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Preschoolers' ingroup bias in predicting others' sharing: The role of contexts and theory of mind

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ABSTRACT

The current study investigated preschoolers' ingroup bias in predicting people's sharing across contexts and its relation to second-order theory of mind (ToM) ability. In Experiment 1, 96 5- and 6-year-old children were assigned to one of two groups in a minimal group paradigm. They heard a story about fictional ingroup and outgroup peers sharing in a public or private condition and were asked to predict and evaluate their sharing behavior. Children predicted that ingroup peers would share more than outgroup peers and also showed ingroup bias in evaluation regardless of the equal actual sharing of ingroup and outgroup peers. Moreover, 6-year-olds displayed a flexible ingroup bias in predicting others' sharing across conditions because they held such a bias only in public conditions and did not expect ingroup and outgroup peers to share differently in private conditions. Experiment 2 tested a new sample of 80 6-year-olds with the same sharing story and a second-order false belief task. Results showed that only 6-year-olds who fully passed the false belief task showed a flexible bias in predicting sharing across conditions. Results indicate that children's ingroup bias in predicting others' sharing is becoming flexible across contexts as they grow up and ToM skills contribute to the development of their increasingly sophisticated prosocial reasoning.

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Introduction

Prosocial behavior is essential for maintaining cooperation in human society and has its roots early on in development (Leimgruber, 2018; Martin & Olson, 2015; Warneken, 2015). The ability to predict others' prosociality plays a vital role in navigating the social world. People need to use what they know about others to judge whether they will act positively or negatively and to decide whether to approach or avoid them (Hamlin, Wynn, & Bloom, 2007), which largely affects children's daily interactions during development (Chalik & Rhodes, 2018; Hamlin & Wynn, 2011; Wilks, Kirby, & Nielsen, 2018). Moreover, children's prosocial behavior is positively associated with their expectations of recipients' prosociality (Kumaki, Moriguchi, & Myowa-Yamakoshi, 2018; Renno & Shutts, 2015). Exploring children's prediction of others' prosocial behaviors can help in figuring out how children understand those acts and in explaining their increasing selectivity in displaying prosociality as they grow up (Martin & Olson, 2015).

In predicting others' behaviors, children often prioritize social category information over individual information (Cimpian & Erickson, 2012; Diesendruck & HaLevi, 2006), although they are able to consider both types of information (Chalik & Rhodes, 2014; Rhodes & Gelman, 2008). Chalik, Rivera, and Rhodes (2014) explained that such a bias boosts early learning because it helps to simplify environmental information for children. Right after acquiring the ability to divide people into social categories at 3 months of age (Bar-Haim, Ziv, Lamy, & Hodes, 2006; Quinn et al., 2008), infants start to use it to predict that people within the same social groups will behave similarly (Powell & Spelke, 2013). By preschool age, children use social categories to make inferences about a fair amount of social interactions such as who will become friends and who will share the same activity preferences (Shutts, Roben, & Spelke, 2013; Taylor, Rhodes, & Gelman, 2009).

Social category information also affects children's judgments regarding prosocial behaviors such as sharing. The first set of studies shows that children take group membership into account when making third-person judgments. For example, when exposed to two animal categories, 1.5- and 2.5-year-olds expected more giving to ingroup members than equal allocation between ingroup and outgroup members when resources were limited (Bian, Sloane, & Baillargeon, 2018). Using the novel groups paradigm, 6- and 7-year-olds expected people to give more to their ingroup members than to outgroup members, and 8- to 10-year-olds expected more giving to their ingroup members than equal allocation (DeJesus, Rhodes, & Kinzler, 2014). These two studies suggest that children generally infer that people tend to give more to those in their own group than to those outside their group. When reasoning about social groups that they were part of themselves, 3- to 5-year-olds predicted more sharing from people in the same gender or race category (Renno & Shutts, 2015), indicating that children hold a positive bias toward the ingroup compared with the outgroup when making inferences about others' sharing.

This ingroup bias in predicting prosociality could influence subsequent information processing such as enhancing positive information for the ingroup and negative information for the outgroup (Baron & Dunham, 2015; Dunham, Baron, & Carey, 2011). In addition, the ingroup bias in prediction and information processing of prosocial behaviors may account for why children evaluate ingroup members more positively than outgroup members (Dunham et al., 2011) and share more resources with them (Fehr, Bernhard, & Rockenbach, 2008). However, it is worth noting that the prosocial behaviors mentioned above were mostly benefiting either children themselves or other ingroup members. No study to date has directly tested whether children hold a positive bias toward the ingroup compared with the outgroup when making inferences about others' prosociality in general. Although it is still unknown whether children predict their ingroup members to behave in a more prosocial manner even in situations where recipients are from outside the group, theoretical accounts regarding the ingroup bias in minimal groups are in favor of such a hypothesis.

