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The interplay between sharing behavior and beliefs about others in children during dictator games

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ABSTRACT

Previous studies in adults demonstrated that beliefs and sharing decisions in social scenarios are closely related. However, to date, little is known about the development of this relationship in children. By using a modified dictator game, we assessed sharing behavior and beliefs about others in children between 3 and 12 years old. We performed four studies (N = 376) aimed to assess whether decisions were related to beliefs (Studies 1 and 2) and whether information about the recipient's forced sharing behavior would shape decisions and beliefs (Studies 3 and 4). Results of Studies 1 and 2 showed that beliefs about others' generosity were related to children's sharing behavior. In Studies 3 and 4, we found that only children older than 9 years shared more pieces of candy when they knew that the recipient would be forced to share (cooperative context) than when they knew that the recipient would be

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forced not to share (noncooperative context). Besides, children older than 6 years did not modify their beliefs about others' generosity according to these social contexts. These results suggest that normative or preconceived beliefs about the functioning of the social world may guide social behavior in children.
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Introduction

Social behaviors such as altruism, aversion to inequality, and reciprocity are deeply rooted in human cognitive systems and are critical to the maintenance of cooperation (Almås, Cappelen, Sørensen, & Tungodden, 2010; Lieberman, 2007; Moore, 2009; Morelli, Rameson, & Lieberman, 2014). Different studies in adults have demonstrated that beliefs and predictions about others' actions influence social decisions (Akerlof & Dickens, 1982; Caprara & Steca, 2005; Di Tella, Perez-Truglia, Babino, & Sigman, 2015; Moll et al., 2006; Piff, Kraus, Cote, Cheng, & Keltner, 2010). For instance, an individual who interacts with another tends to generate beliefs about the other's altruism to guide future actions, and in turn the outcome of this interaction updates his or her beliefs (Caprara & Steca, 2005; Costa-Gomes, Huck, & Weizsäcker, 2014; Smith, 2013). Decisions and beliefs in adults seem to be intermingled, for example, in circumstances where individuals need to justify unfair decisions. Di Tella et al. (2015) showed that when adults faced the opportunity to be ungenerous, they took the chance and thought that their partners were corrupt. In other words, they adjusted their beliefs about others to justify their unfair decisions. Overall, these studies support the presence of a closed loop in which beliefs and decisions are dynamically intertwined; beliefs about others guide choices, which in turn may modify beliefs (Costa-Gomes et al., 2014; de Oliveira, Spraggon, & Denny, 2016; Di Tella et al., 2015; Smith, 2013).

In the current study, we aimed to examine the relationship between sharing behavior and beliefs about others' generous behavior in children. Although little is known about the development of this relationship, there are some studies that indirectly support an association between social behavior and beliefs in children. Findings of studies in developmental social psychology have suggested that cognitive schemas about the functioning of the social world regulate children's behavior (Guerra, Huesmann, & Spindler, 2003; Huesmann & Guerra, 1997). These social-cognitive schemas are based on children's social experiences and can modulate children's social behavior and beliefs (Guerra et al., 2003; Huesmann & Guerra, 1997; Tomasello & Vaish, 2013; Van Overwalle, 2009). For instance, children who act aggressively toward others might have previously experienced a threatening context, and hence they believe that others might be aggressive toward them (Guerra et al., 2003; Huesmann & Guerra, 1997). Another group of studies has demonstrated children could use beliefs to justify their decisions. Evans and Lee (2014) showed that children who had cheated and lied believed that other children would lie too and, conversely, children who had not cheated were biased toward judging their peers as honest. Similarly, some authors have found that children tend to blame others for initiating conflict before accepting responsibility themselves, a phenomenon called self-serving bias (Kearns & Fincham, 2005; Miller & Ross, 1975; Shalvi, Gino, Barkan, & Ayal, 2015; Vonk, 2002).

Continuing with this line of research, we examined whether children who are generous think that others are generous too and whether children who are selfish think that others are selfish too. We also explored to what extent information about others' forced altruistic and nonaltruistic behavior could modify children's decisions and beliefs. We performed four studies in which children between 3 and 12 years old played a modified dictator game (DG) adapted to children (Forsythe, Horowitz, Savin, & Sefton, 1994). In the DG, children were invited to share pieces of candy with an unknown recipient from another school. Participants were told that they participate only as allocators and that they should not assume a recipient role. After sharing, we inquired about participants' beliefs on the future sharing behavior of the unknown recipient when they played the same game (Studies 1, 3, and

4), a group of children from another school who would receive the pieces of candy (Study 2), and other children in general from the same school and other schools (Study 2).

We expected a positive relationship between sharing behavior and beliefs about others' behavior; that is, the more generous participants (children who shared more pieces of candy in the DG) would evaluate other children as generous, and the less generous participants would believe that other children would be less generous.

