

1 **Children are sensitive to norms of giving**

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10 **Abstract**

11 People across societies engage in costly sharing, but the extent of such sharing shows striking cultural
12 variation, highlighting the importance of local norms in shaping generosity. Despite this acknowledged role
13 for norms, it is unclear when they begin to exert their influence in development. Here we use a Dictator
14 Game to investigate the extent to which 4- to 9-year-old children are sensitive to selfish (give 20%) and
15 generous (give 80%) norms. Additionally, we varied whether children were told how much other children
16 give (*descriptive norm*) or what they should give according to an adult (*injunctive norm*). Results showed
17 that children generally gave more when they were exposed to a generous norm. However, patterns of
18 compliance varied with age. Younger children were more likely to comply with the selfish norm,
19 suggesting a licensing effect. By contrast, older children were more influenced by the generous norm, yet
20 capped their donations at 50%, perhaps adhering to a pre-existing norm of equality. Children were not
21 differentially influenced by descriptive or injunctive norms, suggesting a primacy of norm content over
22 norm format. Together, our findings indicate that while generosity is malleable in children, normative
23 information does not completely override pre-existing biases.

24

25 **Keywords**

26 Generosity, cooperation, dictator game, norms, social cognitive development

27 **Introduction**

28 People everywhere engage in costly prosocial behavior, ranging from every-day acts like volunteering time
29 at community events to more tangible gestures like giving away a proportion of one's earnings to charity.
30 Indeed, according to Giving USA, in the last year people in the USA alone gave an estimated \$358.38
31 billion dollars to charity (more than \$1,000 per adult) highlighting the economic importance of
32 understanding the mechanisms supporting generosity in humans.

33 A great deal of work by economists and psychologists has shown that generous behavior can be
34 readily elicited under laboratory conditions. The most widely used task for capturing generosity in the lab is
35 the Dictator Game (Kahneman, Knetsch, & Thaler, 1986). In this game, one person—the dictator—is given
36 a sum of money and is asked to allocate the endowment between themselves and a passive recipient. While
37 traditional economic models predict that dictators will keep the entire endowment for themselves because
38 any donation necessarily reduces the dictator's payoff, dictators typically share a portion of their
39 endowment with partners (Engel, 2011). A further striking finding from work on the Dictator Game is that
40 the *amount* shared with partners shows dramatic variation across different societies (Henrich, Boyd,
41 Bowles, Camerer, Fehr, Gintis et al., 2005). For instance, in one cross-cultural investigation of Dictator
42 Game giving, Hadza participants offered a 20% share on average, while Tsimane participants typically
43 offered ten percent more (Henrich et al., 2005). In these two societies, few people kept everything for
44 themselves, in contrast to American participants, many of whom refused to share at all (Camerer, 2003).
45 This cultural variation demonstrates that while generosity may be a common human behavior, what
46 constitutes generosity is profoundly shaped by local norms.

47 An influential approach to addressing how norms affect behavior begins by distinguishing
48 between two different types of normative information, what we refer to here as *norm format*. *Descriptive*
49 *norms* describe what others are doing, while *injunctive norms* describe what ought to be done to earn social
50 approval (Cialdini, Reno, & Kallgren, 1990). Descriptive and injunctive norms have garnered a great deal
51 of attention in social psychology and each appears to influence people's behavior in a range of social
52 situations including littering (Cialdini et al., 1990), taking resources from a national park (Cialdini,
53 Demaine, Sagarin, & Barrett, 2006) and household energy consumption (Schultz, Nolan, Cialdini,
54 Goldstein, & Griskevicius, 2007). Theoretically, the distinction between descriptive and injunctive norms
55 may be further explored by placing it in a more evolutionarily informed framework, namely by thinking of
56 it as analogous to the distinction between horizontal and oblique transmission (Richerson & Boyd, 2005;
57 Cavalli-Sforza & Feldman, 1981). While this framework must be qualified by acknowledging that both
58 descriptive and injunctive norms can, in principle, be transmitted horizontally or obliquely, this can serve
59 as a useful foundation for thinking about which models are most relevant for children at different stages in
60 development. Horizontal transmission, as the name implies, is transmission of information between peers.
61 One central route for horizontal transmission is direct observation of statistical tendencies, i.e., the learning
62 of descriptive norms of who generally does what. Oblique transmission involves acquiring skills and

63 knowledge, including explicit rules of conduct, i.e. injunctive norms. Oblique transmission is importantly
64 distinct from vertical transmission, which involves learning specifically from parents. While much early
65 learning happens from parents, children begin to increasingly rely on horizontal and oblique transmission
66 as they age (Hewlett et al., 2011). However, the extent to which children differentially weigh normative
67 information from peers versus adults remains unclear. An emerging picture from developmental work
68 suggests that young children have an initial tendency to rely on adults for social information (Jaswal &
69 Neely, 2006; Rakoczy, Warneken, & Tomasello, 2010), which hints at a particular sensitivity to injunctive
70 norms. By contrast, older children are thought to be particularly sensitive to peer influence (Brown, 1990),
71 pointing to the importance of descriptive norms later in development. However, it is not yet known if these
72 same patterns hold when examining children's adherence to norms of generosity.

73 Some recent work has, however, investigated norm format in the context of adults' giving in the
74 Dictator Game (Bicchieri & Xiao, 2007; Raihani & McAuliffe, 2014). Bicchieri and Xiao (2007) found that
75 fair behavior was more affected by participants' expectations of what others give in the dictator game (i.e.,
76 a descriptive norm) as opposed to expectations of what ought to be given (an injunctive norm). However,
77 Raihani and McAuliffe's (2014) results did not accord with these findings. They presented dictators with a
78 descriptive norm, an injunctive norm or no normative information. Within norm format, participants saw
79 either a stingy norm (give at least 20%) or a generous norm (give at least 50%). They found that people
80 were sensitive to both norm content (stingy vs. generous) as well as norm format (injunctive vs.
81 descriptive). Specifically, people gave more when presented with the generous norm than the stingy norm,
82 and injunctive norms increased the propensity to give at least the target amount, whereas descriptive norms
83 did not. Minimally, results from these two studies show that giving behavior is flexible: people's generosity
84 is susceptible to the power of suggestion. However, the extent to which giving behavior is differentially
85 influenced by descriptive versus injunctive norms remains unclear, and in particular, little is known about
86 how or even whether children are sensitive to different norm formats.

