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Young children selectively ignore quality to promote self-interest

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A R T I C L E I N F O

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A B S T R A C T

Although there has been extensive research on how children distribute resources with respect to quantity, little is known about how these decisions are affected by resource quality. The current research addressed this question by conducting two preregistered studies in which 3-, 5-, and 7-year-old children (total $N = 360$) made anonymous distributions of high-quality and low-quality items. Quantitative fairness entailed distributing an equal number of items irrespective of quality, and qualitative fairness entailed distributing equal numbers of high-quality and low-quality items. In Study 1, a majority of 7-year-olds distributed resources equally between themselves and another child in terms of both quality and quantity, whereas a majority of 3- and 5-year-olds did so only in terms of quantity while giving themselves a qualitative advantage. In Study 2, a majority of children in all three age groups distributed resources equally between two other children in terms of both quality and quantity. Together with prior findings, these results suggest that children selectively ignore the dimension of quality

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when it serves their own interests. The results also show, for the first time, that by 7 years of age children consider quality even at the expense of their own interests and that children as young as 3 years have the capacity to take into account resource quality when making distributions.

Introduction

Children who want to maintain good relations with others must learn how to effectively distribute resources across a wide range of contexts (Chernyak & Sobel, 2016). Previous research points to the importance of characteristics of the recipients such as whether they are deserving or needy (Malti et al., 2016), their social group (Rizzo, Elenbaas, Cooley, & Killen, 2016), and their relationship to the giver (Paulus & Moore, 2014). Other studies have identified factors associated with the behavior of the recipients within a particular distribution context such as the effort they have put forth and the outcomes they have produced (Liénard, Chevallier, Mascaro, Kiura, & Baumard, 2013). In the absence of any such distinguishing factors, children often reason and behave in accordance with a norm of equality of outcomes (Rakoczy, Kaufmann, & Lohse, 2016). Although such a tendency is often considered to be a precursor to more complex notions of fairness that incorporate factors such as merit and the welfare of others (Killen & Smetana, 2015), it is not necessarily straightforward for young children to apply the equality of outcomes norm to real-world contexts. One reason for this difficulty, which was the focus of the current research, is that the resources children distribute often vary in quality as well as quantity.

To date, research on how children make fair distributions based on equality has involved distributions of items that vary in quantity alone. A major conclusion has been that when children's self-interest is not involved, they prefer that all recipients receive the same amount. This preference emerges as early as 2 years of age, and it becomes robust during the preschool years (e.g., Geraci & Surian, 2011; McAuliffe, Blake, Steinbeis, & Warneken, 2017; McAuliffe, Jordan, & Warneken, 2015; Olson & Spelke, 2008; Rochat et al., 2009; Schmidt & Sommerville, 2011; Sigelman & Waitzman, 1991; Sloane, Baillargeon, & Premack, 2012). For example, 2-year-olds pay more attention to divisions of resources between two recipients if they are unequal rather than equal (Geraci & Surian, 2011; Schmidt & Sommerville, 2011), and they strongly prefer that individuals who have done the same amount of work be rewarded equally (Sloane et al., 2012). When given the opportunity to make their own distribution decisions, preschool-aged children generally divide resources evenly (e.g., Damon, 1977; Hook & Cook, 1979; Olson & Spelke, 2008; Rochat et al., 2009; Sigelman & Waitzman, 1991). Between 6 and 8 years of age, children are even willing to throw away something of value to avoid making an unequal distribution (Shaw & Olson, 2012), and this preference for equal distributions continues to develop well into adolescence (see Rochat et al., 2009).

There is also a large body of research suggesting that self-interest can affect children's decisions about whether to apply a norm of equality (Benenson, Pascoe, & Radmore, 2007; Blake & Rand, 2010; Damon, 1977; Fehr, Bernhard, & Rockenbach, 2008; Gummerum, Hanoch, Keller, Parsons, & Hummel, 2010; Hook & Cook, 1979). In a classic series of studies on distributive justice, many children younger than 8 years chose to give more to themselves than to others (Damon, 1977; see Hook & Cook, 1979, for a review). More recent research using economic games has shown similar results (Benenson et al., 2007; Blake & Rand, 2010; Gummerum et al., 2010). For example, in a dictator game, 3- to 5-year-olds tended to give more stickers to themselves than to a peer they were told that they would never meet the peer (Gummerum et al., 2010).