In Studies 3 and 4, we explored to what extent social contextual information on forced sharing behavior of the recipient would modify participants' decisions and beliefs. In these studies, participants were randomly assigned to two task conditions that varied in the information about forced social context: (a) a forced-cooperative condition in which participants were told that the future recipient must share their pieces of candy because teachers from this school oblige them to share their belongings and resources or (b) a forced-noncooperative condition in which children were informed that the recipient must not share his or her pieces of candy due to teachers from this school who did not allow children to share their belongings and resources. Given that previous studies showed that children tended to distribute more resources to those who have cooperated or who have behaved in a prosocial way before (Hamann, Warneken, Greenberg, & Tomasello, 2011; Levitt, Weber, Clark, & McDonnell, 1985; Ng, Heyman, & Barner, 2011), we expected that participants would share more pieces of candy in the cooperative condition than in the noncooperative condition irrespective of imposed behavior on the recipient. After sharing in each condition, participants were asked how they thought the recipient would actually act if he or she were free to share. In other words, participants were required to imagine the recipient's real desires and behavior beyond teachers' demands. If children act according to their normative beliefs and preconceived ideas about the functioning of the social world (Guerra et al., 2003; Huesmann & Guerra, 1997), we expected that participants would not differ in their beliefs about the recipient's generosity between conditions; that is, they would respond by imagining the real recipient's desires beyond teachers' impositions. In Study 4, we also examined to what extent beliefs about others' generosity before sharing (prior beliefs) would guide behavior. To this aim, we asked about participants' beliefs before children were randomly assigned to each social condition (i.e., cooperative or noncooperative). If children act according their normative or preconceived beliefs, we expected that (a) prior beliefs would be associated with participants' sharing behavior and (b) prior beliefs and beliefs after sharing would be similar.

Study 1

To examine the relationship between sharing behavior and beliefs about others' generous behavior, children played a DG in which they were required to freely share pieces of candy with an unknown recipient from another school. Afterward, participants were asked how they thought the recipient would act if they were to play the DG with an unknown third person (recipient's sharing behavior) and what they thought about the recipient's kindness.

Method

Participants

A total of 146 children between 3 and 12 years old (mean age = 7.34 years, *SD* = 2.51; 62 girls) were recruited from private schools in Bogotá (Colombia) and Buenos Aires (Argentina). Schools were located in urban areas and featured students from middle to high socioeconomic status in both countries. None of the participants reported a history of psychiatric or neurological disorders or was under psychopharmacological treatment. No differences in age and gender were found between children from both countries [age: $t(144) = -1.52$, $p = .13$; gender: $\chi^2(1) = 0.52$, $p = .51$]. All participants provided verbal informed consent, and a parent, next of kin, caretaker, or guardian gave written informed consent on behalf of each child enrolled in this study. These written informed consents followed the norms of the Declaration of Helsinki. The ethics committee of the Institute of Cognitive Neurology (Argentina) and the ethics committee of the Pontificia Universidad Javeriana (Colombia) approved all studies included in this work.

Instrument

The DG task lasted approximately 5 min and was composed of two phases: (a) a decision phase (sharing) and (b) a beliefs phase. In the decision phase, the experimenter put on the table 10 pieces of candy and informed the participant that he or she could share all, some, few, or none of them with an unknown future recipient from an unknown school (a child of the same gender as the participant). We used an unknown recipient because we wanted participants to make a decision in reference to another child instead of a known peer. First, the experimenter showed two envelopes and identified one for the participant and the other for the unknown child (the experimenter wrote the participant's name on one envelope and left a white space on the other). Then, the experimenter distributed 1 piece of candy to the participant and 1 to the unknown recipient by placing them inside each envelope. After that, the participant was required to freely share the remaining 8 pieces of candy with the recipient. The participant was not encouraged to share the pieces of candy and was informed that he or she could keep the 8 pieces and could eat them at the end of the task. The participant was told that he or she would participate only as an allocator and should not assume the recipient's role. Then, the participant responded to control questions aimed to ensure his or her understanding of task rules. After the participant answered the questions, the experimenter turned around and the participant made his or her decision. The experimenter turned back to face the participant and asked about his or her beliefs about the future recipient's hypothetical behavior when they played the game with a third unknown child. The question was whether the participant believed that the recipient would share a lot of pieces of candy (generous; coded as 1), few pieces of candy (intermediately generous; coded as 0), or no pieces of candy (not generous; coded as −1). Next, the participant was asked whether he or she thought that the recipient would be kind (coded as 1), intermediately kind (coded as 0), or not kind (coded as −1).

After the participant left the room, the experimenter counted the number of pieces of candy shared with the unknown recipient (dependent measure). A detailed description of the instructions is included in the online supplementary material (see Section 1.1.1 of the supplementary material).

Data analysis

To assess whether sharing behavior was associated with beliefs about the recipient's behavior, we used analysis of variance (ANOVA) and Tukey post hoc tests to compare the number of pieces of candy shared according to children's beliefs. To control for the effect of demographic variables on the association between decisions and beliefs, we used age, gender, and country as covariates in an analysis of covariance (ANCOVA). We report the effects before and after covariation. In addition, a Student's t test was used to contrast gender differences in the number of pieces of candy shared, and a Pearson test was used to examine the relationship between sharing behavior and age. Effect sizes were reported by using the partial eta squared test for ANOVAs, and Cohen's d was used for t-test analyses.

Results

Participants shared on average 3.54 pieces of candy (SD = 1.82, 44.25% of the 8 pieces available to share). A t-test analysis revealed that girls shared more than boys (girls: mean = 3.98, SD = 1.57; boys: mean = 3.22, SD = 1.93), $t(144) = -2.52$, $p = .01$. Furthermore, a Pearson test showed that sharing behavior was positively associated with age ($r = .28$, $p < .001$) (see Supplementary Fig. 1 in supplementary material).