87 Taken together, previous studies of Dictator Game giving in adults have clearly demonstrated that
88 generosity shows natural variation across cultures, and suggest that the transmission of normative
89 information is one potential mechanism by which that variation can be maintained. However, the
90 developmental roots of normative influence are as yet unclear. In particular, it remains possible that
91 children hold strong pre-existing biases, for example towards selfishness (e.g., Benenson, Pascoe, &
92 Radmore, 2007) that limit the influence of normative information earlier in development. Alternatively, the
93 nature of selfishness versus generosity might itself be open to revision via normative information from
94 early childhood, in which case, children, like adults would be sensitive to locally presented norms.
95 Addressing these issues is critical to understanding how and when cultural variation emerges, as well as
96 how and when we might intervene on developing notions of fairness and generosity.

97 Broadly past work on children's donations in the Dictator Game demonstrates that, from relatively
98 early in development, children are motivated to share with others, even when doing so comes at a personal

99 cost. Children as young as four willingly offer resources to peers across a variety of experimental games
100 (Fehr, Bernhard, & Rockenbach, 2008; House, Henrich, Brosnan, & Silk, 2012; Moore, 2009). Of
101 particular relevance here are a number of studies that have examined children's sharing behavior using
102 different versions of the Dictator Game (Benenson et al., 2007; Blake, Corbit, Callaghan, & Warneken,
103 2016; Blake & Rand, 2010; Cowell et al., 2016; Gummerum, Hanoch, Keller, Parsons, & Hummel, 2010;
104 Rochat et al., 2009; Smith, Blake, & Harris, 2013). While results from these studies are not entirely
105 consistent, several trends have emerged: First, young children tend to show a selfish bias that is attenuated
106 with age (Benenson et al., 2007; Cowell et al., 2016; Rochat et al., 2009). Second, older children tend to be
107 more equitable than younger children (Fehr et al., 2008; Smith et al., 2013). Third, children rarely give
108 more than an equal split (Benenson et al., 2007; Blake & Rand, 2010).

109 In parallel to work on children's emerging prosociality, other work has shown that an
110 understanding of norms is present from early in ontogeny. For instance, Powell and colleagues (2013)
111 showed that even infants expect similar individuals to behave in the same way, suggesting that humans are
112 predisposed to attend to group norms and that these norms guide expectations of how individuals should
113 act. These expectations appear to persist over the course of ontogeny and drive children to intervene to
114 prevent norm violations in others (Rakoczy & Schmidt, 2012; Rakoczy, Warneken, & Tomasello, 2008).
115 More specifically, children as young as two years of age respond to norm violations (Rakoczy et al., 2008),
116 and by three children explicitly correct others' behavior (Rakoczy et al., 2008) and are particularly likely to
117 enforce norm violations committed by an in-group member (Schmidt, Rakoczy, & Tomasello, 2012).

118 Another recent line of work has begun to investigate how children's understanding of norms
119 influences their prosocial behavior, and begins to explore potential divergences between understanding of
120 what one ought to do (injunctive information) and expectations about what one will do (descriptive
121 information). For instance, Smith and colleagues (2013) showed that American children between the ages
122 of three and eight understand that they ought to share equally and even expect others to share equally with
123 them. Despite this understanding of what they should do, however, it is not until around the age of seven
124 that children actually begin to adhere to this norm of equality. Blake and colleagues (2014) found a similar
125 gap between what children think they should do and what they actually do and showed that children with
126 better self-regulation close this gap faster than those with poor self-regulation. Finally, in a cross-society
127 study of prosocial behavior, House and colleagues (2013) found that children begin to adopt adult-typical
128 patterns of prosocial behavior around middle childhood, suggesting it is not until this period in ontogeny
129 that children begin to internalize their society's norms of generosity. Together, these studies suggest that
130 from early in development children become aware of norms of giving in their respective societies and that
131 they ultimately follow those norms. However, two key questions remain unanswered, and are the focus of
132 the present study. First, does norm format affect children's generosity? That is, will children be
133 differentially influenced by norms about what their peers are doing (descriptive) versus norms about what
134 they ought to do (injunctive)? Second, are children differentially influenced by norms with different

135 content, such as those that prescribe selfishness versus generosity? We address these questions by
136 investigating children's costly giving in the Dictator Game. Children are presented with a selfish (give
137 20%) or generous (give 80%) norm and we test whether their donations vary in response to these norms
138 relative to their donations in a condition in which they are not given normative information. In addition to
139 varying norm content, we also vary the format of norm that is presented: they either learn what other
140 children do (*descriptive norm*) or they learn what *should* be done from the perspective of an authority
141 figure (*injunctive norm*). Based on past work, we predict that younger children will be less inclined to share
142 than older children. We expect to see this age effect regardless of norm condition, but are particularly
143 interested in whether the content (selfish or generous) or format (descriptive or injunctive) of norms can
144 move children away from their age-typical giving behavior. More specifically, the proposed shift from
145 oblique to horizontal transmission (and so from a reliance on injunctive to descriptive norms) raises the
146 possibility that younger children will be relatively more sensitive to injunctive information than older
147 children, and vice versa for descriptive information. We thus set out to examine children's susceptibility to
148 influence from normative information across early and middle childhood with the aim of clarifying how
149 they are affected by norms that differ in format (descriptive versus injunctive) and content (selfish versus
150 generous).

151 **Methods**

152 *Participants*

153 We included 268 children. We tested children between the ages of four and nine, as this age group has been
154 successfully tested in the Dictator Game in previous studies and thus allows us to compare our results to
155 past work (Benenson et al., 2007). Children were divided into three age groups: 4&5 (N = 90, Mean
156 (months) \pm Standard deviation = 60.4 ± 6.8 , 47 Females (F)), 6&7 (N = 94, 82.6 ± 7.3 , 48F) and 8&9 (N =
157 84, 107.4 ± 7.2 , 41F). For ten of our participants we were missing a precise age due to incomplete birthdate
158 information. For those children, ages were estimated from other information on the consent form or from
159 conversations with the child (N = 3), or children were estimated to be their age in years plus six months (N
160 = 7). We recruited participants in parks, museums, festivals and a lab in New Haven, CT. We received
161 informed consent from parents and assent from children prior to participation. Fifty-five additional children
162 were tested but excluded from the final sample because they failed comprehension (9) or manipulation (33)
163 checks (see *Procedure* for details), due to experimenter error (9) or due to parental interference (4).
164 Twenty-four additional children participated but were excluded prior to testing based on pre-specified
165 criteria (e.g. non-English speakers, outside of age range, did not like food resource used). They participated
166 because we wanted to give any interested child the chance to play the game. Our sample size determination
167 was based on a pre-specified target of 20 children per each of 15 design cells. We continued to add children
168 to cells when other children were excluded for the pre-specified criteria described above and exceeded our
169 exact target because we continued to test when we had additional time on-site at a testing session.

