses contexts. *Royal Society Open Science*, *2*(12), 150546. https://doi.org/10.1098/rsos.150546

Fiedler, S., Hellmann, D. M., Dorrough, A. R., & Glöckner, A. (2018). Cross-national in-group favoritism in prosocial behavior: Evidence from Latin and North America. *Judgment & Decision Making*, *13*(1), 42–60. https://doi.org/10.1017/S1930297500008810

Fuertes, J. N., Gottdiener, W. H., Martin, H., Gilbert, T. C., & Giles, H. (2012). A meta-analysis of the effects of speakers' accents on interpersonal evaluations. *European Journal of Social Psychology*, *42*(1), 120–133. https://doi.org/10.1002/EJSP.862

Gelman, A., & Rubin, D. B. (1992). Inference from iterative simulation using multiple sequences. *Statistical Science*, *7*(4), 457–472. https://doi.org/10.1214/ss/1177011136

Gluszek, A., & Dovidio, J. F. (2010). Speaking with a nonnative accent: Perceptions of bias, communication difficulties, and belonging in the United States. *Journal of Language & Social Psychology*, *29*(2), 224–234. https://doi.org/10.1177/0261927X09359590

Hackel, L. M., Zaki, J., & Van Bavel, J. J. (2017). Social identity shapes social valuation: Evidence from prosocial behavior and vicarious reward. *Social Cognitive and Affective Neuroscience*, *12*(8), 1219–1228. https://doi.org/10.1093/scan/nsx045

Haselton, M. G., & Buss, D. M. (2000). Error management theory: A new perspective on biases in cross-sex mind reading. *Journal of Personality & Social Psychology*, *78*(1), 81–91. https://doi.org/10.1037/0022-3514.78.1.81

Hewstone, M., Rubin, M., & Willis, H. (2002). Intergroup bias. *Annual Review of Psychology*, *53*(1), 575–604. https://doi.org/10.1146/annurev.psych.53.100901.135109

Hogg, M. A. (1993). Group cohesiveness: A critical review and some new directions. *European Review of Social Psychology*, *4*(1), 85–111. https://doi.org/10.1080/14792779343000031

Hogg, M. A., & Abrams, D. (1988). *Social identifications: A social psychology of intergroup relations and group processes*. Taylor & Frances/Routledge.

Hogg, M. A., Abrams, D., Otten, S., & Hinkle, S. (2004). The social identity perspective: Intergroup relations, self-conception, and small groups. *Small Group Research*, *35*(3), 246–276. https://doi.org/10.1177/1046496404263424

Hogg, M. A., & Hains, S. C. (1996). Intergroup relations and group solidarity: Effects of group identification and social beliefs on depersonalized attraction. *Journal of Personality & Social Psychology*, *70*(2), 295–309. https://doi.org/10.1037/0022-3514.70.2.295

Imada, H., Codd, D., & Liu, D. (2021). Intergroup discrimination in cooperation among moral and non-moral groups. *Letters on Evolutionary Behavioral Science*, *12*(1), 28–33. https://doi.org/10.5178/LEBS.2021.86

Imada, H., & Mifune, N. (2024). Experimental evidence suggests intergroup relations are, by default, neutral rather than aggressive. *Behavioral and Brain Sciences*, *47*, e13. https://doi.org/10.1017/S0140525X23002728

Imada, H., Mifune, N., & Shimizu, H. (2024). Psychological mechanisms underlying ingroup favouritism in cooperation: Revisiting the reputation management and expectation hypotheses. *Group Processes and Intergroup Relations*, 13684302241239860. https://doi.org/10.1177/13684302241239860

Imada, H., Romano, A., & Mifune, N. (2023). Dynamic indirect reciprocity: When is indirect reciprocity bounded by group membership? *Evolution and Human Behavior*, *44*(4), 373–383. https://doi.org/10.1016/j.evolhumbehav.2023.05.002

Jackson, J. W. (2008). Reactions to social dilemmas as a function of group identity, rational calculations, and social context. *Small Group Research*, *39*(6), 673–705. https://doi.org/10.1177/1046496408322761

Jetten, J., Spears, R., & Manstead, A. S. R. (1997). Strength of identification and intergroup differentiation: The influence of group norms. *European Journal of Social Psychology*, *27*(5), 603–609. https://doi.org/10.1002/(SICI)1099-0992(199709/10)27:5<603:AID-EJSP816>3.0.CO;2-B

Jin, N., Yamagishi, T., & Kiyonari, T. (1996). Bilateral dependency and the minimal group paradigm. *Japanese Journal of Psychology*, *67*(2), 77–85. https://doi.org/10.4992/JJPSY.67.77

Kumar, M. M., Tsoi, L., Lee, M. S., Cone, J., McAuliffe, K., & Capraro, V. (2021). Nationality dominates gender in decision-making in the Dictator and Prisoner's dilemma games. *PLOS ONE*, *16*(1), e0244568. https://doi.org/10.1371/JOURNAL.PONE.0244568

Lakens, D., & Caldwell, A. R. (2021). Simulation-based power analysis for factorial analysis of variance designs. *Advances in Methods and Practices in Psychological Science*, *4*(1), Article 2515245920951503. https://doi.org/10.1177/2515245920951503

Leonardelli, G. J., & Brewer, M. B. (2001). Minority and majority discrimination: When and why. *Journal of Experimental Social Psychology*, *37*(6), 468–485. https://doi.org/10.1006/jesp.2001.1475

Leys, C., Ley, C., Klein, O., Bernard, P., & Licata, L. (2013). Detecting outliers: Do not use standard deviation around the mean, use absolute deviation around the median. *Journal of Experimental Social Psychology*, *49*(4), 764–766. https://doi.org/10.1016/j.jesp.2013.03.013

