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1 **Four-year-olds' strategic allocation of resources: attempts**
2 **to elicit reciprocation correlate negatively with**
3 **spontaneous helping**

4
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9
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11
12 **Abstract**

13 Behaviour benefiting others (prosocial behaviour) can be motivated by self-interested
14 strategic concerns as well as by genuine concern for others. Even in very young children
15 such behaviour can be motivated by concern for others, but whether it can be strategically
16 motivated by self-interest is currently less clear. Here, children had to distribute resources
17 in a game in which a rich but not a poor recipient could reciprocate. From four years of age
18 participants strategically favoured the rich recipient, but only when recipients had stated an
19 intention to reciprocate. Six- and eight-year-olds distributed more equally. Children
20 allocating strategically to the rich recipient were less likely to help when an adult needed
21 assistance but was not in a position to immediately reciprocate, demonstrating consistent
22 cross-task individual differences in the extent to which social behaviour is self- versus
23 other-oriented even in early childhood. By four years of age children are capable of
24 strategically allocating resources to others as a tool to advance their own self-interest.

25 **Keywords:** Prosocial behaviour; self-interested social behaviour; resource distribution;
26 helping; preschoolers

27

1. Introduction

28 Humans display unusually high levels of behaviour benefitting even unrelated others,
29 because others tend to reciprocate (Nowak & Sigmund, 2005). This functional explanation
30 does not, however, solve the question of the psychological mechanisms that cause such
31 prosocial behaviour (de Waal, 2008). It can be motivated by strategic self-interested
32 concerns such as expectations of reciprocation, but also by feelings of genuine sympathy,
33 and debate continues as to the nature of the complex interplay between concerns for self
34 and others (Stich, Doris, & Roedder, 2010). The developmental perspective necessary to
35 understand this interplay is missing, however, because although there is evidence that
36 sympathetic concern motivates prosocial behaviour in very young children (Hepach, Vaish,
37 & Tomasello, 2013; Vaish, Carpenter, & Tomasello, 2009; Warneken & Tomasello, 2009),
38 it is less clear whether self-interested strategic concerns can motivate their prosocial
39 behaviour.

40 An investigation of strategic social behaviour in preschoolers would also be highly
41 revealing because such behaviour requires advanced socio-cognitive problem solving
42 abilities that are not otherwise clearly evident in children of this age (Green & Rechis,
43 2006; Rubin & Rose-Krasnor, 1992). An individual difference approach would also be
44 valuable in this context because while clear individual differences in strategic social
45 behaviour are seen in adults and school-age children (Jones & Paulhus, 2009; Steinbeis,
46 Bernhardt, & Singer, 2012; Wilson, Near, & Miller, 1996), nothing is known about these
47 differences' earlier developmental roots. The current study fills these gaps.

48 Motivations for young children's prosocial behaviour are diverse (Paulus & Moore, 2012).
49 Apart from sympathy, other factors include socialization (Brownell, 2013; Brownell,
50 Svetlova, Anderson, Nichols, & Drummond, 2013), fairness concerns (Paulus & Moore,
51 2012), and the desire to participate in the activities of others (Rheingold, 1982).
52 Furthermore, there are observations consistent with the hypothesis that preschoolers, like
53 older children (Repacholi, Slaughter, Pritchard, & Gibbs, 2003; Steinbeis et al., 2012), may
54 engage in strategic prosociality. Specific patterns of prosocial and aggressive behaviour
55 correlate with social dominance in a manner suggesting that preschoolers use prosocial
56 behaviour to mitigate the negative consequences of aggression (Hawley, 2002; Hawley &
57 Geldhof, 2012; Roseth et al., 2011). When choosing how to share, preschoolers take into
58 account factors that are of strategic importance, for example by sharing more with those
59 who were themselves generous or worked hard or are friends (Kanngiesser & Warneken,
60 2012; Paulus & Moore, 2012). Audience effects are very suggestive: five-year-olds are
61 more generous when they are observed (Engelmann, Herrmann, & Tomasello, 2012;
62 Leimgruber, Shaw, Santos, & Olson, 2012). While such selective prosociality is clearly
63 functionally strategic, it is not yet fully clear that it is psychologically motivated by
64 strategic cognition such as concern for reputation or reciprocation. Such functional social
65 behaviour can also be subserved by automatic mechanisms (Bargh, Schwader, Hailey,
66 Dyer, & Boothby, 2012) such as automatic tendencies to give more to those you like or to
67 behave more prosocially when observed. Audience effects can be unconscious in adults
68 (Haley & Fessler, 2005; Nettle et al., 2013) and even cleaner fish cheat less when cleaning
69 in the presence of bystander client fish (Pinto, Oates, Grutter, & Bshary, 2011).