170 *Design*

171 Children played a one-shot anonymous Dictator Game with an imaginary peer. We used a between-subject
172 design in which children were assigned to one of three norm conditions: injunctive, descriptive or a control
173 in which no norm information was presented (see Table S1 for sample breakdown). Within the injunctive
174 and descriptive conditions, children were assigned to one of two treatments: a selfish norm treatment (give
175 2 out of 10) or a generous norm treatment (give 8 out of 10).

176 *Procedure*

177 We based our procedure on previous Dictator Game methods that have been successfully employed with
178 children in this age range (Blake et al., 2014; Blake & Rand, 2009). Participants were introduced to the
179 rewards being used (Starburst candies), asked if they liked them, and given a choice between playing with
180 two different colors. If a child had never tried a Starburst, they were given the opportunity to do so in order
181 to ensure that they were motivated by the resource. Children were then given ten candies and told that they
182 were theirs to keep and that they could do whatever they wanted with them. By assigning ownership in this
183 way we were able to ask about children's generosity. That is, their willingness to share their own resources.
184 The candies were counted out in front of the child in two rows of five. They were then introduced to two
185 paper bags: one bag was for them and one bag was for another child who would be coming to play later. It
186 was explained that they could keep as many candies as they wanted and they could give as many as they
187 wanted to the other child. They were then introduced to one of the condition/treatment combinations or
188 were tested in the no-norm control condition. In the *injunctive* condition the experimenter said: "I think you
189 should give 2/8 to the other child". In the *descriptive* condition, the experimenter said: "most kids that play
190 this game give 2/8 to the other child". To make the divisions more salient to the child, the experimenter
191 physically moved the candies on top of the child's bag and the recipient's bag to demonstrate the giving
192 norms. The candies were then placed back in front of the child in two rows of five. In the control, no
193 information about donation behavior was described. Children were then introduced to a "privacy box", a
194 large cardboard box that sat over the study area such that the child could make their decision out of view.
195 Children were also explicitly told that no one would see them make their decision.

196 To ensure that children understood all aspects of the game, they were asked four comprehension
197 questions before making their decision about how to divide the candy. They were asked (1) to whom the
198 candies belonged; (2) to identify their paper bag; (3) to identify the paper bag of their partner; and (4)
199 whether anyone could see them in the privacy box. The majority of children spontaneously passed these
200 checks (89%, 91%, 98%, 95%). If a child did not answer correctly, they were given another explanation
201 and the comprehension question was re-asked. If children continued to fail these pre-decision
202 comprehension checks, they were excluded (see above for number of excluded children). In three cases, the
203 experimenter re-explained but forgot to re-ask a comprehension question. Given that children
204 overwhelmingly passed comprehension checks after the second explanation, these children were included

205 in the final sample. After making their decisions, the children were again asked to identify their bag and
206 asked what would happen to the candies in the partner's bag. Because these questions were asked after
207 children had made their decisions, they were not used as exclusion criteria.

208 To ensure that children had attended to the norm information that we provided, children in
209 injunctive and descriptive conditions were asked to remember the norm content (selfish: give 2 or
210 generous: give 8) before taking their candies home. Children who did not pass this manipulation check
211 were excluded from the sample (see above). Because this entailed rejecting children from these conditions
212 at a higher rate than the control (which did not have a manipulation check), we ran additional analyses that
213 included the children who failed the manipulation check. Including these children did not change the
214 overall pattern of results (see Table S2). Following these checks, children were debriefed: it was explained
215 that another child would be coming but might not get the specific candies that had been donated and that
216 the norm information was not necessarily true.

217 Early in the study we made a minor change to the script. Notably, experimenters had initially
218 followed the norm manipulation described above with the phrase "that's just what I think you should do
219 (injunctive) / others are doing (descriptive)." This was done to ensure that children understood that they
220 were free to donate however many they wanted (i.e., so that they did not view the norm as a command).
221 However, we ultimately determined that this could weaken the normative content and so removed this
222 phrase, instead, emphasizing that they were free to make whatever decision they wanted. To ensure that this
223 change did not affect our results, we confirmed that our pattern of our results holds regardless of whether
224 these initial sessions are included or excluded (Table S6).

225 *Coding and analysis*

226 Data were collected live. If parents provided video consent and the child provided assent (90% of sessions),
227 a recording was also taken of the task up until the child made a decision. When the child was about to make
228 a decision in the privacy box, the camera was turned off. After the child made a decision, their bag was
229 saved and the number of candies inside was counted after they left. The experimenter entered the live data
230 and, where possible, the experimental videos were later checked to ensure that no experimenter errors had
231 been made and to double-check comprehension checks. Because children made their decisions in secret, we
232 do not have video confirmation of their allocation decisions. However, because recording their decisions
233 required simply counting between zero and ten candies, errors were unlikely to be introduced at this stage
234 and any errors that did occur should have been equally distributed across conditions.

235 We performed analyses using three main approaches. We first asked whether average donations
236 varied across experimental conditions and treatments. Specifically, we asked (1) whether children were
237 differentially responsive to injunctive or descriptive norms and (2) whether their responsiveness differed
238 based on receiving generous versus selfish norm content. Because children in the control condition did not
239 receive norm information and so could not contribute to a treatment by condition interaction (the main

240 predictor of interest for these analyses), this analysis focused only on children in the two test conditions. To
241 examine whether donations were predicted by condition and treatment, we ran linear models with subject
242 donation (0 to 10 candies) as the response term and condition (norm format: descriptive, injunctive,
243 control), treatment (norm content: selfish, generous), age group (4&5, 6&7, 8&9) and gender fit as fixed
244 effects (see Table 1 for information about base levels). Gender was not found to be a significant predictor
245 in any of our models. Analyses were also run with age fit as a continuous effect and this did not change the
246 overall pattern (see SOM for model output from these analyses). Where appropriate based on the analysis at
247 hand, we included interactions between condition, treatment and age group. To determine which factors
248 were important predictors of donations we eliminated single terms from a full model using the ‘drop1’
249 command. In this way, we assessed whether their inclusion improved model fit using likelihood ratio tests
250 (LRTs). Based on these tests, we created a minimal model, which included the combination of factors that
251 provided the best fit to our data.