McAuliffe and Dunham (2016) reviewed studies on ingroup bias in children and adults and concluded that ingroup bias in cooperative decision making was most likely to be explained by the *mere preferences hypothesis*. On this account, children's positive feeling toward the ingroup is expected to stem from a positive view of themselves through associative processes. Levy, Sabato, Bereby-Meyer,

and Kogut (2020) found that children perceived themselves as better than most of their peers in terms of generosity in general. In this sense, children should expect that the ingroup, as an extension of the self, will also be more generous than other peers and such positive expectations should exist no matter whether the recipients are from the same group or not. Indirect evidence comes from studies using behavioral attribution measures, which show that 5- to 8-year-olds were more likely to attribute prosocial actions to ingroup members than to outgroup members (Baron & Dunham, 2015; Dunham et al., 2011). The current study aimed at extending current evidence on children's ingroup bias in predicting others' prosociality by exploring whether young children predict their ingroup to be more generous than the outgroup when recipients are anonymous.

More important, no prior research in this area took contextual factors into account, and it is unclear whether ingroup bias in predicting others' prosociality exists across public versus private contexts. Research shows that young children's prosocial behavior is influenced by situational factors such as the presence and awareness of recipients or third parties (Martin & Olson, 2015). Five-year-old children tend to share more when recipients (Leimgruber, Shaw, Santos, & Olson, 2012) or bystanders (Engelmann, Herrmann, & Tomasello, 2012) are aware of their sharing behaviors, indicating that their motivation to manage their reputation is affected by contextual cues (Engelmann & Rapp, 2018). Children are also sensitive to people's diverse motivations for sharing across contexts and evaluate those behaviors differently (Heyman, Barner, Heumann, & Schenck, 2014), which may influence their further reciprocal actions toward those people. Specifically, whereas 6- and 7-year-olds view public sharing as a good way to gain social approval and evaluate it more favorably, 8- to 10-year-olds tend to discount public sharing and admire private sharing. It remains an unsolved question whether contextual information is used selectively in young children's prediction about ingroup and outgroup peers' sharing behaviors, and the current study aimed to explore this issue.

Using a minimal group paradigm, Experiment 1 assessed 5- and 6-year-olds' prediction of fictional ingroup and outgroup peers' sharing with anonymous recipients in two different situations. In the public condition fictional peers' sharing was observed by a teacher, whereas in the private condition fictional peers shared their resources when nobody was around. First, we expected children to show ingroup bias in predicting peers' sharing in both conditions based on their general preference toward the ingroup. Moreover, one intuitive theory that children hold is that people belonging to the same social group are fundamentally similar to one another (Diesendruck & HaLevi, 2006). As mentioned above, children at this age tend to share more when being observed (Engelmann et al., 2012; Engelmann, Herrmann, & Tomasello, 2018), and they view public sharing positively as a way to gain social approval (Heyman et al., 2014). Therefore, it is possible that children in the current study expected ingroup members to act the same way as they themselves do and to share more than outgroup members in order to impress the teacher in the public condition. The ingroup bias on predicted sharing thus was expected to be more pronounced in the public condition than in the private condition.

If children indeed show stronger ingroup bias in the public condition than in the private condition, what might be the underlying mechanism that contributes to such a context-sensitive bias? Rhodes and Wellman (2017) argued that theory of mind (ToM) skills are critical when children use mental state knowledge to reason about others' moral actions. ToM has been found to be relevant in children's moral reasoning regarding resource allocation (Li, Rizzo, Burkholder, & Killen, 2017; Mulvey, Buchheister, & McGrath, 2016). To make prosocial judgments in the public condition, children need to figure out whether those peers care about how the observer thinks about them, which requires the ability to perceive others' mental states (Banerjee & Yuill, 1999). In terms of reading ingroup and outgroup members' minds, McLoughlin and Over (2017) found that young children were more willing to use mental state terms to describe the ingroup than to describe the outgroup, and they even tended to dehumanize the outgroup in a face perception task (McLoughlin, Tipper, & Over, 2018). These studies indicate that children may be more likely to spontaneously apply their growing ToM skills when reasoning about ingroup members' future behaviors than when reasoning about outgroup members' future behaviors. Specifically, children with higher ToM skills may be more likely to reason that ingroup peers notice the existence of the observer in the public condition and infer that ingroup peers have a strong motivation to share more to impress the teacher. In predicting outgroup peers' sharing in the same situation, children may fail to take peers' caring for the teacher's opinion into con-

sideration and deem that outgroup peers' incentive to share is less strong than that of ingroup peers. In the private condition with an observer being absent, both ingroup and outgroup peers may be relatively less motivated to share and the difference of predicted sharing between ingroup and outgroup peers should be smaller. Experiment 2 aimed at testing this hypothesis and explored how children's ToM interacts with group membership of fictional peers and context information (observed vs. not observed by a teacher) in predicting ingroup and outgroup peers' sharing with an anonymous recipient.