Mifune, N., Hashimoto, H., & Yamagishi, T. (2010). Altruism toward in-group members as a reputation mechanism. *Evolution and Human Behavior*, *31*(2), 109–117. https://doi.org/10.1016/j.evolhumbehav.2009.09.004

Mifune, N., & Yamagishi, T. (2015). A test of the correlation between ingroup favoritism and fear of negative evaluation. *Research in Social Psychology*, *31*(2), 128–134. https://doi.org/10.14966/jssp.31.2_128

Miller, J. (1991). Short report: Reaction time analysis with outlier exclusion: Bias varies with sample size. *The Quarterly Journal of Experimental Psychology Section A*, *43*(4), 907–912. https://doi.org/10.1080/14640749108400962

Mullen, B., Migdal, M. J., & Hewstone, M. (2001). Crossed categorization versus simple categorization and intergroup evaluations: A meta-analysis. *European Journal of Social Psychology*, *31*(6), 721–736. https://doi.org/10.1002/EJSP.60

Nadler, A., & Halabi, S. (2006). Intergroup helping as status relations: Effects of status stability, identification, and type of help on receptivity to high-status group's help. *Journal of Personality & Social Psychology*, *91*(1), 97–110. https://doi.org/10.1037/0022-3514.91.1.97

Nakagawa, Y., Yokota, K., & Nakanishi, D. (2015). The theoretical validity of social identity theory and the bounded generalized reciprocity hypothesis in real social groups: A vignette experiment on Hiroshima Toyo Carp fans. *Research in Social Psychology*, *30*(3), 153–163. https://doi.org/10.14966/jssp.30.3_153

Nowak, M. A. (2006). Five rules for the evolution of cooperation. *Science*, *314*(5805), 1560–1563. https://doi.org/10.1126/science.1133755

Nowak, M. A., & Sigmund, K. (1998). Evolution of indirect reciprocity by image scoring. *Nature*, *393*(6685), 573–577. https://doi.org/10.1038/31225

Nowak, M. A., & Sigmund, K. (2005). Evolution of indirect reciprocity. *Nature*, *437*(7063), 1291–1298. https://doi.org/10.1038/nature04131

Romano, A., Balliet, D., & Wu, J. (2017). Unbounded indirect reciprocity: Is reputation-based cooperation bounded by group membership? *Journal of Experimental Social Psychology*, *71*, 59–67. https://doi.org/10.1016/j.jesp.2017.02.008

Romano, A., Sutter, M., Liu, J. H., Yamagishi, T., & Balliet, D. (2021). National parochialism is ubiquitous across 42 nations around the world. *Nature Communications*, *12*(1), 1–8. https://doi.org/10.1038/s41467-021-24787-1

Ruffle, B. J., & Sosis, R. (2006). Cooperation and the in-group-out-group bias: A field test on Israeli kibbutz members and city residents. *Journal of Economic Behavior and Organization*, *60*(2), 147–163. https://doi.org/10.1016/j.jebo.2004.07.007

Strathman, A., & Joireman, J. (2005). Understanding behavior in the context of time: Theory, research, and application. *Understanding Behavior in the Context of Time: Theory, Research, and Application*, 1–356. https://doi.org/10.4324/9781410613516

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In W. G. Austin & S. Worchel (Eds.), *The social psychology of intergroup relations* (pp. 33–37). Brooks/Cole.

Turner, J. C., Brown, R. J., & Tajfel, H. (1979). Social comparison and group interest in ingroup favouritism. *European Journal of Social Psychology*, *9*(2), 187–204. https://doi.org/10.1002/ejsp.2420090207

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987). *Rediscovering the social group: A self-categorization theory*. Basil Blackwell.

Uğurlar, P., Dorrough, A. R., Isler, O., & Yilmaz, O. (2023). Shared group memberships mitigate intergroup bias in cooperation. *Social Psychological & Personality Science*, *19485506231209788*. https://doi.org/10.1177/19485506231209788

Van Vugt, M. (2009). Averting the tragedy of the commons: Using social psychological science to protect the environment. *Current Directions in Psychological Science*, *18*(3), 169–173. https://doi.org/10.1111/J.1467-8721.2009.01630.X

Verhoeff, T. (1993). *A continuous version of the prisoner's dilemma*. Technische Universiteit Eindhoven.

Wahl, L. M., & Nowak, M. A. (1999). The continuous prisoner's dilemma: I. Linear reactive strategies. *Journal of Theoretical Biology*, *200*(3), 307–321. https://doi.org/10.1006/jtbi.1999.0996

Wu, J., Balliet, D., & Van Lange, P. A. M. (2015). When does gossip promote generosity? Indirect reciprocity under the shadow of the future. *Social Psychological & Personality Science*, *6*(8), 923–930. https://doi.org/10.1177/1948550615595272

Yamagishi, T., Jin, N., & Kiyonari, T. (1999). Bounded generalized reciprocity: In group boasting and ingroup favoritism. In E. J. Lawler, S. R. Thye, M. W. Macy & H. A. Walker (Eds.), *Advances in group processes* (pp. 161–197). Emerald.

Yamagishi, T., & Kiyonari, T. (2000). The group as the container of generalized reciprocity. *Social Psychology Quarterly*, *63*(2), 116–132. https://doi.org/10.2307/2695887

Yamagishi, T., & Mifune, N. (2008). Does shared group membership promote altruism?: Fear, greed, and reputation. *Rationality and Society*, *20*(1), 5–30. https://doi.org/10.1177/1043463107085442

Swan, S., & Wyer, R. S., Jr. (1997). Gender stereotypes and social identity: How being in the minority affects judgment of self and others. *Personality & Social Psychology Bulletin*, *23*(12), 1265–1276. https://doi.org/10.1177/01461672972312004