70 Here we conduct an experiment in which strategic resource allocation is possible but can
 71 only arise from an explicitly strategic motivation. This is because participants must
 72 consider not only the presence or absence of others, but also their material ability to
 73 reciprocate (Experiments 1 and 2), and whether or not they state an intention to reciprocate
 74 (Experiment 2). Participants play a game with two experimenters. One round consists of
 75 each player in turn using a token (if they have one) to buy from a vending machine a plastic
 76 egg containing either one or two candies (ostensibly at random but in fact in a
 77 predetermined sequence). One candy is always kept, but an extra candy must be given to
 78 either of the other players (Fig. 1). If the hypothesis that children are able and motivated to
 79 engage in strategic resource allocation holds, then they are predicted to prefer to allocate
 80 candies to participants who have access to tokens and who have stated an intention to
 81 reciprocate. Experimenters' access to tokens is manipulated in experiments 1 and 2 and
 82 their stated intention to reciprocate is manipulated in experiment 2.



83
 84 **Fig. 1.** A participant handing a candy to the token-rich experimenter.

85 We also examine whether there are consistent individual differences in the extent to which
 86 social behaviour is self- or other-oriented that produce individually consistent behaviour
 87 across different situations with the possibility for prosocial behaviour. Although such
 88 consistent individual differences have not previously been found in young children
 89 (Dunfield & Kuhlmeier, 2010, 2013; Paulus, Kühn-Popp, Licata, Sodian, & Meinhardt,
 90 2013; Thompson & Newton, 2013), their presence in older children and adults indicates
 91 that they might exist (Penner, Dovidio, Piliavin, & Schroeder, 2005). Participants are tested
 92 for their tendency to spontaneously help an adult in need, a behaviour that has been argued
 93 to be motivated by concern for others (Hepach et al., 2013; Warneken & Tomasello, 2009).
 94 We use a helping test in which there is little motive for strategic helping as reciprocation is
 95 unlikely to be forthcoming because the adult is not present when helped. If individuals
 96 consistently differ across tasks in the extent to which their choices concerning social
 97 behaviour are self- versus other-oriented, then helping in this situation is predicted to
 98 correlate negatively with strategic distribution in the sharing game.

99 We test four-year-olds; the procedure would presumably be extremely challenging for
100 younger children because of their limited understanding of others' verbally expressed
101 intentions (Apperly & Butterfill, 2009). We also test older children to explore the
102 competing influences of different developmental processes: older children are able to be
103 more strategic because of improved cognitive skills (Steinbeis et al., 2012), but might act
104 less strategically because of increased commitment to fair distribution (Damon, 1994;
105 Gummerum, Hanoch, & Keller, 2008).

106 **2. Experiment 1**

107 **2.1. Method**

108 Fifty-two participants were clustered in three age-groups: 16 four-year-olds (7 girls, $M = 50$
109 months, $SD = 3$), 24 six-year-olds (11 girls, $M = 80$ months, $SD = 3$), and 12 eight-year-
110 olds (5 girls, $M = 98$ months, $SD = 3$). Two additional six-year-olds were tested but
111 excluded from analysis due to experimenter error. One four-year-old and two six-year-olds
112 were included in analysis of the sharing game but excluded from analysis of spontaneous
113 helping because of parental interference, likewise one six-year-old because of experimenter
114 error.