252 We next collapsed data across injunctive and descriptive conditions and tested whether children
253 were differentially influenced by information about selfish and generous target donations. Here we go
254 beyond an analysis of mean donations to instead examine the *distributions* of donations in each condition.
255 The distributional analysis has the advantage of allowing us to distinguish between different possible
256 patterns of responding with similar means. For example, an analysis of means might not allow us to
257 distinguish between some children showing large shifts and others not shifting at all, on the one hand, and
258 many children shifting slightly on the other hand (because these two patterns could involve identical mean
259 donations). That is, this analysis supplements the analysis of means by providing insight into the
260 distribution of responses in each condition. We examined distributions within each age group using
261 Kolmogorov–Smirnov tests. We used bootstrapped Kolmogorov–Smirnov tests (using the ks.boot
262 command in the “Matching” package; Sekhon, 2011) because donation data were not perfectly continuous
263 and contained ties.

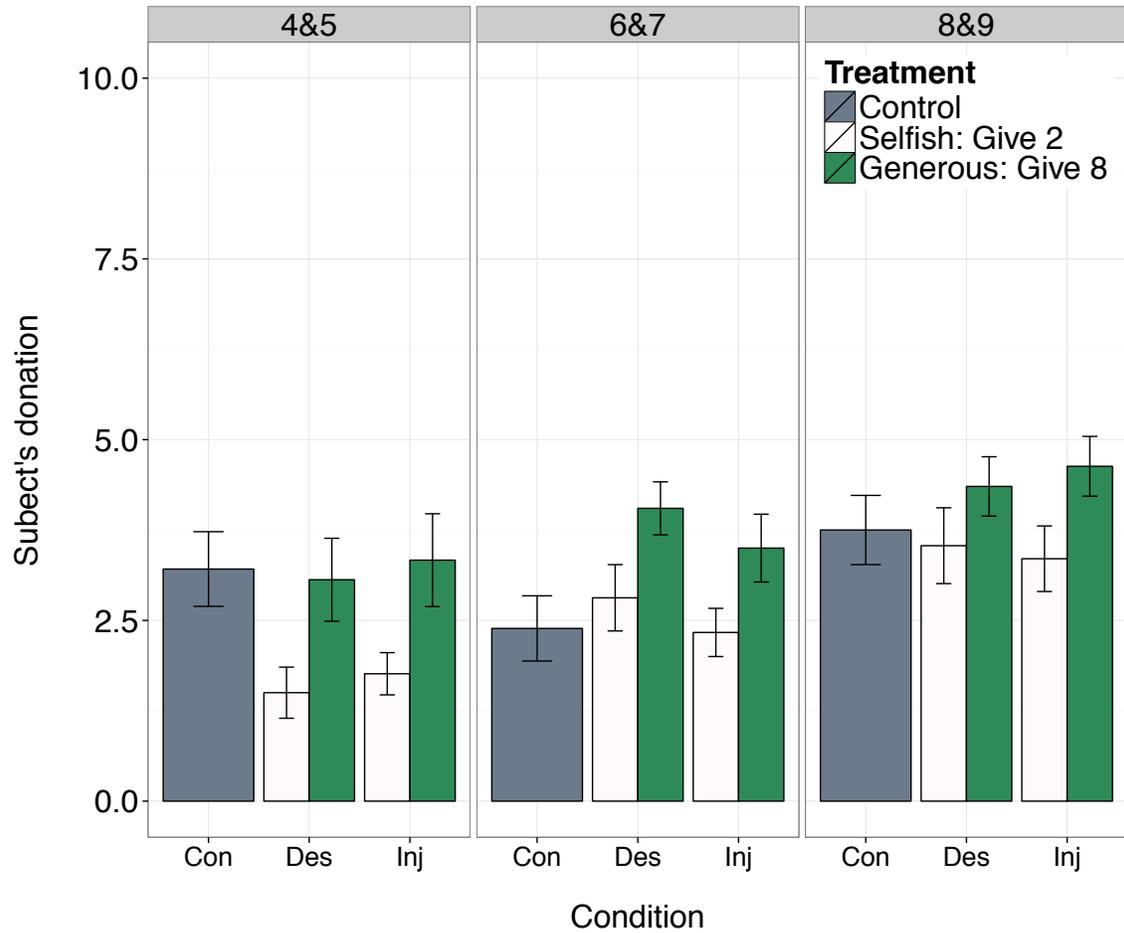
264 Finally, we investigated exact compliance to specific norms (i.e., the possibility that a given norm
265 would lead children to give exactly 2 of 10 or 8 of 10, depending on condition, or that children would give
266 exactly 5, conforming to a pre-existing norm of equality) using generalized linear models (GLMs) with
267 norm compliance fit as a binary outcome (complied = 1, did not comply = 0). To assess the importance of
268 different predictors, we again used LRTs as described above. Again, additional models were run with age
269 fit as a continuous predictor with qualitatively similar results (see SOM). To assess whether compliance
270 varied within particular age groups and treatments, we compared the frequency of children who complied
271 with a given norm (Give 2, Give 8, Give half) in the treatments versus the frequency of children who made
272 those same donations in the control condition. To do this we conducted Pearson Chi Square tests with
273 Yates correction. These were used as an alternative to GLMs because output from our initial GLMs on the
274 subsetted data indicated a convergence issue, most likely due to too few observations for certain factor
275 combinations. All analyses were performed using R software (version 3.1, R Core Team, 2014).

276 **Results**

277 *Did norms affect children's donations?*

278 The norm format (condition: injunctive vs. descriptive) had no effect on children's donations (Fig. 1). We
279 found no effect of condition on donations (LRT, $p = 0.8$), no interaction between condition and treatment (p
280 $= 0.8$) and no three-way interaction between condition x age x treatment ($p = 0.9$) when we examined
281 children who had been tested in the two test conditions. Consequently, we collapsed our data across
282 injunctive and descriptive conditions in order to test whether children's donations were differentially
283 affected by the generous and selfish target amounts when compared to the control. Our linear model
284 showed that both age group (LRT, $\chi^2_2 = 80.1$, $p < 0.001$) and treatment (LRT, $\chi^2_2 = 89.6$, $p < 0.001$) were
285 significant predictors of donations: older children tended to be more generous than younger children and
286 children in the generous treatment gave more than children in the selfish treatment or control. Children in
287 the selfish condition tended to give less than those in the control ($\beta = -0.6$), but this was not a significant
288 effect in our minimal model ($p = 0.07$; Table 1). There was no interaction between age group and treatment
289 ($p = 0.2$).