Although there has been less research on children's distributions in relation to resource quality, the studies that have been conducted suggest that it does have an impact (Blake & Rand, 2010; Chernyak & Kushnir, 2013; Schmidt & Sommerville, 2011; Shaw & Olson, 2013). For example, Rizzo et al. (2016)

found that the extent to which children prioritized merit versus concern for the welfare of others depended on whether they were distributing items that were needed versus simply enjoyable to have. In addition, Chernyak and Sobel (2016) found that children shared more valuable stickers with preferred puppets even though they made even numerical splits. Most relevant to the current research, Sheskin et al. (2016) gave 3- to 10-year-olds four resources that differed in quality, based on children's ordered rankings of how "cool" or "uncool" the items were, and asked how many they wanted to distribute to another child who would be arriving later in the day. Before 10 years of age, the typical pattern was for children to give two of the items to the other child but keep the two best ones for themselves. In a second study, Sheskin and colleagues asked a small group of 6- to 8-year-olds how the four resources of varying quality should be distributed between two other children. They found that participants in this age group had no trouble in making distributions that were equal in quality as well as quantity.

The aim of the current work was to examine how 3-, 5-, and 7-year-old children distribute resources that vary in both quantity and quality to unknown others. Doing so is important for our understanding of why children sometimes fail to apply equality norms that they endorse (Blake, McAuliffe, & Warneken, 2014; Smith, Blake, & Harris, 2013). Varying both quantity and quality at the same time provides a window into how children balance genuine concerns about being fair with a desire to appear fair (Shaw et al., 2014) given that quantitative fairness can be viewed as more central to reputation management than qualitative fairness and that a willingness to make qualitatively fair distributions that go against one's self-interest may be any indicator of an internally motivated sense of fairness (see Sheskin et al., 2016).

Our work builds on the theoretical and empirical work of Sheskin et al. (2016) and uses a similar methodology, but with some noteworthy differences. First, in a set of preregistered studies with larger samples, we investigated children's actual distribution behavior both when their self-interest was at stake and when it was not. Second, we designed the procedure to help rule out the possibility that children's behavior would be affected by concerns about how the experimenter might judge them (see Shaw et al., 2014). Finally, we made it clear to participants that all recipients preferred the designated high-quality resources to the designated low-quality ones because otherwise they might make decisions that appear to advantage themselves but actually reflect an assumption that the recipient has a different preference.

Across two studies, we asked children to distribute resources in the form of pencils that varied in quality, as defined by subjective value or preference (see Chernyak & Sobel, 2016). Given that there are many possible dimensions that relate to resource quality or value (e.g., appearance, utility), we chose to focus on appearance as a starting point. We asked children to distribute equal numbers of high-value and low-value pencils to make it easy for them to differentiate by value based on appearance alone. The high-value pencils had bright colors and patterns, and the low-value pencils had a uniform dull gray appearance (see Rochat et al., 2009, for a similar distinction with respect to whether or not resources look "plain"), and these value designations were confirmed by children's ratings.

In Study 1 children were asked to distribute the high-value and low-value items between themselves and another child, and in Study 2 they were asked to distribute the items between two other children. In each study we used equality as a proxy for fairness. Although equality is not always the same as fairness (see Starmans, Sheskin, & Bloom, 2017), it is likely to serve as a reasonable approximation in the current context because the potential recipients were described as having engaged in the same tasks as the participants, and there was no reason for children to believe that there were differences in effort or outcome because none was noted (see the General Discussion for further discussion of this issue). We defined *quantitative fairness* as children distributing an equal number of items to each recipient regardless of value, and we defined *qualitative fairness* as children distributing equal numbers of both high-value and low-value items to each recipient.