115 Participants first observed the three-player sharing game. A model experimenter played two
116 rounds with a token-rich and a token-poor experimenter, going first and sharing first with
117 one then the other (counterbalanced), without justifying her choices. The rich and poor
118 experimenters (identities counterbalanced) shared one candy each with the model, saying "I
119 usually share with those who share with me, and [the model] shared with me, so I'm
120 sharing with her". On the turn they were not shared with, the rich and poor experimenters
121 obtained eggs with only one candy.

122 After the demonstration rounds the model left and the participant took her place (Fig. 1).
123 The rich experimenter and the participant had many tokens left but the poor experimenter
124 had now run out. Seven rounds were played, with the child always receiving an egg with
125 two candies and therefore choosing who to share with, the rich experimenter receiving eggs
126 with only one candy, and the poor experimenter saying that because she had no tokens she
127 must skip her turn. The only exception was on turn four: the poor experimenter found a
128 final token in her pocket, and to allay suspicions the game was rigged, both experimenters
129 received an egg with two candies which they shared with the participant because "[the
130 participant] shared with me". The procedure establishes that both experimenters intend to
131 reciprocate, and that the rich experimenter is likely to be able to do so, without either
132 experimenter actually reciprocating more often than the other. At turn four a minority of
133 participants had not in fact shared with both experimenters, and it was therefore not always
134 true that "[the participant] shared with me", but supplementary analyses in which trials after
135 this event were excluded produced the same results, see Supplementary Online Material
136 (SOM).

137 Participants might favour the rich experimenter for reasons other than strategy, preferring
138 for example individuals who are lucky or control resources (Hawley, 2002; Olson, Banaji,
139 Dweck, & Spelke, 2006). To control for this participants were asked to leave their final

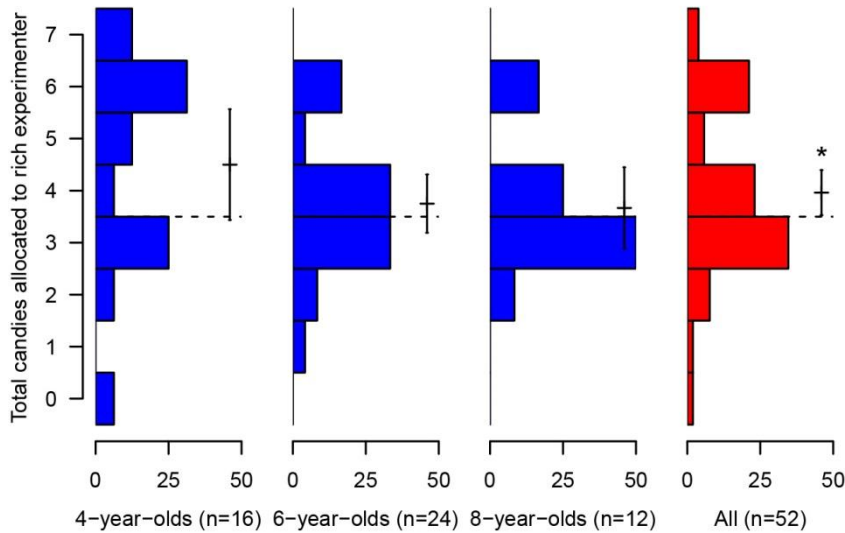
140 token with either the rich or poor experimenter when it was time to go as they did not have
141 time to use it. Non-strategic reasons for preferring the rich individual, but not strategic
142 reasons, predict that the final token will also be allocated to the rich individual.

143 After the sharing game, participants were tested for their tendency to spontaneously help.
144 Immediately after the final round of the sharing game, the poor experimenter received a
145 telephone text-message that both experimenters must leave immediately. Hurrying to leave,
146 the poor experimenter knocked over the rich experimenter's cup of tokens, commenting
147 that she had no time to pick them up. Helping was scored if the participant began picking
148 up tokens in the 45s before the experimenter returned. Further details of participants,
149 procedure and analysis are available as SOM.