Experiment 1

Method

Participants

Participants were 5- and 6-year-old children recruited from a kindergarten in a mid-sized city in China. Parents who agreed to their children's participation provided an informed consent form, and children offered verbal agreement before participation. The ethics committee of Radboud University approved the study. To our knowledge, no studies have yet explored children's prediction of others' sharing across public and private contexts. Based on a previous study (Dunham et al., 2011) on children's ingroup bias in explicit evaluation, a sample size of 18–26 children per cell was found to be suitable to detect a medium effect size at $\alpha = .05$ and power of .80 using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). We decided to use 24 participants per cell, which was similar to multiple studies addressing children's ingroup bias in resource allocation (Benozio & Diesendruck, 2015; Renno & Shutts, 2015). The analysis sample included 48 5-year-olds ($M_{\text{age}} = 60.10$ months, $SD = 3.27$; 25 girls and 23 boys) and 48 6-year-olds ($M_{\text{age}} = 73.52$ months, $SD = 3.62$; 24 girls and 24 boys). All children belonged to the Han ethnicity, the majority ethnic group in China.

Procedure

The experiment had a 2×2 mixed design. Group membership of the giver (ingroup vs. outgroup) was a within-participants variable, and condition (in public vs. in private) was a between-participants variable.

Participants were first asked to wear a red or yellow scarf and cap. They were told that they were going to play a game and there would be a red team and a yellow team. Children with the same color scarf and cap belonged to the same team. The group color was used to create minimal groups, having the participants viewing other children on the team with the same color as ingroup members and children on a team with another color as outgroup members (Dunham et al., 2011). Then they were shown two cartoon figures, representing a red team child who wore a red scarf and cap and a yellow team child who wore a yellow scarf and cap. First, they were asked to identify which child belonged to the same team as they did (ingroup member) and which child belonged to the other team (outgroup member). The experiment continued only if participating children correctly identified the group membership of the two cartoon children.

After that, participants were told that these fictional peers each owned 10 candies and were going to participate in a donation task. They could choose whether to share some candies with some poor children who they did not know or to keep all their candies to themselves (*prediction question*). In the story, the two fictional peers entered a room one by one and put candies into a donation box in that room. The candies in the box would then be given to poor children after the event. In the private condition, there was nobody else in the room, so the hypothetical children's sharing would not be seen by others. In the public condition, there was a female teacher present in the room, so the hypothetical children would be observed by the teacher. To check the effectiveness of the manipulation, children were asked whether hypothetical children were observed when they made the donation. All the children in the private condition were able to answer that no one would see, and all the children in the public condition answered that the teacher would observe those hypothetical peers during the donation. Then the experimenter asked participants how many of their 10 candies they thought each of the two children would put into the donation box.

To investigate how children thought about the identity of those fictional anonymous recipients (i.e., poor children), we tested an additional sample of 24 5- and 6-year-olds with the same procedure and asked them which team those poor children belonged to before the prediction phase. To simplify the task, we offered them four options (ingroup, outgroup, neither of the two groups, and don't know) and asked them to choose one answer. Results showed that 42% of children stated that the poor children did not belong to either group and 33% of children had no idea about the poor children's group membership. In addition, the proportions of children who identified the group membership of poor children were 17% for the ingroup and 8% for the outgroup. Thus, 75% of children did not expect the poor children to belong to the ingroup or outgroup.

After the predicted giving question, participants were shown that each child actually put three of their candies into the box. Participants were then asked to evaluate the sharing of the two hypothetical children during the task. The experimenter asked participants for each of the two hypothetical children (*evaluation question*), "Do you think the child behaved well in the donation event? Here are seven faces from very happy to very sad. If you choose the very happy one, it means that you think the child behaved very well in the donation event. If you choose the very sad one, it means that you think the child behaved very badly in the donation event. You can also pick faces that are in between. You need to choose one face for each child. Which one do you choose for Child A [name first hypothetical child]? And which one for Child B [name second hypothetical child]?"

The color of the team of the participant and the assignment to the public and private conditions was counterbalanced across participants. Participants were shown hypothetical children of the same gender as their own. Fig. 1 shows the pictures used for the story and the sequence of presenting them.

Results

Prediction

Fig. 2 represents 5- and 6-year-old children's predicted sharing of ingroup and outgroup peers in two conditions. A 2 (Condition) $\times$ 2 (Age) $\times$ 2 (Group Membership) analysis of variance (ANOVA) was run on predicted sharing, with group membership as a repeated-measures factor. The main effect of group membership was significant, $F(1, 92) = 5.49$, $p = .032$, $\eta^2 = .05$. In general, children predicted ingroup peers ($M = 7.29$, $SD = 2.24$) to share more than outgroup peers ($M = 6.74$, $SD = 2.58$). The