We included measures of executive functioning and theory of mind understanding in both studies as a means to examine possible links between cognition and behavior in this context. We hypothesized that there would be a link between these cognitive factors and children's distribution decisions in light of evidence that children with greater executive function skills are better able to inhibit a selfish desire to favor themselves over others (Aguilar-Pardo, Martínez-Arias, & Colmenares, 2013; Cowell et al., 2017; Howard, Johnson, & Pascual-Leone, 2014; Steinbeis & Over, 2017; but see Smith et al.,

2013) and, therefore, tend to behave more fairly (see Cowell et al., 2017). In addition, as children acquire a greater level of theory of mind understanding, including recognizing the mental states and perspectives of others, they may behave more fairly because they are better able to take the perspectives of others into account (e.g., Takagishi, Kameshima, Schug, Koizumi, & Yamagishi, 2010; Wainryb, Brehl, Matwin, Sokol, & Hammond, 2005; but see Cowell et al., 2017).

Study 1

The aim of Study 1 was to examine the development of qualitative fairness when self-interest was involved. We presented two distribution tasks in a counterbalanced order. Of primary interest was an *experimental task,* which assessed both qualitative and quantitative forms of fairness. This task involved distributing eight pencils: four high-value ones that had bright colors and patterns and four low-value ones that were dull gray. This quality difference was initially validated through a pilot test with 10 children who did not participate in either Study 1 or Study 2; all these children reported a preference for the colorful pencils. Further validation was done with the research participants (see the procedure below).

The other distribution task was a *control task* in which children were given eight identical erasers to distribute. The control task was included to verify children's tendency to make fair distributions of identical resources.

On both the experimental task and the control task, participants were asked to distribute the prizes between themselves and a gender-matched anonymous child who was described as being another study participant. Children were made to believe that the experimenter would not know how the prizes were distributed. Specifically, they were told that while the experimenter was away they should place the prizes for themselves and for the other child into two separate boxes and then seal them both. Children were also told that the recipient would not know who had distributed the prizes.

Method

Participants

The study was approved by the local ethics committee of Hangzhou Normal University. Parents or legal guardians gave informed consent to allow their children to participate, and children gave their oral assent prior to participating.

In accordance with our preregistration (https://aspredicted.org/blind.php?x=26ng7s), we tested 180 children, with 60 in each of three age groups: 3-year-olds (3.12–4.04 years, M = 3.69, SD = 0.21; 30 boys), 5-year-olds (5.03–6.03 years, M = 5.44, SD = 0.25; 29 boys), and 7-year-olds (7.01–7.95 years, M = 7.65, SD = 0.24; 30 boys). They were recruited from a preschool and an elementary school located in Eastern China, and all were Han Chinese and from middle-class backgrounds.

Design and procedure

To confirm the viability of the procedure, we first conducted a pretest with a separate group of 5 3-year-olds and 5 5-year-olds who had participated in an unrelated project, and we found that none of them had difficulty in following the instructions.

Participants were tested by a female graduate student in one-on-one sessions in a private room at their school. The sessions were conducted in Chinese. At the beginning of the session, participants were presented with a high-value pencil and a low-value pencil, and they were asked which one they preferred. Of the 180 participants, 171 identified the colorful pencil as more valuable than the plain one. However, the remaining 9 participants (2 3-year-olds, 3 5-year-olds, and 4 7-year-olds) unexpectedly showed a preference for low-value pencils. All participants were told that their own pencil preferences were shared by the potential recipient.

Participants then answered five simple questions (e.g., "What do rabbits like to eat?") as a pretext for the experimenter to give them eight pencils and eight erasers to distribute. All participants answered the five questions correctly, and they were then told, "You did a good job answering my questions. I want to give you some prizes."

Next, participants completed the experimental and control distribution tasks in an order that was counterbalanced across participants within each age group. On each distribution task, participants were told to distribute the eight prizes between themselves and the other child. On the first distribution task (regardless of whether it was the experimental task or the control task) the potential recipient was described as a child who had completed the task earlier in the day and should have received some prizes, and on the second task the potential recipient was described as a child who would come later in the day and should receive some prizes for completing the task. The two recipients were described in a way that ensured that children would have no trouble in differentiating between them.