150 **2.2. Results**

151 Consistent with the hypothesis that children strategically choose to favour a rich individual
152 who has the potential to reciprocate, across ages participants allocated more candies to the
153 rich experimenter than the poor, $t(51) = 2.19$, $p = .033$, $d = .30$ (Fig. 2). Candies allocated
154 to the rich experimenter was not clearly predicted by age, $t(45) = 1.65$, $p = .106$
155 (generalized least squares model), unstandardized beta = $-.21$, 95% CI $[-.47, .04]$. Younger
156 participants did however show a greater deviation from equal division between the
157 experimenters, demonstrated by a negative correlation between age and the absolute
158 difference from 50:50 distribution, $F(1,50) = 7.13$, $p = .010$, $R^2 = .12$ (linear regression).
159 When leaving the experiment, 88% of participants gave their final token to the poor
160 experimenter, meaning they were less likely to favour the rich experimenter in the final
161 token allocation than they were to favour the rich experimenter with most candies in the
162 sharing game, $p < .001$ (McNemar test). Non-strategic explanations for favouring the rich
163 experimenter were therefore unlikely.

164



165
 166 **Fig. 2.** Percentage frequency histograms of candies allocated to the rich experimenter in
 167 Experiment 1, with means and associated 95% CI. The asterisk indicates significant
 168 deviation from equal distribution between the rich and poor experimenters ($p < .05$).

169
 170 We had hypothesised that children who are more likely to use resource allocation as a self-
 171 interested strategic tool are less likely to help when immediate reciprocation is unlikely to
 172 be forthcoming. This predicts a negative correlation between helping and allocating to the
 173 rich experimenter, and indeed, controlling for age, participants who did not help had shared
 174 more candies with the rich experimenter, $t(45) = 2.93, p = .005, d = .88$ (generalized least
 175 squares model, see SOM for details). Inclusion of the age * helping interaction in the model
 176 revealed no effect, $t(44) = .23, p = .820$, meaning there was no evidence that the relation
 177 between helping and allocating to the rich experimenter depended on age (Table 1).
 178 Helping did not depend on age, Wald $Z = 1.38, p = .169$ (binary logistic regression, Table
 179 1).

180

181 Table 1.

182 Participants who spontaneously helped allocated fewer candies to the rich experimenter
 183 irrespective of age.

Age (years)	n	% who helped	Mean number of 7 candies allocated to rich experimenter	
			Participants who helped	Participants who did not help
4	15	47	4.1	5.4
6	21	67	3.4	4.3
8	12	67	3.2	4.5

184

185

3. Experiment 2

186 Experiment 2 was designed to test whether the results of Experiment 1 could be replicated
187 in a group composed only of four-year-olds, and to include an improved control by varying
188 the stated sharing intentions of the rich and poor experimenters. In the reciprocal condition,
189 as in Experiment 1, the experimenters stated an intention to reciprocate. In the control
190 condition, the rich and poor experimenters instead stated an intention to share with one
191 another. In the control condition there could therefore be no incentive to strategically share
192 with the rich experimenter, but other reasons to prefer the rich experimenter apply to both
193 conditions. Our prediction was therefore that participants would favour the rich
194 experimenter more in the reciprocal than the control condition. The two conditions are
195 implemented both between and within subjects, with a condition switch half-way through
196 the game. The between subjects comparison of distribution prior to the switch was most
197 important. This was because within subject differences were expected to be weaker as
198 children of this age find switching to cope with new circumstances challenging (Anderson
199 & Reidy, 2012; Zelazo, 2006) and also because for practical reasons the condition switch
200 was demonstrated with fewer trials than the establishment of the first condition. The within
201 subject aspect of the design was nevertheless included as an exploration of children's
202 potential ability to switch.

203 3.1. Method

204 Participants were 48 four-year-olds (21 girls, $M = 48$ months, $SD = 1$) randomly divided
205 into two groups beginning in the reciprocal or control conditions. Three addition
206 participants were tested but excluded from analysis, two due to parental or sibling
207 interference and one due to an insufficient grasp of Swedish. Three participants were
208 excluded only from analysis of spontaneous helping due to ambiguous behaviour (see
209 below).