One-way ANOVAs revealed significant differences in sharing behavior depending on participants' beliefs about the future recipient's behavior, $F(2, 143) = 6.00$, $p = .003$, $\eta^2 = .09$. This effect was still found after adjusting for covariables, $F(2, 140) = 4.60$, $p = .01$, $\eta^2 = .07$. Post hoc analysis (Tukey, MS = 3.12, df = 143.0) showed that children who believed that the recipient would not be generous shared significantly fewer pieces of candy than children who believed that the recipient would be generous ($p = .001$) or intermediately generous ($p = .008$) (see Fig. 1A). Children who believed that the recipient would be generous shared on average 3.83 pieces of candy (SD = 1.91), nearly twice as many as children who believed that the recipient would not be generous (2.17 pieces of candy, SD = 1.84).

Similar results were found when we contrasted differences in sharing depending on participants' beliefs about the recipient's kindness, $F(2, 143) = 4.99$, $p = .007$, $\eta^2 = .07$, and the effect also persisted

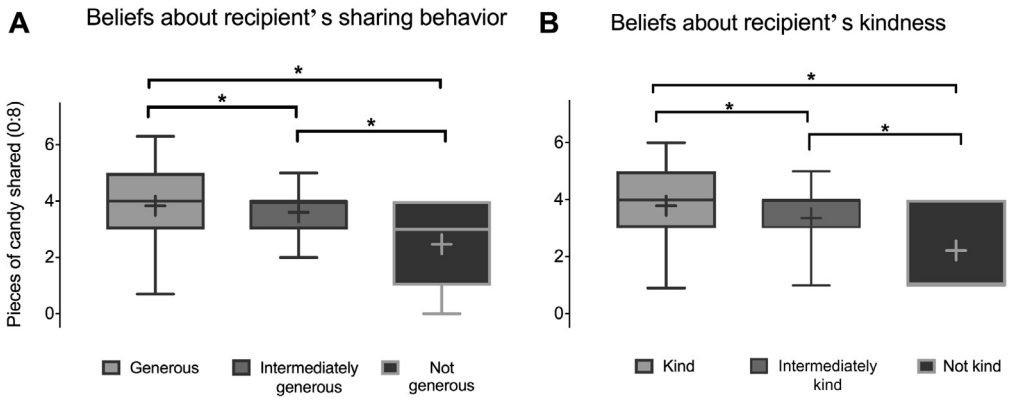


Fig. 1. Main results of Study 1. (A) Box plot showing significant differences in number of pieces of candy shared among groups divided by beliefs about recipients' generosity. Each independent box plot depicts the children who opted for each type of belief about recipients of another school (generous: $n = 66$; intermediately generous: $n = 63$; not generous: $n = 17$). (B) Differences in number of pieces of candy shared among groups divided by beliefs about others' kindness. Each independent box plot depicts the children who opted for each type of belief about recipients of another school (kind: $n = 98$; intermediately kind: $n = 39$; not kind: $n = 9$). In all panels, lines inside box plot or bold lines represent median values, boxes stand for the values between 25 and 75 percentiles, and whiskers stand for ±2 * SE. Cross symbol depicts the media values. Asterisk symbol depicts significant differences at $p < .05$.

after adjusting for covariables, $F(2, 140) = 3.15$, $p = .04$, $\eta^2 = .06$. Post hoc analyses (Tukey HSD [highly significant difference], $MS = 3.16$, $df = 146.0$) showed that children who believed that the recipient would not be kind shared significantly fewer pieces of candy than children who believed that the recipient would be kind ($p = .006$) (see Fig. 1B). Results were similar in both countries (see details in Section 2 of supplementary material).

Together, the results of Study 1 support a relationship between social decisions and beliefs in children.

Study 2

Here, we examined to what extent sharing behavior and beliefs about others' generosity would be associated when participants need to share with an unknown group of children from another school (instead of a single individual recipient) and also when they need to imagine the hypothetical generosity of children in general, that is, children from the same participant's school and children from other schools.

Method

Participants

A total of 130 children between 3 and 12 years old (mean age = 7.44 years, $SD = 2.11$; 66 girls) were recruited from a private school of Bogotá.

Instrument

In this DG, participants were introduced to the same procedure described in Study 1, but in this case they were invited to share the 8 pieces of candy with a group of children from another school. Participants were told that all children who played the game before and those who would play after them could decide how many pieces of candy to share with this group of children. The total amount of resources collected by all children from participants' school would be used by the other group of children to play a new DG in which they would share with a third unknown group. In the beliefs phase, participants responded to four questions: (a) the hypothetical sharing behavior of this group of

children, (b) the kindness of this group of children, (c) the sharing behavior of children in general who would play the same DG (children of the same school, children from another school or neighborhood, etc.), and (d) the kindness of children in general who would play the DG. These questions were coded in the same way as in Study 1 (see instructions in Section 1.1.2 of supplementary material).

Data analysis

To test whether sharing behavior was associated with beliefs about others' behavior, we followed the same analyses used in Study 1. We used age and gender as covariates to control for the effect of demographic variables and report the effects before and after covariation.