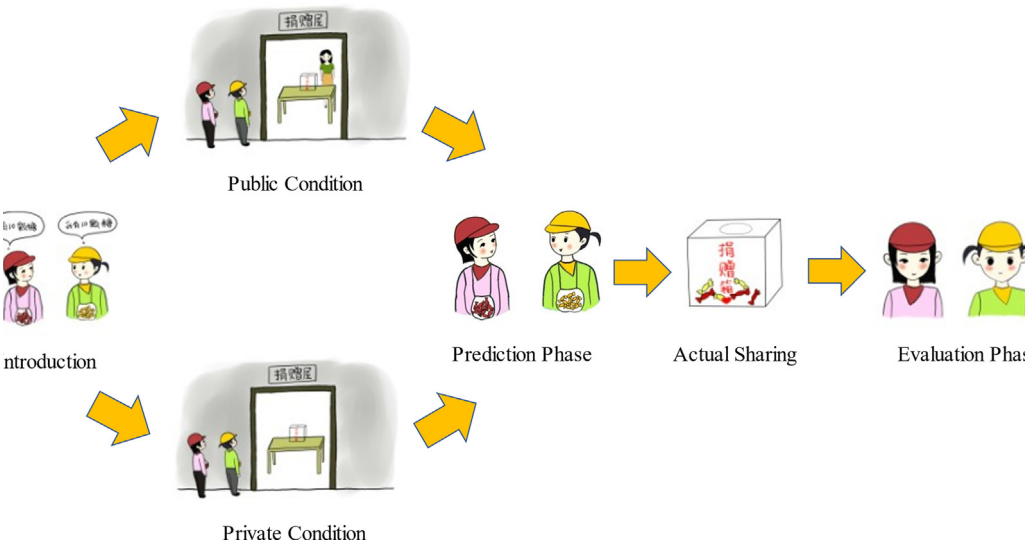


Fig. 1. Demonstration of the story for girl participants.

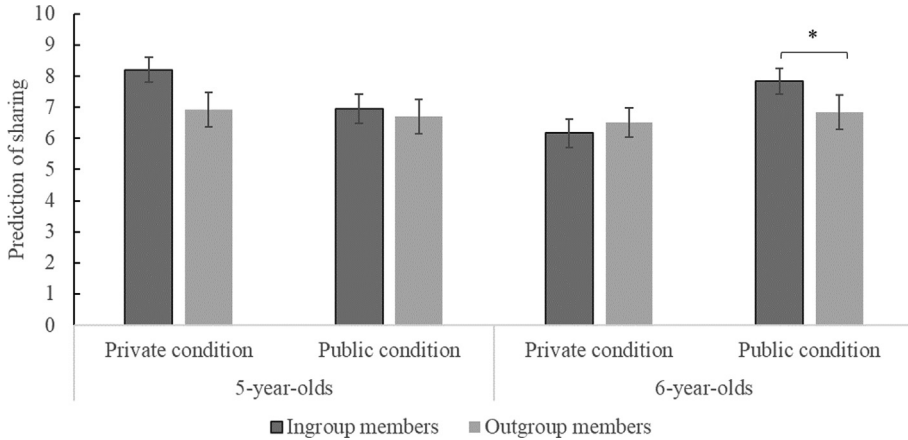


Fig. 2. Prediction of ingroup and outgroup members' sharing in public and private conditions by children in two age groups. * $p < .05$.

interaction between age and group membership was not significant, $F(1, 92) = 0.75$, $p = .390$, $\eta^2 = .01$, indicating that the effect of group membership on children's prediction of sharing remained equally strong at 5 and 6 years of age. The main effects of age and condition were not significant ($ps > .38$). The three-way interaction of group membership, age, and condition was significant, $F(1, 92) = 5.49$, $p = .021$, $\eta^2 = .06$. To further examine this effect, the interaction between group membership and condition was analyzed for each of the two age groups separately.

For 5-year-olds, the interaction effect between condition and group membership was not significant, $F(1, 46) = 1.45$, $p = .235$, $\eta^2 = .03$. For 6-year-olds the interaction effect between condition and group membership was significant, $F(1, 46) = 6.40$, $p = .015$, $\eta^2 = .12$. Paired t tests showed that, in the public condition, 6-year-olds predicted ingroup members to share more ($M = 7.83$, $SD = 1.99$) than outgroup members ($M = 6.83$, $SD = 2.76$), $t(23) = 2.63$, $p = .015$, Cohen's $d = 0.42$. In the private condition, 6-year-olds did not predict ingroup and outgroup members to share differently ($M = 6.17$, $SD = 2.22$ and $M = 6.50$, $SD = 2.28$, respectively), $t(23) = -0.92$, $p = .370$, Cohen's $d = -0.15$. Independent t tests showed that 6-year-olds predicted ingroup members to share more in the public condition than in the private condition ($M = 7.83$, $SD = 1.99$ and $M = 6.17$, $SD = 2.22$, respectively), $t(46) = 2.73$,

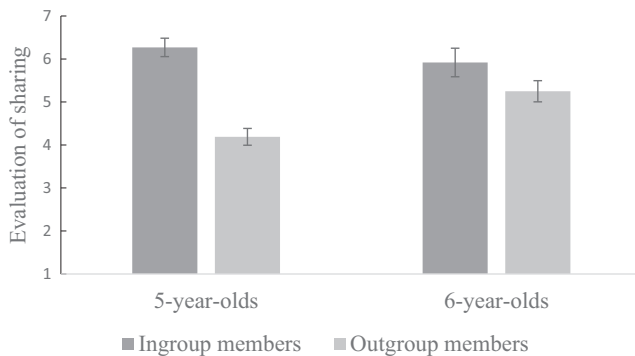


Fig. 3. Evaluation of ingroup and outgroup members' sharing by children in two age groups.