210 The reciprocal group procedure was the same as in Experiment 1, with minor changes
211 including the addition of a third demonstration round (see SOM). Four test rounds were
212 conducted in a first test phase. The control condition differed from the reciprocal condition
213 only in that rather than sharing reciprocally with the model during the demonstration phase,
214 the rich and poor experimenters shared with each other, saying "I usually share with my
215 best friend, and [the other experimenter] is my best friend, so I'm sharing with her".

216 During the fourth round, after the participant's turn, the condition was switched. As in
217 Experiment 1, both experimenters received an extra candy to share, but rather than sharing
218 according to the intentions they stated during the demonstration phase, they both switched
219 to sharing in the opposite way, explaining: "Now I have changed my mind about how I
220 share. From now on I will..." either "...share with my best friend, and [the other
221 experimenter] is my best friend, so I'm sharing with her" (switching from reciprocal to
222 control) or "...share with those who share with me, and [the participant] shared with me, so
223 I'm sharing with her" (switching from control to reciprocal). Four rounds were conducted
224 in this second test-phase. At switching from control to reciprocal, a minority of participants

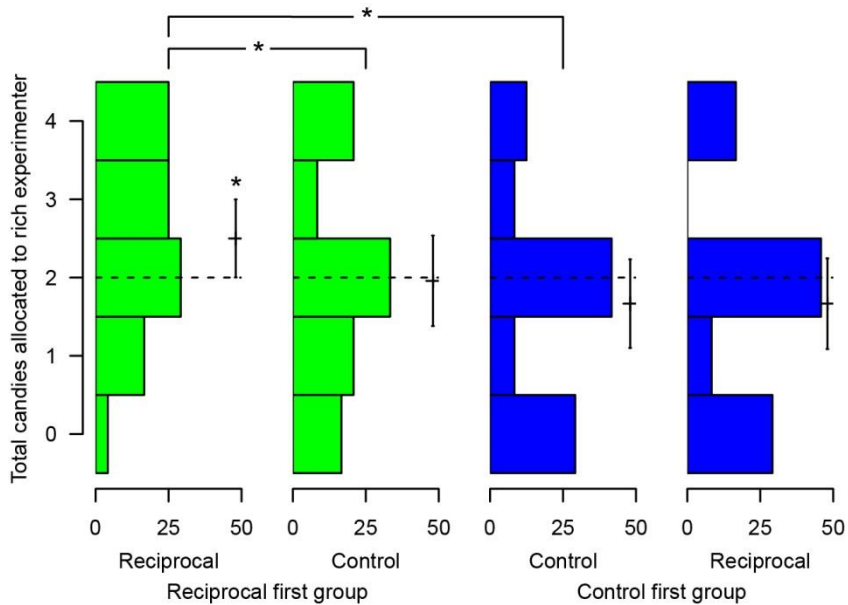
225 were potentially confused because they had not in fact shared with both experimenters.
226 Supplementary analyses in which these participants were excluded did not alter the results
227 (see SOM). Coding of participants' potential protest at the experimenters' failure to share
228 with them when switching from the reciprocal condition was aborted after coding 10
229 participants because no verbal protest was observed, although negative facial expressions
230 were observed in 3 of these participants.

231 The spontaneous helping task was the same as in Experiment 1 but an addition was made to
232 the coding procedure to accommodate a new behaviour observed in three participants.
233 These participants (one in the reciprocal-condition-first group) picked up the tokens but
234 then later spontaneously attempted to or stated an intention to use them for themselves.
235 Because it was therefore ambiguous whether they were helping or planning theft when they
236 first picked up the tokens, they were excluded from analysis of helping. All participants
237 who picked up tokens and who did not attempt or state an intention to use them for
238 themselves had replaced the refilled token cup on the table and were therefore coded as
239 unambiguously helping.

240 **3.2. Results**

241 Our first-test-phase prediction that reciprocal condition participants would favour the rich
242 experimenter more than control condition participants was confirmed, $t(45) = 2.29$, $p =$
243 $.027$, $d = .66$ (Fig. 3). Furthermore, in the first-test-phase reciprocal condition participants
244 allocated more to the rich than poor experimenter, $t(23) = 2.08$, $p = .049$, $d = .42$. One
245 participant, prior to allocating to the rich experimenter, said to the poor experimenter
246 "you've got no tokens so I'm not sharing with you".