290 To more directly compare patterns of children's donations in each treatment relative to the control,
291 we examined the relationship between age and donations specifically *within* the selfish and generous
292 treatments (Fig. 1) by subsetting our data into two sets: (1) children in the selfish and control conditions
293 and (2) children in the generous and control conditions. We then modeled donations as a function of age,
294 treatment and the interaction between the two. Our first model examined children's donations in the selfish
295 vs. control condition and showed that children who received the selfish norm tended to give less than those
296 in the control (Table S4). We also found that younger children were especially likely to show this
297 distinction (LRT, age x treatment interaction, $\chi^2_2 = 19.47$, $p = 0.044$). Our second model examined
298 children's donations in the generous vs. control treatments. We found no interaction between age and
299 treatment ($p = 0.2$). However, our reduced model showed that the oldest children gave more than the
300 youngest children (LRT, age, $\chi^2_2 = 33.91$, $p = 0.019$; Table S4) and that children donated more in the
301 generous condition compared to the selfish condition (LRT, treatment, $\chi^2_1 = 18.20$, $p = 0.038$; Table S4).



302

303 **Figure 1.** Mean donations of candies (out of ten) in an anonymous Dictator Game. Donations are shown by
 304 control (Con), descriptive (Des) and injunctive (Inj) conditions treatment, faceted by participant age group.
 305 Within the two norm conditions, children were either exposed to a selfish or generous norm. We used a
 306 between-subject design in which children were tested in a single condition/treatment combination. Children
 307 in the control condition received no treatment, as the control was run to measure baseline donations by age.
 308 Error bars show standard error.

309

310 **Table 1.** Effects and standard errors from linear and generalized linear models predicting donations (Model
 311 1) and norm compliance (Models 2 and 3). Base levels for Models 1 and 3 were: Age group = 4&5;
 312 Treatment = Control. Base levels for Model 2 were: Age group = 4&5, Treatment = selfish. Table also
 313 shows goodness of fit.

	Model 1: Donations	Model 2: Compliance to specified norms	Model 3: Compliance to equality norm
Intercept	2.55 ^{***} (0.31)	-0.11 (0.32)	-1.90 ^{***} (0.42)
Age group: 6&7 vs. 4&5	0.42 (0.28)	-0.63 (0.46)	0.72 (0.39)
Age group: 8&9 vs. 4&5	1.33 ^{***} (0.29)	-1.44 ^{**} (0.54)	1.47 ^{***} (0.38)
Treatment: selfish vs. control	-0.60		-0.53

	(0.32)		(0.43)
Treatment: generous vs. control (models 1 & 3);	0.70*	-2.93***	0.65
generous vs. selfish (model 2)	(0.32)	(0.63)	(0.39)
<hr/>			
R ²	0.15		
Adj. R ²	0.14		
Num. obs.	268	215	268
AIC		158.40	294.16
BIC		171.88	312.12
Log Likelihood		-75.20	-142.08
Deviance		150.40	284.16
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*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

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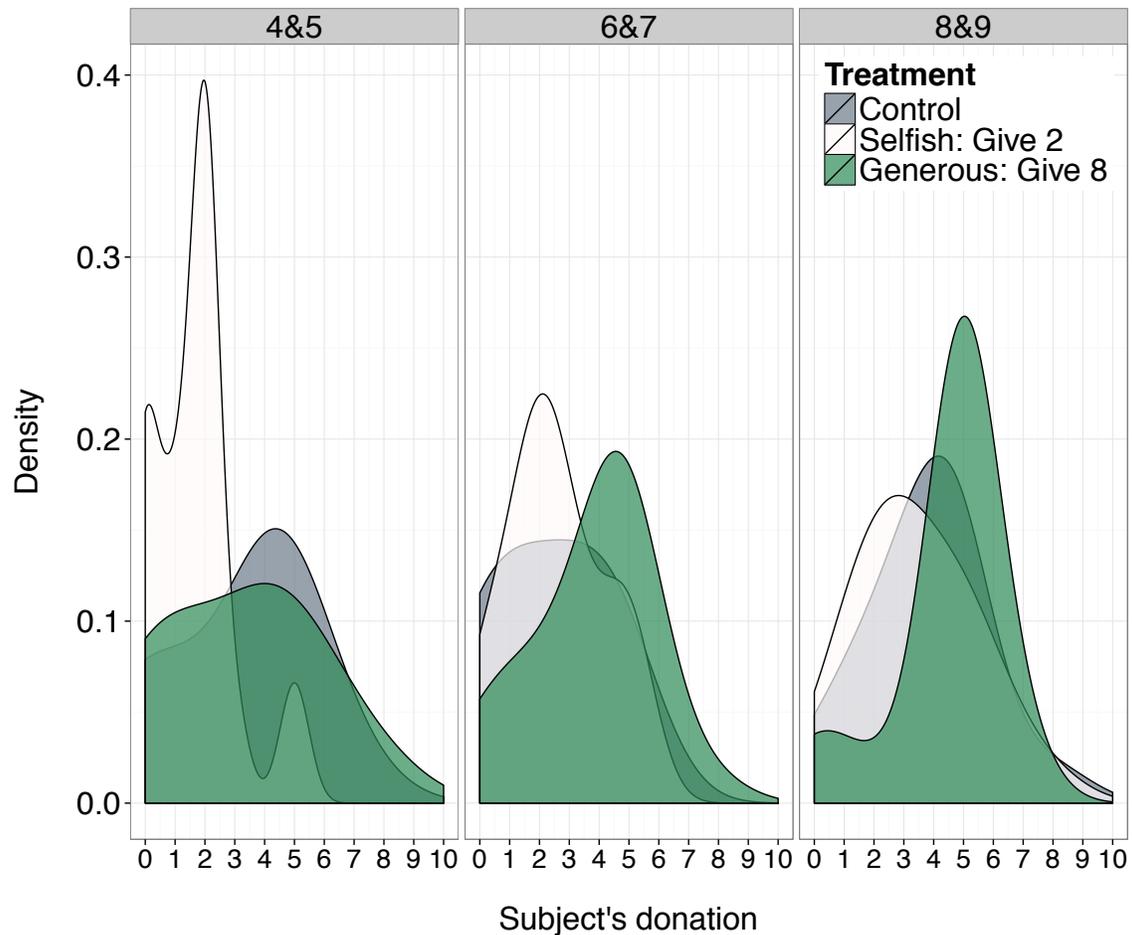
315 *Did the distributions of donations vary across treatment within age groups?*

316 Moving beyond an analysis of means, we now turned to an analysis of the broader distribution of donations
317 within each age and condition. Within the youngest age group, the distribution of children's donations
318 showed variation across the norm treatments. Four- and five-year-old children who were presented with the
319 selfish treatment made offers that were heavily skewed towards the selfish end of the spectrum when
320 compared to children in the generous and control treatments (Fig. 2). We found differences between the
321 selfish treatment and the control (K-S Test, $D = 0.6$, $N = 56$, $p < 0.001$) and between the generous and
322 selfish treatments (K-S Test, $D = 0.45$, $N = 71$, $p = 0.001$) but not between the generous treatment and the
323 control ($p = 0.9$).