$p = .009$, Cohen's $d = 0.80$. But they did not predict outgroup members to share differently across two conditions ($M = 6.83$, $SD = 2.76$ and $M = 6.50$, $SD = 2.28$, respectively), $t(46) = 0.46$, $p = .651$, Cohen's $d = 0.13$.

Evaluation

Fig. 3 illustrates 5- and 6-year-old children's evaluation of ingroup and outgroup peers' sharing. A 2 (Condition) $\times$ 2 (Age) $\times$ 2 (Group Membership) ANOVA was run on the evaluation of sharing, with group membership as a repeated-measures factor. The main effect of group was significant, $F(1, 92) = 8.28$, $p < .001$, $\eta^2 = .25$. Although both ingroup and outgroup children shared three candies, children evaluated ingroup members' sharing more positively ($M = 6.09$, $SD = 1.42$) than outgroup members' sharing ($M = 4.72$, $SD = 2.09$). The main effect of condition and its interactions with other factors all were nonsignificant ($ps > .27$).

The interaction between group membership and age was significant, $F(1, 92) = 8.28$, $p = .005$, $\eta^2 = .08$. Further paired t tests showed that 5-year-olds evaluated ingroup members' sharing more positively ($M = 6.27$, $SD = 1.48$) than outgroup members' sharing ($M = 4.19$, $SD = 2.30$), $t(47) = 5.86$, $p < .001$, Cohen's $d = 1.09$. The 6-year-olds also rated ingroup members' sharing more positively ($M = 5.92$, $SD = 1.35$) than outgroup members' sharing ($M = 5.25$, $SD = 1.71$), $t(47) = 2.00$, $p = .051$, Cohen's $d = 0.44$. However, the difference in evaluation between ingroup and outgroup members' sharing was larger among 5-year-olds ($M = 2.08$, $SD = 2.47$) than among 6-year-olds ($M = 0.67$, $SD = 2.31$), $t(94) = 2.91$, $p = .005$, Cohen's $d = 0.60$. Furthermore, independent t tests showed that 5- and 6-year-olds did not evaluate ingroup members' sharing differently, $t(94) = 1.22$, $p = .224$, Cohen's $d = 0.25$, but 5-year-olds ($M = 4.19$, $SD = 2.30$) evaluated outgroup members' sharing significantly more negatively than 6-year-olds ($M = 5.25$, $SD = 1.71$), $t(86.67) = -2.57$, $p = .012$, Cohen's $d = -0.53$.

Discussion

The results from Experiment 1 showed that preschool children's ingroup bias in predicting people's sharing does extend to situations with anonymous recipients. That is, they expected their ingroup members to give more of their resources to anonymous recipients than outgroup members. Moreover, the bias was flexibly displayed and existed only in the public condition for 6-year-olds when there was a teacher in the story observing the sharing behavior of the children in the story. In the private condition, 6-year-olds did not hold different expectations for the ingroup and outgroup regarding their sharing. In addition, despite ingroup and outgroup peers actually sharing the same amount, both 5- and 6-year-olds evaluated ingroup peers' sharing more favorably. This ingroup bias with regard to the evaluation of sharing behavior did not vary across sharing in a public versus private context.

The next question was why 6-year-olds held such a prediction bias only in the public condition but not in the private condition. As elaborated on before, ToM skills may be crucial in reasoning about peers' sharing, especially in the public condition, because children tend to attribute more mental states to their ingroup peers (McLoughlin & Over, 2017; Over, 2018). Previous studies indicate that children at this age are developing their ToM ability, especially the ability to represent second-order, or embedded, mental states of other people (Fu, Xiao, Killen, & Lee, 2014; Sullivan, Zaitchik, & Tager-Flusberg, 1994). It is likely that children spontaneously use their developing second-order ToM skills to interpret ingroup peers' motivations for sharing and predict that they would share more to leave a good impression on the observer (i.e., teacher) in the public condition. In the private condition, second-order ToM skills are not necessarily required in the absence of the observer and might not interact with group membership in predicting others' sharing. Experiment 2 was aimed at testing this hypothesis.

Experiment 2

Because results in Experiment 1 showed that only 6-year-olds took the context into account when predicting ingroup and outgroup peers' sharing behavior, we recruited only 6-year-olds for Experi-

ment 2. Children in Experiment 2 first completed the task as in Experiment 1 and then were tested with a second-order false belief task.