247 Participants beginning in the reciprocal condition allocated less candies to the rich
248 experimenter after the switch, $t(23) = 2.07$, $p = .050$, $d = .42$ (Fig. 3). Some children who
249 had anticipated reciprocation from the rich experimenter therefore stopped favouring the
250 rich experimenter after the expected reciprocation did not occur. Participants beginning in
251 the control condition did not change their distribution pattern at all between the phases,
252 allocating exactly the same number of candies to the rich experimenter both before and
253 after the switch (Fig. 3).



254

255 **Fig. 3.** Percentage frequency histograms of candies allocated to the rich experimenter in
 256 Experiment 2, with means and associated 95% CI. $n = 24$ per group. Asterisks indicate
 257 significant deviation from equal distribution between the rich and poor experimenters
 258 within conditions, and significant between-condition comparisons ($p \leq .05$).

259

260 Because there is no evidence for strategic allocation after the condition switch, we compare
 261 the tendency to spontaneously help with distribution in the first test-phase only. In the
 262 reciprocal condition, the prediction of a negative correlation between helping and allocating
 263 to the rich experimenter was again confirmed: the 40% of participants who did not help had
 264 allocated more candies to the rich experimenter than those who did help, $M_{NotHelped} = 3.10$,
 265 95% CI [2.47, 3.73]; $M_{Helped} = 2.23$, 95% CI [1.57, 2.89]; $t(20) = 2.12$, $p = .047$, $d = .88$.
 266 Participants who did not help had shown a very strong tendency to favour the rich
 267 experimenter, $t(9) = 3.97$, $p = .003$, $d = 1.26$. As expected, there was no such negative
 268 correlation between helping and allocating to the rich experimenter in the control condition,
 269 $M_{NotHelped} = 1.70$, 95% CI [.74, 2.66]; $M_{Helped} = 1.60$, 95% CI [.76, 2.44]; $t(17) = .18$, $p =$
 270 $.861$ (50% of participants helped).

271 4. General discussion

272 In four- to eight-years-olds' resource allocation, favouring of an individual was contingent
 273 on the individual's ability to reciprocate (Experiments 1 and 2) and on the individual's
 274 intention to reciprocate (Experiment 2). Favouring of a rich individual ceased after the
 275 individual reneged on the intention to reciprocate (Experiment 2) and was negatively
 276 correlated with helping (Experiments 1 and 2). This converging evidence clearly indicates
 277 that targets for resource allocation were chosen strategically in children as young as four.

278 It is known that children as young as three or four are able to choose appropriate problem
 279 solving strategies for familiar social situations such as negotiating inclusion in group

280 activities or resource access or by lying to avoid disapproval (Polak & Harris, 1999;
281 Webster-Stratton & Lindsay, 1999; Ziv, 2013). Here it is further established that four-year-
282 olds can spontaneously and strategically generate a novel strategy which maximises their
283 gain in a novel social situation. Because there was no positive feedback for favouring the
284 rich experimenter, participants must have created the strategy from scratch (or arrived at it
285 by creative adaptation of known strategies) and then chosen to adopt the strategy because of
286 its expected results.

287 Models of social problem solving (Crick & Dodge, 1994; Rubin & Rose-Krasnor, 1992;
288 Semrud-Clikeman, 2007) also include the ability to re-evaluate a chosen strategy following
289 unexpected results. In Experiment 2 participants stopped favouring the rich experimenter
290 following her failure to reciprocate (because of the condition switch) which indicates that
291 four-year-olds are also capable of such re-evaluation. Having chosen to distribute
292 strategically, participants changed to equal distribution when they learned the initial
293 strategy could no longer succeed. Participants apparently no longer saw a reason to deviate
294 from norms of equal distribution, but their change in distribution may also have reflected
295 frustration at the rich experimenter.