324 Within the middle age group, the distribution of donations varied to a lesser extent than in the
325 youngest age group: offers in the selfish treatment were slightly skewed towards selfishness while offers in
326 the generous treatment were slightly skewed towards equality (Fig. 2). Indeed, the distribution of donations
327 varied across the generous and selfish treatments (K-S Test, $D = 0.4$, $N = 76$, $p = 0.005$), but not between
328 either treatment and the control ($ps > 0.3$).

329 Within the oldest age group, offers in the generous treatment were skewed towards equality when
330 compared to offers in the selfish treatment and—to a lesser extent—the control treatment. Our tests showed
331 that indeed the distributions between the selfish and generous treatment differed (K-S Test, $D = 0.45$, $N =$
332 68 , $p = 0.002$). The distributions of donations between the generous treatment and the control were
333 marginally different (K-S Test, $D = 0.4$, $N = 52$, $p = 0.055$), but there was not a significant difference
334 between the distributions of donations in the selfish versus control treatments ($p = 0.7$).

335



336

337 **Figure 2.** Density plots showing the distribution of Dictator Game donations (out of ten) across the selfish and generous treatments relative to the control condition. Density plots are faceted by age group.

338

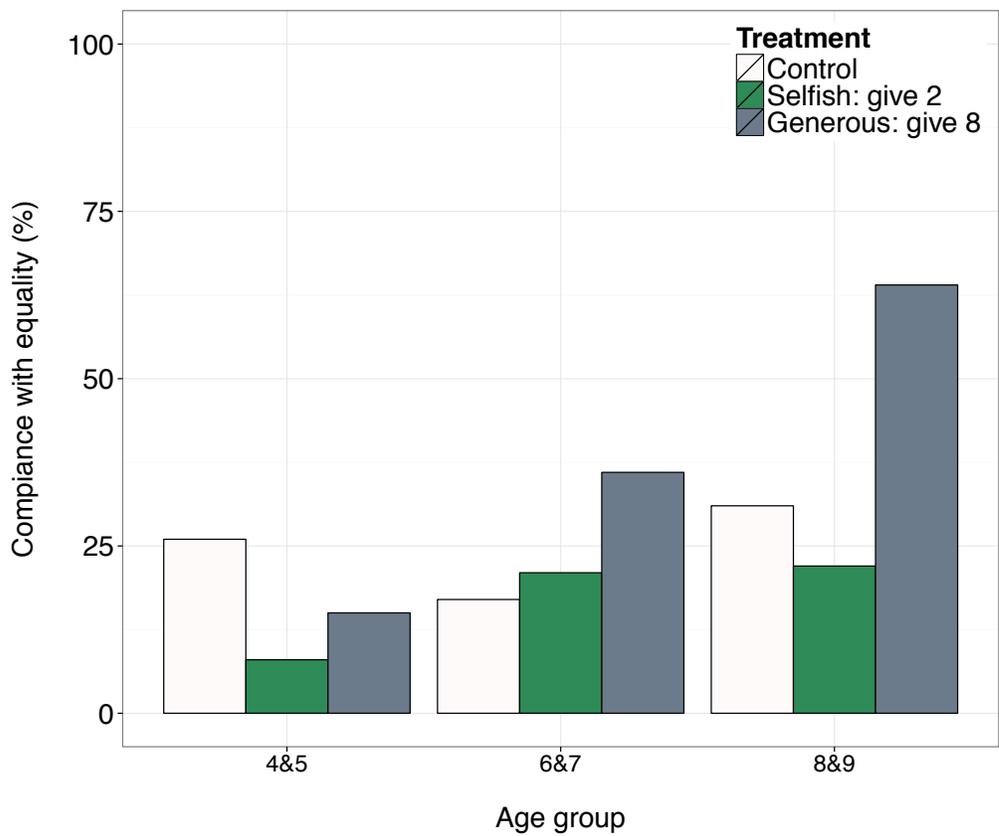
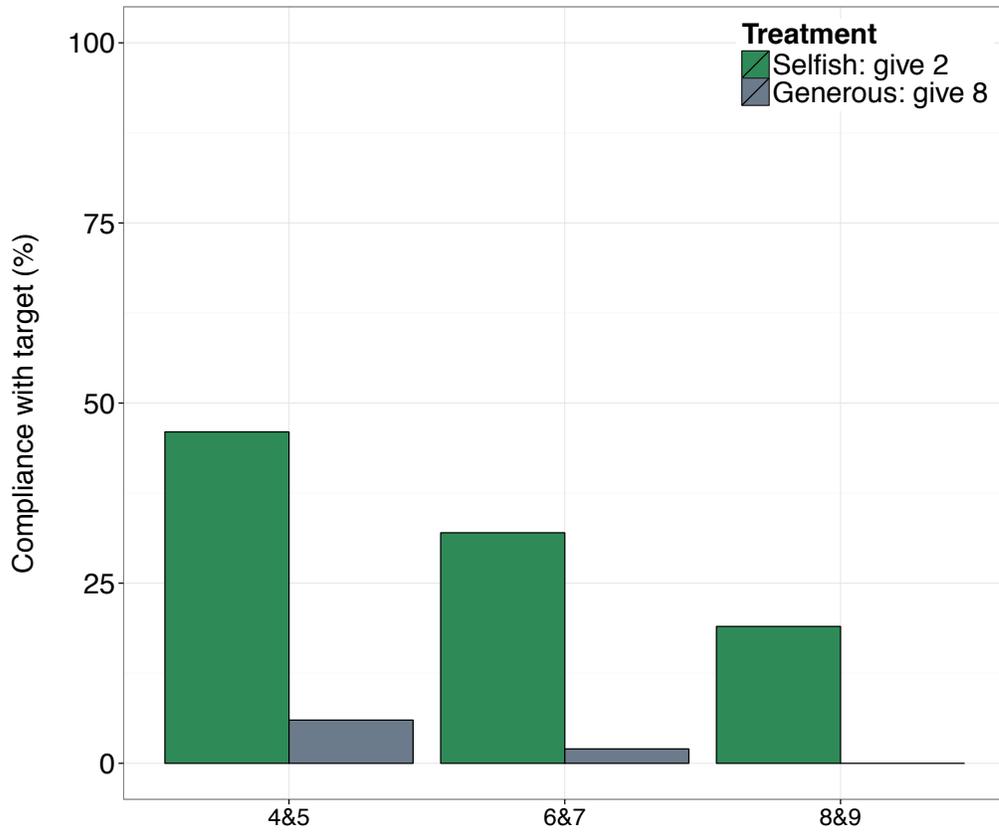
339