Method

Participants

The sample included 80 6-year-old children recruited from the same kindergarten as in Experiment 1 ($M_{\text{age}} = 70.99$ months, $SD = 4.30$; 44 girls and 36 boys).

Procedure

The procedure was similar to that in Experiment 1, and children completed a second-order ToM task after making all predictions and evaluations.

In the ToM task, the experimenter told participants a story that was adapted from Sullivan et al.'s (1994) birthday puppy story. Characters' names were changed to Chinese names. In the story, a mom bought a puppy for her son but told him that she bought a toy car instead of a puppy in order to surprise him with the puppy. However, the son accidentally found the puppy, but his mom did not know that. Participants needed to correctly reason about the mom's mental state regarding whether her son knew the real gift. They were asked two questions: whether the mom knew that her son knew the real gift (ignorance question) and what gift the son expected his mom's mind (false belief question). For the ignorance question, if they answered that the mom thought her son did not know about the real gift, the answer was scored as 1; otherwise, it was scored as 0. For the false belief question, if children answered that the mom said her son thought she had bought him a toy car, the answer was scored as 1; if the answer was the puppy or something else, it was scored as 0. The scores were summed and ranged from 0 to 2.

Results

Recoding ToM score

Results showed that 38.8% (31/80) of participants passed all the questions and scored a 2, whereas 50% (40/80) scored a 1 and 11.2% (9/80) scored a 0. For the convenience of analysis, children with a

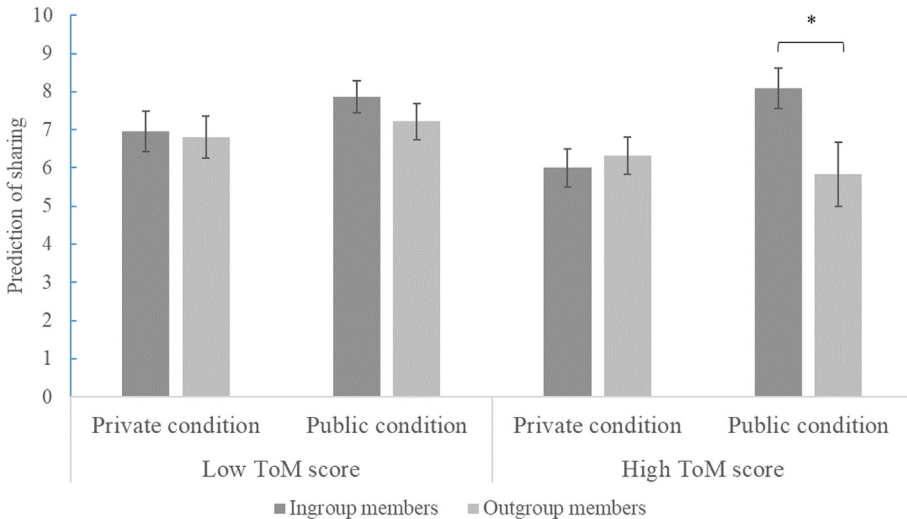


Fig. 4. Prediction of ingroup and outgroup peers' sharing in public and private conditions by children with different theory of mind (ToM) scores. * $p < .05$.

score of 1 or 0 were categorized as the group with low ToM scores, and children with a score of 2 were categorized as the group with high ToM scores.

Prediction

Fig. 4 shows the predicted sharing of ingroup and outgroup peers in two conditions among 6-year-olds with high and low ToM scores. A 2 (Condition) $\times$ 2 (Group Membership) $\times$ 2 (ToM Score) ANOVA was run on predicted sharing, with group membership as a repeated-measures factor. The main effect of group membership was significant, $F(1, 76) = 10.89, p < .001, \eta^2 = .13$. In general, 6-year-olds predicted ingroup members ($M = 7.21, SD = 2.31$) to share more than outgroup members ($M = 6.69, SD = 2.49$). The main effects of ToM score and condition were not significant ($ps > .16$). Replicating the results in Experiment 1, the interaction effect between condition and group membership was significant, $F(1, 76) = 13.84, p < .001, \eta^2 = .15$. Paired t tests showed that, in the public condition, 6-year-olds predicted ingroup members to share more ($M = 7.93, SD = 2.09$) than outgroup members ($M = 6.80, SD = 2.69$), $t(39) = 3.49, p = .001$, Cohen's $d = 0.48$. In the private condition, they did not predict ingroup and outgroup members to share differently ($M = 6.50, SD = 2.32$ and $M = 6.58, SD = 2.31$, respectively), $t(39) = -0.30, p = .765$, Cohen's $d = 0.03$.

The three-way interaction of group membership, condition, and ToM score was significant, $F(1, 76) = 9.73, p = .014, \eta^2 = .08$. To further examine this effect, the interaction between group membership and condition on predicted sharing was analyzed separately for children with different levels of ToM scores.