296 In participants instead experiencing a switch from the control to reciprocal condition, no
297 change in behaviour was observed. For practical reasons the procedure establishing the
298 condition switch at phase 2 was briefer than the establishment of the condition at phase 1. It
299 makes sense that the brief switch procedure was sufficient to inform participants already
300 expecting reciprocation that such reciprocation would not in fact be forthcoming, but not
301 sufficient to establish the more novel concepts of reciprocation and the possibility of its
302 exploitation. Adapting to this latter switch type is more demanding, and strategy switches
303 are inherently demanding for children of this age (Anderson & Reidy, 2012; Zelazo, 2006).

304 Whereas four-year-olds tended to favour the rich experimenter, only a minority of six- and
305 eight-year-olds did so, with the majority distributing as equally as possible. The reduced
306 tendency with age towards favouritism of either experimenter was statistically clear, and
307 there was a marginal trend for older children to allocate less to the rich experimenter.
308 Together these results suggest that older children may have been more concerned with
309 equal distribution, a result which would be consistent with a range of previous findings
310 concerning the development of attitudes towards distributive justice (Gummerum et al.,
311 2008; Paulus & Moore, 2012; Rochat et al., 2009). This development has been argued to
312 arise from older children's increased understanding of normative principles of fairness
313 (Damon, 1994). However, it has also been observed that three-year-olds and even infants
314 have some understanding of fairness (Geraci & Surian, 2011; Paulus & Moore, 2012;
315 Sloane, Baillargeon, & Premack, 2012; Sommerville, Schmidt, Yun, & Burns, 2013).
316 Conversely, in older children distribution can be very strategic (Steinbeis et al., 2012) and
317 the relative importance of different types of fairness principles applied can depend on
318 context (Gummerum et al., 2008). Together with the current result that strategic behaviour
319 is established early, these observations suggest that the transition with age towards more
320 equal distribution may be motivated by strategic concerns regarding personal reputation
321 (Engelmann, Over, Herrmann, & Tomasello, 2013; Shaw, 2013) as much as by an
322 increased commitment to the moral principle of fairness.

323 There are some potential limitations to the generality of our results because they concerns
324 children's behaviour in one particular laboratory task. Cues indicating the possibility of
325 reciprocation were explicitly verbal, and participants were compelled to allocate a resource
326 to one of two individuals. It is not clear from this result how much strategic sharing would
327 be observed in circumstances in which giving is optional or the possibility of reciprocation
328 is less obvious. We note, however, that previous studies in which children have chosen
329 whether or not to behave prosocially and in which cues were less explicit have provided
330 results that were suggestive, if not conclusive, of strategically motivated prosocial
331 behaviour (Engelmann et al., 2012; Hawley, 2002; Leimgruber et al., 2012; Rochat et al.,
332 2009; Roseth et al., 2011). Furthermore, one very recent study closely parallels the current
333 study by demonstrating that five-year-old participants were more generous to a second
334 party in the presence of a third-party observer if the observer would later have an
335 opportunity to share with the participant (Engelmann et al., 2013). In contrast to here, that
336 study demonstrates general reputation management rather than direct reciprocation
337 elicitation: participants could not distribute to the observer, so they were concerned with
338 appearing generous rather than with directly benefitting a potential reciprocator. Because
339 distributing participants were nevertheless sensitive to observers' ability to subsequently
340 share with them, however, the study provides independent confirmation of preschoolers'
341 ability to strategically distribute resources, beyond a simple audience effect.

342 Because prosocial behaviour is potentially self- or other-oriented, the motivation for such
343 behaviour inside and outside the laboratory is frequently ambiguous. The current study
344 finds evidence for both types of motivation. Although distribution by the youngest children
345 was frequently motivated by concern for self, evidence for other-orientation across all age-
346 groups and in both experiments comes from comparison with the spontaneous helping task:
347 those who were more likely to spontaneously help were less likely to evidence self-
348 orientation when allocating. Although alternative explanations for such a correlational
349 result cannot be completely ruled out (for example, helpful individuals might be less able to
350 think strategically) the most likely interpretation is that individuals expressed a
351 comparatively higher or lower other-orientation in both tasks. This conclusion is interesting
352 for several reasons. A number of previous studies have found no correlations between
353 young children's different prosocial behaviours such as instrumental helping, comforting,
354 and generosity, and have found evidence for separate neural substrates, indicating that
355 separate motivations underlie these different forms (Dunfield & Kuhlmeier, 2010, 2013;
356 Paulus et al., 2013; Thompson & Newton, 2013). The current result indicates that there is in
357 fact in preschoolers a degree of overlap in the motivation of different behaviours which
358 benefit others in different ways, in that resource distribution and instrumental helping were
359 both affected by a general other-orientation.