340 *Were children more compliant with some norms than others?*

341 Our investigation of children's compliance with the specified target amounts showed that (1) younger
 342 children were generally more compliant with target norms (LRT, age group, $\chi^2_2 = 7.9, p = 0.019$) and (2)
 343 children were more compliant with the selfish compared to generous norm (LRT, treatment, $\chi^2_1 = 38.97, p$
 344 < 0.001 ; Fig 3; Table 1). Indeed, we saw very little exact compliance with the generous norm; i.e., children
 345 rarely gave eight candies to their partner (Fig 3). Our GLMM showed no interaction between age group and
 346 treatment ($p = 0.6$). Children in the control condition were excluded from this analysis because they did not
 347 learn about a target amount. However, we conducted additional analyses to test whether receiving a norm
 348 treatment affected donations of the specified amount. To this end, we compared the frequency of exact
 349 compliance (gave exactly two, gave exactly 8) between children in the selfish and generous treatments
 350 compared to control children across the three age groups (Table S5). These analyses showed that, within

351 the youngest age group, there was a greater frequency of children who gave exactly two candies in the
352 treatments than in the control ($\chi^2 = 10.46, p = 0.001$).

353 In addition to complying to target amounts, children may have been complying with a pre-existing
354 norm of equality (i.e., giving 5 out of 10). To investigate this, we examined whether children who received
355 one of the norm treatments were more likely to adhere to an equality norm compared to children in the
356 control (Figure 3, right panel). Our GLMM again showed first order effects of age group (LRT, $\chi^2_2 = 16.34$,
357 $p < 0.001$) and treatment (LRT, $\chi^2_2 = 13.16, p < 0.01$) but no interaction between the two ($p = 0.14$). Older
358 children were more likely to share equally compared to younger children (Table 1). Children in the
359 generous treatment were slightly more likely to give half than children in the control ($\beta = 0.6$) while
360 children in the selfish treatment were slightly less likely to give half than children in the control ($\beta = -0.5$),
361 but these were not significant effects ($P_s > 0.09$; Table 1). Additionally, as above, we examined whether
362 the frequency of compliance to an equality norm varied between children who had been exposed to a norm
363 versus controls (Table S5). We found that, within the oldest age group, there was a marginally greater
364 frequency of children who gave exactly five candies in the generous treatment compared to the control (χ^2
365 $= 3.53, p = 0.06$).



367 **Figure 3.** Percent of participants who complied exactly with the selfish or generous norms (left panel) and
368 who complied exactly with an equality norm (right panel). Percentages are shown by participant age group
369 and treatment. The left panel excludes participants in the control condition because they were not exposed
370 to either norm.

371

372 **Discussion**

373 In this study we addressed two main questions. First, are children sensitive to selfish and generous norms of
374 giving and, second, are they differentially influenced by injunctive versus descriptive information? Our
375 results suggest that the answer to our first question is a resounding yes. Relative to their baseline giving in
376 the control, children gave more candies to their partner when presented with the generous (give 8) norm
377 and—to a lesser extent—gave fewer candies when presented with a selfish norm (give 2). However,
378 contrary to predictions concerning age-related shifts in the weight accorded to different norm formats,
379 children were not differentially influenced by either descriptive or injunctive norms. Instead, both kinds of
380 norms moved children away from their baseline level of generosity to an equivalent degree.

381 Why were descriptive and injunctive norms equally effective here? One (admittedly speculative)
382 reason for this difference could be that as children are actively internalizing the norms that govern
383 generosity, they remain open to all sources of information about what constitutes acceptable behavior.
384 Indeed, both peers and authority figures represent reasonable sources of such information about the way the
385 world works, and focusing on one at the expense of the other might not be an optimal strategy. By contrast,
386 in line with Raihani and McAuliffe (2014), adults may be more selective about which norms they choose to
387 follow, and more sensitive to injunctive norms in particular, because they are concerned with garnering
388 social approval or concerned about the negative consequences of violating injunctive norms (or gains in
389 upholding them). In other words, even if many or even most people are being selfish, if one *ought* to be
390 generous there may still be gains to be made from following the injunctive norm, at least in some
391 circumstances (for example, reputational gains or the avoidance of costs associated with non-compliance).
392 On this account, then, children are equal-opportunity norm compliers, while adults are particularly swayed
393 by injunctive information.

394 Another possibility, however, is that children simply have difficulty distinguishing descriptive
395 from injunctive norms. Some recent research, while not directly investigating this possibility, provides
396 enough evidence to seriously entertain it. In particular, this work suggests that children might obscure the
397 distinction in a particular manner, namely by inferring injunctive content from descriptive information. For
398 example, a substantial program of research (reviewed in Schmidt & Tomasello, 2012) shows that children
399 rapidly learn simple behavioral regularities such as how a puppet interacts with an object or the rules of a
400 game. Despite the fact that the demonstrations from which they learn are “merely” descriptive in that no
401 directly injunctive information is provided, children spontaneously protest subsequent deviations from the
402 previously demonstrated behavior, suggesting that they have inferred injunctive content from the
403 descriptive regularity. Even more generally, other recent work has shown that children readily infer

404 “ought” from “is” across a wide range of examples (Tworek & Cimpian, 2016), again suggesting a
405 tendency to use descriptive information as evidence for injunctive information (and indeed this tendency
406 may not go away entirely even in adults; e.g. Eidelman, Crandall, & Pattershall, 2009). All evidence is
407 certainly not uniformly consistent with this possibility, however. Indeed, closer to our domain of resource
408 allocation behavior, one recent study (DeJesus, Rhodes, & Kinzler, 2014) showed that while four and five-
409 year-olds’ judgments of how someone *should* and *would* distribute resources were identical, older children
410 clearly differentiated the two kinds of judgments, in particular by thinking that others would distribute
411 preferentially towards ingroup others even though they should distribute in line with a norm of fairness.
412 And some of the research we reviewed previously also suggests that children distinguish what they ought to
413 do from what they (or a third party) will do (Smith et al., 2013; Blake et al., 2014). There are many
414 differences across these studies that make direct comparison difficult, but we see the question of whether
415 and when children distinguish descriptive from injunctive norms as a critical area for future investigation.
416 This is especially true given the argument that different modes of social transmission, and by extension
417 different norm formats, should be expected to predominate at different points of development (Hewlett et
418 al., 2011), a view which requires that children have the capacity to distinguish them in the first place.