Results

Similar to Study 1, the results showed significant differences in sharing behavior depending on participants' beliefs about others' generosity and kindness (see Fig. 2) when participants reported their beliefs about the group of children [beliefs about others' sharing behavior: $F(2, 129) = 11.27$, $p < .01$, $\eta^2 = .10$; beliefs about others' kindness: $F(2, 129) = 7.22$, $p < .01$, $\eta^2 = .09$] and beliefs about other children in general [beliefs about others' sharing behavior: $F(2, 129) = 5.17$, $p < .05$, $\eta^2 = .06$; beliefs about others' kindness: $F(2, 129) = 3.04$, $p < .05$, $\eta^2 = .04$]. These effects were still found after adjusting for covariables [beliefs about sharing behavior of another group of children: $F(2, 129) = 6.88$, $p = .01$, $\eta^2 = .09$; beliefs about kindness of another group of children: $F(2, 129) = 2.98$, $p < .05$, $\eta^2 = .04$; beliefs about sharing behavior of others in general: $F(2, 129) = 4.18$, $p < .05$, $\eta^2 = .04$; beliefs about kindness of other children in general: $F(2, 129) = 2.45$, $p < .05$, $\eta^2 = .04$]. Post hoc analyses revealed that participants who believed that other children would be more generous or kind shared significantly more pieces of candy than participants who believed that other children would be not generous or not kind (see details in Fig. 2 and Section 2.2 of supplementary material).

Overall, the results of the first two studies showed similar results; more generous participants had more positive beliefs about others' generosity, and less generous participants believed that others are less generous too.

Study 3

In this between-participant study, we explored to what extent children's decisions in the DG and beliefs would change when participants were informed of the future recipient's sharing behavior. Participants were randomly assigned to one of two conditions: (a) a forced-cooperative condition (before sharing the pieces of candy, participants were informed that the future recipient would be forced to share the pieces of candy he or she would receive) and (b) a forced-noncooperative condition (before sharing, participants were told that the future recipient would be forced not to share the pieces of candy). After the decision, participants responded to how they thought the recipient would actually act if he or she were free to share.

Method

Participants

We assessed 246 children between 3 and 12 years old from Colombia and Argentina. Children were randomly assigned to the forced-cooperative or forced-noncooperative condition. Participants in both conditions were matched according to age, $t(245) = -1.20$, $p = .22$, and gender, $\chi^2(1) = 0.23$, $p = .63$ (see Table 1). No significant differences in demographic variables were found between conditions in each country (see Section 1.2 of supplementary material).

Instrument

Participants performed a DG similar to the task of Study 1. The only differences were that participants could share 10 pieces of candy (providing more pieces of candy was used to reduce possible bias toward equal distribution) and received different information about the recipient's forced sharing

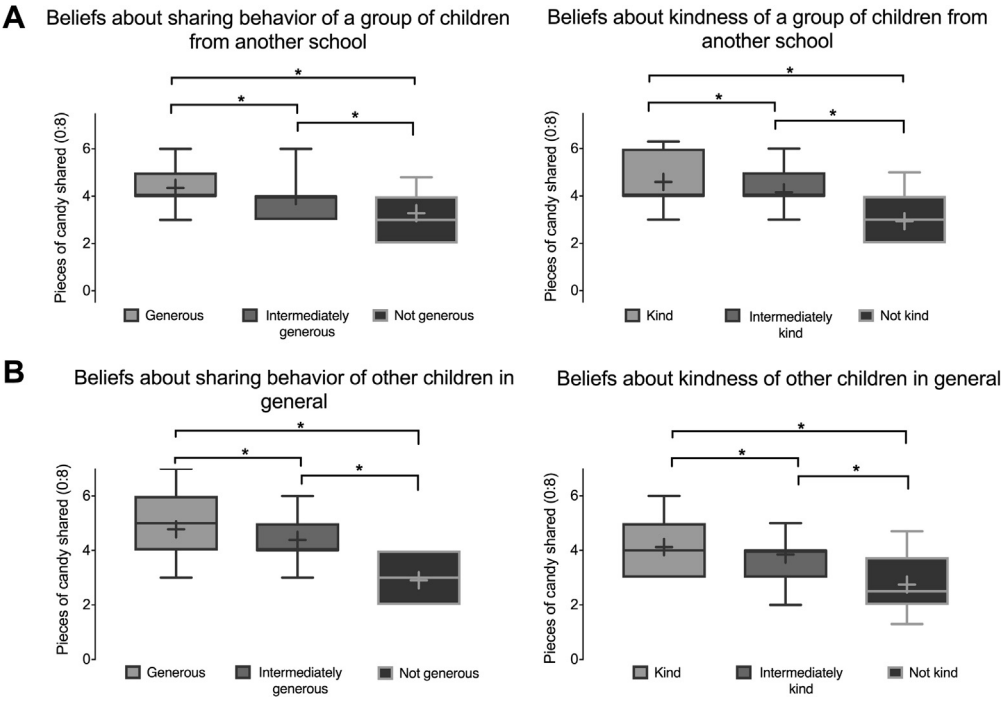


Fig. 2. Main results of Study 2. (A) Box plots showing significant differences in the number of pieces of candy shared among groups divided by beliefs about sharing behavior (left panel) and kindness (right panel) of a group of children from another school. Each independent box plot depicts the children who opted for each type of belief about recipients of another school (generous: n = 48; intermediately generous: n = 64; not generous: n = 18; kind: n = 70; intermediately kind: n = 45; not kind: n = 15). (B) Box plots showing similar differences among groups divided by beliefs about generosity (left panel) and kindness (right panel) of other children in general. Each independent box plot depicts the children who opted for each type of belief about other children in general (generous: n = 73; intermediately generous: n = 50; not generous: n = 15; kind: n = 73; intermediately kind: n = 44; not kind: n = 13). In all panels, lines inside box plot or bold lines represent median values, boxes stand for the values between 25 and 75 percentiles, and whiskers stand for ±2 * SE. Cross symbol depicts the media values. Asterisk symbol depicts significant differences at $p < .05$.