360 The current result is also of interest because although some have argued that young
361 children's instrumental help is genuinely based on concern for others (Warneken &
362 Tomasello, 2009), others have argued that alternative explanations are similarly plausible
363 (Paulus & Moore, 2012). The correlation of instrumental helping with a reduced tendency
364 to deviate from fair treatment of others for self-interested reasons indicates that concern for
365 others does sometimes play a role in four-year-olds' instrumental helping.

366 Although the existence of individual differences in general self- versus other-orientation
367 has received little support from previous studies of preschoolers, studies of adults and older
368 children have provided some evidence for stable cross-situation individual differences in
369 prosocial behaviour (Penner et al., 2005). Furthermore, stability in prosocial behaviour has
370 been found through early childhood (Kienbaum, 2014) and a modest degree of stability
371 from childhood into adulthood (Eisenberg et al., 2002; Nantel-Vivier et al., 2009).
372 Associations have been found between sympathy, moral cognition, and other-oriented
373 behaviour, even in six-year-olds (Malti, Gummerum, Keller, & Buchmann, 2009), lending
374 further plausibility to the current finding. One study found individual consistency in one-
375 year-olds' behaviour across different resource distribution tasks (Sommerville et al., 2013).

376 It is important to note, however, that individual differences in general other-orientation do
377 not imply that clear correlations will be found across all relevant tasks, because situation-
378 specific individual differences and cognitive constraints may be stronger (as is evident from
379 previous work on preschoolers). Here, we note that although favouring of the rich
380 experimenter correlated with a lack of helping in the reciprocal condition, there was no
381 correlation in the control condition. Although the control condition offered no incentive to
382 strategically favour the rich experimenter, individuals who are more other-oriented and who
383 therefore help more might have been expected to be more likely to compensate the poor
384 experimenter by favouring them. In general, however, there was no evidence for systematic
385 favouring of the poor experimenter. This is consistent with previous results showing that
386 children during the primary school years gradually transition from emphasising equal
387 distribution irrespective of context towards also taking prior individual needs into account
388 (Frederickson & Simmonds, 2008; Sigelman & Waitzman, 1991). The current data
389 supports the view that the tendency to deviate from fair distribution to help the needy
390 develops after the preschool years, even in comparatively other-oriented individuals.

391 The negative relation between strategic distribution and helping did not depend on age, and
392 indeed a reduced tendency to spontaneous help among those showing a greater tendency to
393 strategic prosociality is also seen in adults (Wilson et al., 1996). In adults, manipulative
394 prosocial behaviour does not correlate with intelligence or empathy (Jones & Paulhus,
395 2009; Wilson et al., 1996), implying individual differences in strategic prosociality are
396 primarily due to motivation rather than ability. The sources of the differences identified
397 here are uncertain. We note that environmental factors contribute to some differences in
398 very young children's prosocial behaviour (Brownell, 2013; Brownell et al., 2013). There
399 are also genetic determinants of prosocial behaviour in adults and children (Ebstein, Knafo,
400 Mankuta, Chew, & Lai, 2012; Lewis & Bates, 2011), and even indications of a genetic
401 component to strategic prosocial behaviour in adults (Jones & Paulhus, 2009; Wilson et al.,
402 1996).

403 Evolutionary models indicate that highly self-interested human social behaviour is only
404 successful at a low population-frequency (Mealey, 1995). In the light of this, it is
405 noteworthy that self-interested strategic resource distribution was quite infrequent here in
406 the older children. The sources of the different motives for seemingly altruistic behaviour in
407 humans is a fascinating question which is only beginning to be resolved and which requires
408 a continuation of this developmental individual-differences approach.

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