419 A more prosaic possibility for the lack of effect of norm format is that our design simply did not
420 make the distinction between them salient enough. In the injunctive condition in our study, the
421 Experimenter said “I think you should give 2/8”. This phrasing communicates the injunctive construction
422 through the use of the word “should.” However, this phrasing leaves open the possibility that children
423 considered this to be the opinion of the experimenter as opposed to a norm about what ought to be done
424 more generally. If children did consider this information to be a subjective opinion, however, we might
425 have expected to see a stronger effect of the descriptive norm compared to the ‘injunctive’ norm. Instead,
426 both norms influenced children’s behavior to the same degree. Thus, we believe our injunctive phrasing
427 successfully communicated a norm about what ought to be done generally. An interesting avenue for future
428 work would be to test whether these norms exert differential effects in other contexts as they do in adults
429 (Cialdini et al., 1990). For example, it is possible that these norms do not exert differential influences in the
430 context of children’s giving behavior but might be differentially effective in other contexts such as which
431 rules can be broken (e.g. you should tidy up your toys but no-one else has tidied up their toys) and which
432 conventions should be followed (e.g. you should tuck in your shirt but no-one else has tucked in their
433 shirts).

434 Results from our distributional and compliance analyses highlighted two main age-related results.
435 First, the distribution of children’s donations varied based on whether participants were exposed to a
436 generous or selfish norm versus no norm. Specifically, 4- and 5-year-old children’s donations were
437 particularly skewed by the selfish norm. Indeed, children in this youngest group were especially likely to
438 show exact compliance with the selfish norm (i.e., many of them gave exactly two out of ten candies). This
439 result is supported by our model predicting donations from only the subset of children who received the

440 selfish norm versus control, which showed a significant interaction between age and donation. This finding
441 is also supported by the results from compliance analyses, which showed that, among the youngest
442 children, donations of exactly two candies were more common in the selfish treatment than in the control.

443 In contrast to the youngest age group, 8- and 9-year-old children's donations were more skewed
444 by the generous norm. Older children who were exposed to the generous norm were especially likely to
445 give half of their candies to their partner, showing high levels of compliance with what was perhaps a pre-
446 existing norm of equality. Yet, interestingly, these children rarely showed exact compliance with the
447 generous norm (i.e., they almost never donated eight out of ten candies). This pattern is also supported by
448 our contingency table analysis, which showed a trend towards more frequent equal splits in the generous
449 condition than in the control specifically among the oldest children.

450 Our findings clearly show that generosity is flexible in children from early in development.
451 However, they also demonstrate that this flexibility is constrained by pre-existing biases. Younger children,
452 who tend to show a self-interested bias in the Dictator Game (Benenson et al., 2007), were particularly
453 influenced by—and likely to comply exactly with—the selfish norm. This result suggests that the selfish
454 norm had a licensing effect on their behavior; that is, 4- and 5-year-olds were more willing to be selfish if
455 the experimenter explicitly condoned selfishness or if they learned that their peers tend to be selfish,
456 perhaps because the match between norm and self-interest gave them cover to conform to that norm rather
457 than a potentially competing norm of generosity or fairness which conflicted with self-interest. By contrast,
458 older children were more influenced by the generous norm but refused to comply exactly with the target
459 amount. Instead, the generous norm had the effect of pushing their donations towards equality. This finding
460 is consistent with previous work that suggests that it is not until mid- to late-childhood that children begin
461 to adhere to a norm of equality, even though younger children are aware of the norm (Blake et al., 2014;
462 Smith et al., 2013). It is also consistent with cross-cultural work that suggests that around this period in
463 development, children adopt adult-typical patterns of prosocial behavior (House et al., 2013). Our findings
464 also suggest that it is not simply that younger children fail to spontaneously bring to mind a norm of which
465 they are aware. That is, younger children's failure to comply with norms that they think should apply to
466 others and to themselves (e.g. Smith et al., 2013) is not a limitation of failing to activate a known norm,
467 because even when we explicitly bring a norm to mind it fails to influence their behavior. Rather, generous
468 norms appear to be ineffective in shifting younger children's behavior even when they have been
469 manipulated to think explicitly about it prior to acting.

470 Our finding that children in the generous norm condition were slightly more likely to share equally
471 than those in the control or selfish norm condition extends past work by showing that even as children
472 begin to move towards equality, their behavior has not become rote but rather is still susceptible to external
473 normative influences. Interestingly, however, children did not blindly comply with stated norms. Instead,
474 they generally capped their generosity at an equal split. Broadly, the pattern of giving in 8- and 9-year old
475 participants suggests that with a minimal amount of information children can be persuaded to engage in

476 costlier prosocial behavior than they would otherwise, but they place limits on the degree to which they
477 accept such influence, essentially refusing to take a bad deal (i.e., to give so much that they would be left
478 with less than half).

479 Children in the middle age group—the 6- and 7-year-olds—present an interesting puzzle.
480 According to our distributional analyses, these children were not influenced by either the selfish or
481 generous norms compared to the control. However, the distribution of children’s responses did differ across
482 selfish and generous treatments: offers were skewed towards selfishness in the selfish treatment and
483 towards equality in the generous condition. These findings suggest that both norms exerted some influence,
484 though to a lesser extent than in both younger and older children. While future work is necessary to
485 understand why normative information was not as influential in this age range, we tentatively suggest that
486 this is because 6- and 7-year-olds are in a transition stage, moving away from a self-focused default to a
487 more egalitarian default; this state of more active internal conflict leads them to be less readily licensed by
488 the selfish norm (as compared to younger children) but also less willing to give away a full half of their
489 rewards (as compared to older children). In other words, for children in this age range, the pull of the
490 generous norm is attenuated by a pre-existing desire to keep slightly more for oneself while the pull of the
491 selfish norm is attenuated by the knowledge that one ought to share equally.

492 In sum, our results demonstrate that children are sensitive to information that communicates
493 norms of giving. However, this sensitivity shows age-related change, with younger children more
494 influenced by selfishness and older children more influenced by generosity. Further, children’s receptivity
495 to new normative information is constrained by their pre-existing biases, potentially including previously
496 acquired norms of fairness. More broadly, our results begin to shed light on the ontogeny of giving
497 behavior, and in particular its flexible tuning to local norms. Both information about what others are doing
498 as well as information about what ought to be done likely contribute to the emerging differences in how
499 children and adults engage in costly giving behavior.

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