Table 1
Age and gender distributions of groups assessed in Study 3.

	Forced-cooperative condition			Forced-noncooperative condition		
	n	Gender (boys:girls)	Mean age (*SD*)	*n*	Gender (boys:girls)	Mean age (*SD*)
3- to 5-year-olds	39	17:21	4.36 (0.71)	30	15:15	4.46 (0.68)
6- to 8-year-olds	62	30:32	6.90 (0.86)	55	28:27	6.92 (0.79)
9- to 12-year-olds	27	13:14	10.22 (0.75)	34	15:19	10.14 (0.65)

behavior depending on the condition to which they were assigned. Participants in the forced-cooperative condition were informed that the recipient must share the pieces of candy he or she would receive because teachers in this school oblige children to share their resources. Participants in the forced-noncooperative condition were informed that the recipient must not share the pieces of candy he or she would receive because teachers in this school did not allow children to share their belongings and resources. In the belief phase, participants were asked how they imagined the future recipient would behave if he or she were free to share, that is, if the participant were not obliged to be generous in the forced-cooperative condition and if he or she were not obliged to be ungenerous in the

forced-noncooperative condition. Responses were coded using the same procedure as in Study 1. A detailed description of instructions of this task is included in the supplementary material (see Section 1.1.2).

Data analysis

Given that in Study 1 we observed a developmental effect on sharing behavior, here we analyzed children's responses in three age groups: (a) 3–5 years, (b) 6–8 years, and (c) 9–12 years. No significant differences in age and gender were found between conditions [age: $t(144) = -1.32$, $p = .22$; gender: $\chi^2(1) = 0.43$, $p = .56$] (see Table 1). An independent t test was performed in each age group to compare the number of pieces of candy shared between conditions. A chi-square test was used to compare differences in the distribution of beliefs between conditions in each age group. Significant differences were further explored by using nonparametric Friedman and Wilcoxon tests.

Results

Comparison of sharing behavior between conditions in each age group revealed a significant difference only for the 9- to 12-year-old group, $t(60) = -3.58$, $p = .01$, Cohen's $d = 0.78$. Participants in the forced-cooperative condition shared nearly half of their pieces of candy (mean = 5.37, $SD = 0.57$), whereas those in the forced-noncooperative condition shared significantly fewer resources (mean = 4.35, $SD = 0.61$) (see Fig. 3A). No significant differences were observed for the 3- to 5-year-olds, $t(67) = -0.24$, $p = .80$, Cohen's $d = -0.05$, and the 6- to 8-year-olds, $t(115) = -0.63$, $p = .52$, Cohen's $d = -0.11$.

Regarding beliefs on the hypothetical recipient's behavior, no significant differences between conditions were observed in the distribution of beliefs in the 6- to 8-year-olds, $\chi^2(2) = 0.62$, $p = .74$, and the 9- to 12-year-olds, $\chi^2(2) = 1.24$, $p = .53$. However, we observed significant differences between conditions in the 3- to 5-year-olds, $\chi^2(2) = 11.52$, $p = .004$ (see Fig. 3B). In the cooperative condition, a nonparametric Friedman test revealed significant differences in the percentage of children who opted for each type of belief (generous, intermediately generous, or not generous), $\chi^2(2) = 7.30$, $p < .01$. A Wilcoxon test showed that the percentage of children who thought that the recipient would be generous significantly differed from the percentage of children who thought that the recipient would be intermediately generous ($p < .01$) or not generous ($p < .01$). No significant differences among type of beliefs were observed in the forced-noncooperative condition in this age group, $\chi^2(2) = 2.30$, $p = .15$. These results were similar in both countries (see details in Section 1.1.3 of supplementary material).

In summary, results confirmed that providing information on the recipient's forced behavior influenced children's sharing behavior, but only in children older than 9 years. Regarding beliefs about the recipient's hypothetical behavior if he or she could act freely, we observed that only the youngest group differed between forced-cooperative and forced-noncooperative conditions. Children older than 6 years reported similar beliefs between conditions.

Study 4

In this study, we examined beliefs about others' generosity before participants were assigned to the social contextual conditions of Study 3. We examined to what extent these prior beliefs were associated with participants' sharing behavior and whether the prior beliefs were similar to the beliefs after sharing.

Method

Participants

The same sample of participants reported in Study 2 (130 children between 3 and 12 years old) were divided into three age groups and randomly assigned to the forced-cooperative or forced-