For children with a low ToM score, there was a main effect of group membership, $F(1, 47) = 4.00, p = .051, \eta^2 = .09$. They predicted ingroup members ($M = 7.47, SD = 2.33$) to share more than outgroup members ($M = 7.04, SD = 2.52$). The main effect of condition and the interaction effect between condition and group membership were nonsignificant ($ps > .209$). For children with a high ToM score, the interaction effect between condition and group membership was significant, $F(1, 29) = 9.47, p = .005, \eta^2 = .25$. Paired t tests showed that, in the public condition, children with a high ToM score predicted ingroup members to share more ($M = 8.08, SD = 1.88$) than outgroup members ($M = 5.83, SD = 2.89$), $t(11) = 2.82, p = .017$, Cohen's $d = 0.97$. In the private condition, they did not predict different sharing between ingroup and outgroup members ($M = 6.00, SD = 2.13$ and $M = 6.32, SD = 2.08$, respectively), $t(18) = -0.73, p = .475$, Cohen's $d = -.16$.

Evaluation

A 2 (Condition) $\times$ 2 (Group Membership) $\times$ 2 (ToM Score) ANOVA was run on evaluation of sharing, with group membership as a repeated-measures factor. The only significant effect was the main effect of group, $F(1, 76) = 8.36, p = .005, \eta^2 = .10$. Children evaluated ingroup members' sharing more positively ($M = 5.99, SD = 1.36$) than outgroup members' sharing ($M = 5.25, SD = 1.51$). The main effects of ToM score, condition, and the interactions were nonsignificant ($ps > .41$).

Discussion

Consistent with our hypothesis, children with good second-order ToM capacities showed flexibility in displaying ingroup bias across private and public contexts. They expected ingroup peers to share more than outgroup peers in the public condition but not in the private condition. In contrast, such flexibility did not manifest in children with relatively poor second-order ToM capacities. Instead, there seemed to be a tendency to show an ingroup bias across both conditions. Results seem to suggest that with sophisticated second-order ToM abilities, children are able to incorporate contextual information into group reasoning and adjust their ingroup bias on predicted sharing in different conditions.

General discussion Our results revealed that preschool children predicted ingroup peers to give more than outgroup peers in an anonymous sharing task. Moreover, this ingroup bias was flexible given that it was sensitive to contextual information on whether the sharing behavior was known to another person or not. This sensitivity seemed to emerge between 5 and 6 years of age. Whereas 5-year-olds' ingroup bias regarding expected sharing was not sensitive to the sharing being public versus private, 6-year-olds expected the ingroup to share more, but only when the peers in the story were observed by a teacher. Moreover, second-order ToM contributed to this flexible prosocial reasoning. Only 6-year-olds who fully passed the second-order false belief task displayed an ingroup bias that varied based on contextual information.

Previous studies provide evidence of children's ingroup bias in predicting others' sharing with specific others. That is, children hold a positive expectation only for ingroup members giving to ingroup recipients (Renno & Shutts, 2015). The current study extends previous evidence by showing that such an ingroup bias exists even when recipients are anonymous and do not belong to either the ingroup or outgroup. In line with the mere preferences hypothesis, such a bias is likely to come from a general positive feeling toward objects and people related to the self (McAuliffe & Dunham, 2016). Because children likely associate ingroup members with the self, they may hope that ingroup members are more generous than outgroup members regardless of the identity of recipients, thereby basking in the reflected glory of the prosocial ingroup member (Dunham, 2018).

Another theoretical contribution that the current study provides is demonstrating that as children grow up their prediction of others' prosociality based on group membership becomes more nuanced. Children start to take contextual information into consideration, reflecting their grasp of reputation management. Specifically, in the current study, 6-year-olds, but not 5-year-olds, took the presence of the teacher in the public condition into account and adjusted their predictions according to their understanding that people are likely to behave more prosocially when a third party is present (Engelmann & Rapp, 2018). Herrmann, Engelmann, and Tomasello (2019) found that 8-year-olds, but not 5-year-olds, engaged in competitive altruism to earn a better reputation and shared more when they were observed by a person who could choose one partner for a future rewarding game. It is likely that older children expect ingroup members to behave more strategically given that they would also try to share more than outgroup members when being observed in order to gain a better reputation. In the private condition where nobody was around and costly generous behaviors could not be observed, children perceived ingroup peers' motivation to share to be not as strong as in the public condition. However, it is important to note that the third party in the current study was a female teacher. Children's over-sharing in the public condition may be motivated by fear of punishment rather than by attempts to manage reputation. Future research should use other people such as peers as observers to rule out such an alternative explanation.