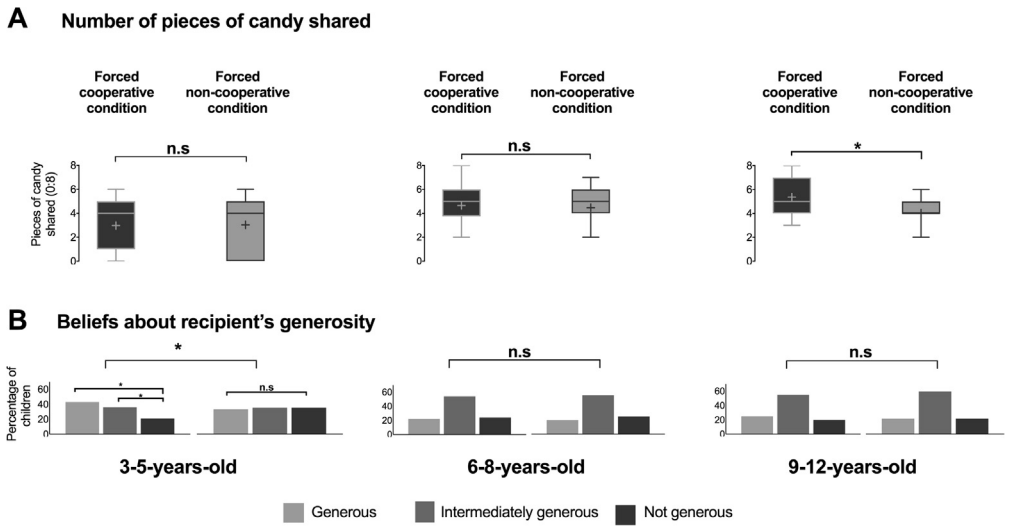


Fig. 3. Main results of Study 3. (A) Box plot shows significant differences between conditions in the number of pieces of candy shared only in the 9- to 12-year-old group. The lines inside box plot or bold lines represent median values, boxes stand for the values between 25 and 75 percentiles, and whiskers stand for ±2 * SE. Cross symbol depicts the media values. Asterisk symbol depicts significant differences at $p < .05$. (B) Bar graphs show the percentage of children who opted for each type of belief about recipient behavior (generous, intermediately generous, or not generous) according to the forced-cooperative and forced-noncooperative conditions in each age group. Only the 3- to 5-year-old group showed significant differences between conditions in beliefs about others' generosity. No significant differences were observed in the other two groups. Asterisk symbol depicts significance level at $p < .05$.

noncooperative condition (see Study 3). Participants in both conditions were matched according to age, $t(129) = -0.82$, $p = .21$, and gender, $\chi^2(1) = 0.45$, $p = .39$ (see Table 2).

Instruments

We used the same task and procedure described in Study 3, but in this case we included a question regarding beliefs about others' generous behavior before task instructions (prior beliefs). Thus, participants were asked how they think other children (from the same school and other schools) would act when they needed to share their resources (school supplies, chocolates, candies, toys, etc.). Thus, children were asked the following: Would other children share a lot (coded as 1), a little bit (coded as 0), or not at all (coded as −1)? Afterward, we followed the same instructions and procedure of Study 3; participants were informed of the recipient's future sharing behavior, then they shared their pieces of candy, and finally they reported their beliefs on the recipient's sharing if he or she could act freely (beliefs after decision). To avoid bias, participants reported their prior beliefs before performing any DG (see more details in Section 1.1.4 of supplementary material).

Data analysis

A Spearman test was employed to examine the relationship between prior beliefs and sharing behavior in each condition and each age group. A chi-square test was used to compare differences in the distribution of prior beliefs and beliefs after decision in each condition and age group. Significant differences were further explored by using Friedman and Wilcoxon tests.

Results

First, as we expected, no significant differences in prior beliefs were observed between forced-cooperative and forced-noncooperative conditions in each age group [3- to 5-year-olds: $\chi^2(2) = 0.15$, $p = .92$; 6- to 8-year-olds: $\chi^2(2) = 0.36$, $p = .83$; 9- to 12-year-olds: $\chi^2(2) = 0.53$, $p = .76$] (see

Table 2
Age and gender distributions of groups assessed in Study 4.

	Forced-cooperative condition			Forced-noncooperative condition		
	n	Gender (boys:girls)	Mean age (*SD*)	*n*	Gender (boys:girls)	Mean age (*SD*)
3- to 5-year-olds	18	9:9	4.41 (0.61)	20	10:10	4.36 (0.48)
6- to 8-year-olds	20	11:9	6.78 (0.66)	19	9:10	6.53 (0.67)
9- to 12-year-olds	26	12:14	9.12 (0.45)	27	14:13	9.45 (0.57)

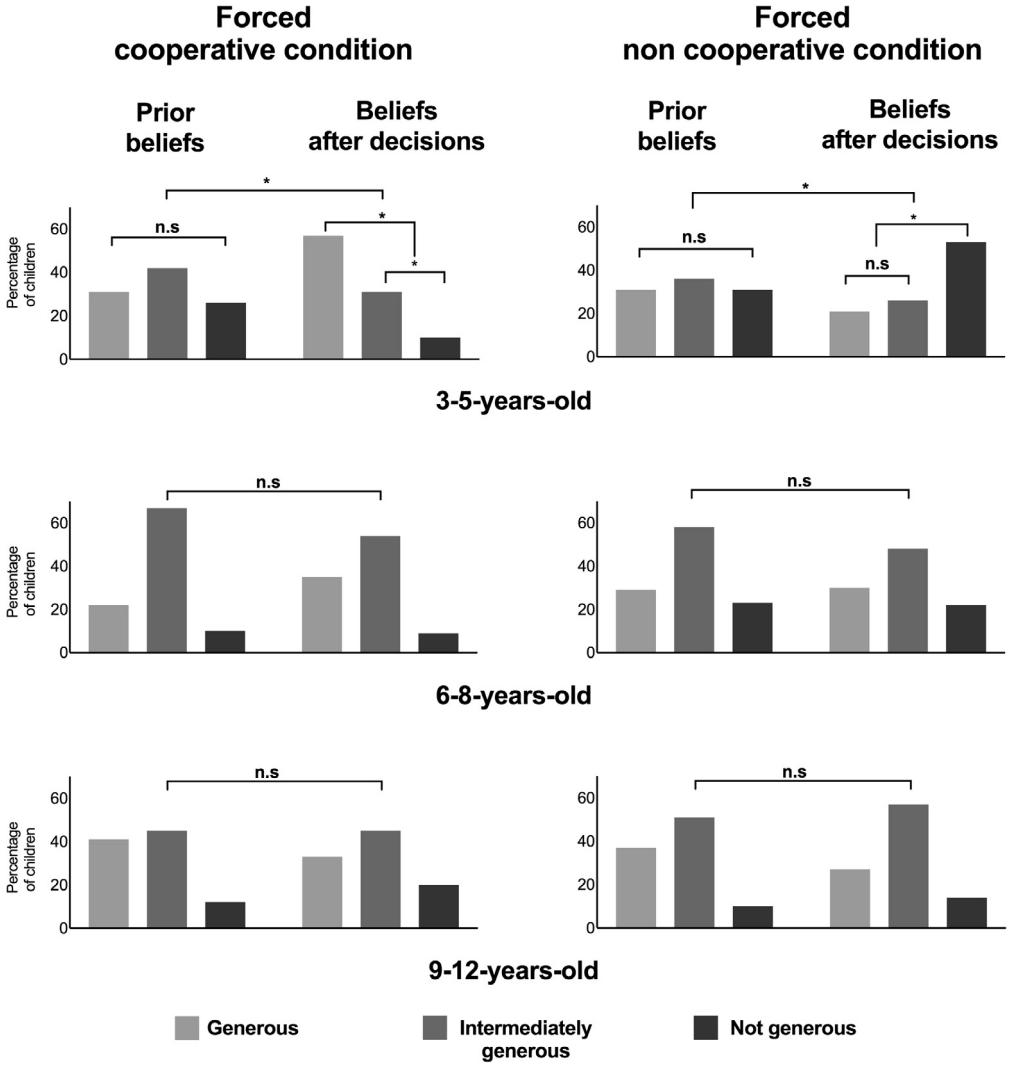


Fig. 4. Main results of Study 4. Percentage of children in each age group who opted for each type of belief option in the forced-cooperative condition (left panels) and forced-noncooperative condition (right panels). Asterisk symbol depicts significance level at $p < .05$.

Fig. 4). Second, we observed a significant positive association between prior beliefs and sharing behavior in all age groups and conditions (see Table 3). Third, we found no significant differences within

Table 3
Association between prior beliefs and sharing behavior.

Group of children	*n*	Spearman's rho, *p* value
3- to 5-year-olds	38	$r_s = .51$, $p = .001$
6- to 8-year-olds	39	$r_s = .29$, $p = .04$
9- to 12-year-olds	53	$r_s = .31$, $p = .03$

prior beliefs and beliefs after the decision in the 6- to 8-year-olds [for both the forced-cooperative condition, $\chi^2(2) = 0.66$, $p = .41$, and the forced-noncooperative condition, $\chi^2(2) = 0.25$, $p = .79$] and the 9- to 12-year-olds [for both the forced-cooperative condition, $\chi^2(2) = 0.91$, $p = .36$, and the forced-noncooperative condition, $\chi^2(2) = 0.73$, $p = .46$]. However, significant differences were observed within prior beliefs and beliefs after decisions in the younger group, $\chi^2(2) = 7.82$, $p < .01$ (see Fig. 4). In this group, a nonparametric Friedman test revealed no significant differences in the percentage of children who opted for each type of prior belief in both conditions [forced cooperative: $\chi^2(2) = 0.10$, $p = .94$; forced noncooperative: $\chi^2(2) = 0.22$, $p = .76$]. Regarding beliefs after decisions, significant differences were observed in both conditions [forced cooperative: $\chi^2(2) = 9.57$, $p < .01$; forced noncooperative: $\chi^2(2) = 3.97$, $p < .01$]. A Wilcoxon test showed that in the forced-cooperative condition, the percentage of children who thought that the recipient would be generous was significantly higher than the percentage of children who thought that the recipient would be intermediately generous ($p < .01$) and not generous ($p < .01$). In the forced-noncooperative condition, the percentage of children who thought that the recipient would be not generous was significantly lower than the percentage of children who thought that the recipient would be generous ($p < .01$) and intermediately generous ($p < .01$).

Finally, similar to Study 3, we observed significant differences between conditions in sharing behavior in the 9- to 12-year-olds, $t(51) = 2.78$, $p < .01$, Cohen's $d = -0.34$, and no significant difference in the 6- to 8-year-olds, $t(36) = 1.62$, $p = .11$, Cohen's $d = -0.14$) and the 3- to 5-year-olds, $t(37) = 0.46$, $p = .74$, Cohen's $d = -0.07$ (see Supplementary Fig. 2 in Supplementary material).

Overall, these results showed that all age groups shared according to their prior beliefs about others' generosity and that the information on the forced sharing behavior of the recipient (condition assignment) did not modify participants' prior beliefs about others' generosity (except in younger children).

General discussion

In this work, we showed that sharing behavior was tightly associated with beliefs about others' generous behavior and kindness in children between 3 and 12 years old. In addition, we showed that the information on the recipient's generous behavior affected children's sharing behavior, but not beliefs about others' generosity, only in 9- to 12-year-olds.