Why do young children care about ingroup members' reputations? Engelmann et al. (2018) found that young children shared more to increase the overall group donation, indicating their concern for the group's reputation. Investing in group reputation is ultimately beneficial for each individual in the group because individual reputation information is usually inaccessible in daily life and other people tend to rely on the reputation of the social group that a person belongs to when making decisions regarding cooperation. Rhodes and Wellman (2017) proposed that children use intuitive sociological theories about group obligations to make moral judgments. As children gain a deeper understanding of reputation with age, it is likely that they update intuitive sociological theories. As a result, they start to view group members behaving well when observers can identify their group membership as group obligations that everyone in the group should discharge. Therefore, they may expect ingroup members to behave more prosocially in public conditions for the benefit of the group's reputation. However, the concept of group reputation was not directly manipulated in the current study. Future studies should explore how children understand group reputation and group norms regarding individuals' obligations to benefit the group.

The next question was what contributes to children's context-dependent ingroup bias in predicted sharing. The current study demonstrates that second-order ToM ability plays a significant role here. Six-year-olds with relatively low second-order ToM scores in Experiment 2 may have had difficulty

in considering contextual information in their prosocial reasoning and, as a result, showed an equally strong ingroup bias in predicting sharing across conditions. Children who fully passed the second-order false belief task integrated contextual information into their reasoning and showed ingroup bias in predictions only in the public condition. These results add to previous significant findings regarding ToM in children's reasoning with regard to reputation management. First, [Silver and Shaw \(2018\)](#) proposed that mental state reasoning ability is critical in reputational cognition and that a rudimentary ToM ability is a prerequisite for children to engage in self-presentational behavior. Current results extend these claims and demonstrate that a more sophisticated ToM ability is required for children to predict others' reputation management behaviors. Second, the association between advanced ToM and reputation management prediction manifests itself first in reasoning about the ingroup because children are more prone to infer ingroup members' mental states. However, previous evidence regarding the relation between children's ToM competence and ingroup bias is mixed. Whereas some studies found that children with advanced ToM skills tend to discard ingroup biases ([Chalik et al., 2014](#); [Mulvey et al., 2016](#); [Rizzo & Killen, 2018](#)), other scholars proposed that social-cognitive skills contribute to children's group discriminations ([Spears Brown & Bigler, 2004, 2005](#)). The current study offers a novel perspective by showing that, at least in the realm of prosocial behavior prediction, ToM can lead to flexible ingroup bias across contexts, with a stronger ingroup bias in a public context than in a private context.

Furthermore, the current results suggest that group membership affects children's prediction and evaluation of sharing differently. First, whereas ingroup bias in predicted sharing did not significantly change between 5 and 6 years of age, ingroup bias in evaluation became less pronounced among 6-year-olds. Second, 6-year-olds' ingroup bias in predictions, but not in evaluations, varied between the private and public conditions. Similarly, using a third-person paradigm, [DeJesus et al. \(2014\)](#) found that children's use of group membership in predicting and evaluating resource allocation gradually diverged with age. This converging evidence likely indicates that children's ingroup biases in predictions and evaluations are supported by different mechanisms. [Dunham \(2018\)](#) proposed that there are dual causal pathways that explain membership effects. The first one is similar to the mere preferences hypothesis ([McAuliffe & Dunham, 2016](#)) and mainly accounts for evaluative aspects of ingroup bias, which is closely linked to positive self-evaluations. In the current study, children's ingroup bias in the evaluations may have been solely based on a general positive feeling toward the ingroup and was not influenced by sharing outcomes, contextual factors, or children's ToM ability. The second pathway involves abstract coalitional principles and expectations regarding group functioning. In the current setting, sharing more when the observer can recognize the group membership of donors is beneficial for ingroup members because generous sharing of individual group members can potentially increase the reputation of their group. Because children have a better grasp of group reputation and potentially regard behaving well in the public condition as a group obligation, they begin to form their predictions of sharing outcomes based on such cooperative group norms. As a result, with age ingroup bias in predicting others' behaviors may be increasingly driven by group cooperation expectations.

As mentioned in Method, the current study referred to studies addressing children's ingroup bias in evaluation to estimate the appropriate sample size given that studies dealing with children's ingroup bias in predicting others' sharing are scarce. With regard to the observed power of the main effect of group membership on evaluation, post hoc power analyses revealed that achieved power was 99% in Experiment 1 and 99% in Experiment 2, indicating that the manipulation of the minimal group paradigm was successful and elicited children's use of group membership information in making social judgments. The observed power of the main effect of group membership on prediction was 58% in Experiment 1 and 90% in Experiment 2. It is worth noting that there was a significant interaction among age, condition (private vs. public), and group membership. Children's ingroup bias in predicting others' sharing varied across age groups and conditions. Thus, these two factors should be taken into account in future studies to address children's ingroup bias when predicting others' sharing.

In conclusion, the current study showed that preschool children favored the ingroup when predicting others' sharing with anonymous recipients and that such a bias became sensitive to contextual factors (i.e., stronger ingroup bias in a public context than in a private context) between 5 and 6 years of age. In addition, advanced sociocognitive abilities (i.e., second-order ToM) seem to contribute to this

stronger ingroup bias when it comes to predicting prosocial behavior more in public situations than in private situations.

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