Studies from different disciplines such as economics, social psychology, and experimental psychology have established that social behavior is implicitly shaped by beliefs about the social world (Akerlof & Dickens, 1982; Bear, Manning, & Izard, 2003; Beck, 1996; Boxer & Tisak, 2005; Di Tella et al., 2015; Festinger, 1962). The findings of Studies 1, 2, and 4 add to this work by showing that sharing behavior in children is associated with their beliefs about others' generosity and kindness. The relationship between decisions and beliefs seems to be broadly stable in different social interactions, including a direct allocator–receptor context, group context, and more general and unspecified contexts. These results align with evidence from other populations indicating that social cognition tendencies, including beliefs about others, go beyond the particular scenarios in which they are rooted and can be generalized to more general situational settings (Cvencek, Meltzoff, & Greenwald, 2017; Heyman & Dweck, 1998).

These results suggest that children's social behavior is possibly guided by children's cognitive schemas and normative beliefs about the social world (Huesmann & Guerra, 1997). Therefore, generous behavior would be supported by preconceived ideas of the acceptability and importance of being

generous and, similarly, ungenerous behavior would be supported by preconceived ideas about others' selfishness. It is important to note that our results do not speak to the causality or directionality of the relationship between decisions and beliefs (i.e., whether children decided according to their beliefs or whether their choices modified their beliefs). The results of Study 4 showed that beliefs about others' generosity before sharing (prior beliefs) were associated with sharing behavior. Although these results suggest that participants possibly decided how to share following preconceptions on fairness (i.e., social schemas), future studies should further explore how beliefs and decisions are mutually connected to guide sharing behavior in children.

In Studies 3 and 4, we explored to what extent sharing behavior and beliefs would differ according to the information on the recipient's sharing behavior (forced-cooperative or forced-noncooperative behavior). Results revealed that only children older than 9 years were sensitive to this information and shared more resources than those forced to share (cooperative condition) compared with those forced not to share (noncooperative condition). This result is aligned with previous studies (Almås et al., 2010; Fehr, Bernhard, & Rockenbach, 2008; Shaw, Choshen-Hillel, & Caruso, 2016; Sheskin, Bloom, & Wynn, 2014), which showed that during development, as social interactions become richer and more diverse, children (in particular those older than 6 or 7 years) exhibit a preference for fairness and cooperative behavior (Kato-Shimizu, Onishi, Kanazawa, & Hinobayashi, 2013; Li, Wang, Yu, & Zhu, 2016). We suggest that, with age, children become progressively more prone to adapt their behavior to the social context.

By contrast, sharing behavior in younger children was similar between both social contextual conditions, suggesting that their behavior could be guided by principles of equity (Almås et al., 2010; Fehr et al., 2008; Shaw et al., 2016; Sheskin et al., 2014).

In these studies, we also inquired about children's belief on the recipient's generosity as in whether he or she would act freely. As we expected, we observed that the information on the forced recipient's sharing behavior did not modify the beliefs about others' real desires and motivations to share in children older than 6 years. In Study 4, we also observed that beliefs about others' generosity before sharing were similar to beliefs after the decision in both conditions. These results suggest that children might act according to their normative beliefs and preconceived ideas of the functioning of the social world (Huesmann & Guerra, 1997). These results are aligned with previous studies showing that after 6 years children's beliefs about social and moral situations are socially determined and progressively become more stable (Giles & Heyman, 2017; Laible, McGinley, Carlo, Augustine, & Murphy, 2014; Lockhart, Chang, & Story, 2002).

However, an intriguing aspect of our results is that in both Studies 3 and 4 the information on the forced recipient's sharing behavior in the two experimental conditions did not modify sharing behavior in young children but affected their beliefs about the recipient's generosity in the hypothetical case of whether he or she would act freely. Thus, children reported more negative beliefs about others' generosity in the forced-noncooperative condition compared with the forced-cooperative condition. We suggest that young children may have modified their beliefs because they were confused, as in many experiments of children of this age, by an abstract question that requires a high cognitive flexibility process, that is, to change the idea that the recipient was forced to behave in a certain way by the idea that the recipient could behave freely. In our concept, it is possible that children had presented difficulties in inferring the recipient's behavior beyond teachers' impositions. This type of inference requires different cognitive computations, such as mental preparation abilities (Corina & Singleton, 2009; Cowell, Samek, List, & Decety, 2015), skills for reasoning on abstract entities (Tullos & Woolley, 2009), and reversing learning processes (i.e., the ability to change a previous learned rule during a task) (Kendler, Kendler, & Wells, 1960; Nolan & Pendarvis, 1970), which before 6 years are still immature in children. Alternatively, given previous studies showing that younger children's opinions and beliefs are highly moldable by others' suggestions and opinions (Cvencek et al., 2017; Lockhart et al., 2002; Vanderbilt, Heyman, & Liu, 2014), it is possible that young children were more conditioned by teachers' impositions about the recipient's behavior. In other words, these children might follow their initial (unbiased) beliefs when deciding how to share their pieces of candy, but then after receiving information on the recipient's future sharing behavior, they updated their beliefs. Future studies should further explore these different interpretations.

Overall, these four studies highlight the importance of beliefs and cognition on children's sharing behavior and might have practical implications. Educational programs aimed at encouraging fairness and prosocial interactions might focus on both children's behaviors and beliefs. Children's beliefs about others could reveal how children would behave toward other children in future situations. Decisions and beliefs are intertwined during development, and understanding how this relationship works could provide information on how children acquire a richer understanding of the social world.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jecp.2017.08.016.

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