For explanatory purposes, the remainder of this section describes the procedure as it was conducted for participants who were presented with the experimental task first. On the experimental task, the participant was presented with eight pencils, four high-value and four low-value ones, that were handed to him or her as a group. The instructions were as follows:

> Look, here are eight pencils that I want to give both to you and to another boy/girl as prizes. I was told that the boy/girl came here earlier, before you arrived, but did not get any of these pencils as prizes for doing a good job. Like you, he/she saw the two kinds of pencils before and also preferred this kind of pencil [with the experimenter pointing at the one preferred by the participant]. Now I want you to decide who gets each of these pencils. You can decide which ones you want to give yourself and leave the others to that boy/girl.

The participant was then presented with two identical boxes and several pieces of adhesive tape and was told the following:

> Look, I have two boxes that are exactly the same. I am going to write your name on one of them. Whatever you put in that box belongs to you. You need to put all the pencils you decide to give yourself into your box. The other box without your name on it will be given to that boy/girl, and you need to put all of the other pencils into his/her box. After you put yours and his/hers separately into the two boxes, you should seal the boxes by using this tape. That way no one—not even me—will know how many pencils you give yourself and how many you give to that boy/girl.

The experimenter showed the participant how to use the tape to make sure that he or she would be able to tape the box closed without assistance. Next, the experimenter's cell phone rang and she pretended to answer. She told the participant the following:

> I have to deal with the call right now. When I am away, you need to decide by yourself who gets each of these pencils. When you are done, you should take your box with you and find me outside the room. You should leave the box containing the pencils for that boy/girl on the table. His/Her teacher will come and get the box later. I don't know who the boy/girl is or who his/her teacher is. No one will know that you were the one who decided which pencils he/she got.

Before leaving the room, the experimenter asked the following questions as manipulation checks:

- Which two children should get these pencils?
- Which one of the two kinds of pencils does that boy/girl prefer?
- Where should you put the pencils for yourself and the pencils for that boy/girl?
- Will you be the only one who knows how many pencils you give to yourself?
- Will that boy/girl or his/her teacher know that you were the one who decided which pencils he/she got?

The vast majority of participants answered all these questions correctly, and following all incorrect responses the experimenter corrected the children and repeated the question, at which point all children were able to answer correctly.

After finishing the experimental task, the participant was given the control task, in which the experimenter presented eight identical erasers and told the participant the following:

> I just remembered that I have some other prizes and I want to give some of them to you. Look, here are eight erasers. I was just told that there is another boy/girl who will come here later, after you

leave, who should also get some of these erasers as prizes for doing a good job. Now I want you to decide who gets each of these erasers. You can decide which ones to give yourself and leave the others for that boy/girl.

The rest of the control task was the same as the experimental task except that no questions were asked about eraser preferences because all the erasers were identical.

The two cognitive measures were administered on the following day because they required nearly half an hour to complete and it might have been too taxing for children to do all the testing in a single session. To assess children's executive function skills with respect to inhibitory control, we used the National Institutes of Health (NIH) Toolbox Flanker Inhibitory Control Test, in which a higher age-corrected standard score is associated with greater inhibitory control. To assess children's theory of mind understanding, we adopted a Chinese version of a theory of mind understanding scale that was obtained from Zhang, Shao, and Zhang (2016; see also Wellman & Liu, 2004). This scale includes five first-order false-belief tasks: (a) diverse desires (different people want different things), (b) diverse beliefs (different people hold diverse beliefs about the same thing), (c) knowledge access (not seeing leads to not knowing), (d) false beliefs (unexpected content false-belief task), and (e) hidden emotions (people feel one emotion but display a different one). The scale was scored from 0 to 5, with a higher score representing a higher level of first-order false-belief understanding.

Data preparation

We classified children's distributions on the experimental task as being qualitatively fair, quantitatively but not qualitatively fair, or unfair. We then established dichotomous *pattern* measures, which allowed us to assess two forms of fairness; one was *qualitative fairness,* which required an equal distribution of high-value and low-value pencils, and the other was *quantitative fairness,* which required an equal distribution of pencils irrespective of value. On the control task, we established a *pattern* measure to assess whether children had shown fairness by distributing an equal number of erasers to each recipient.

We also established continuous *magnitude* measures regarding the degree to which participants' distributions were fair versus unfair (for unfair distributions, we did not distinguish between self-advantage and self-disadvantage given that nearly all cases involved self-advantage; see Table A1 in the Appendix). For the experimental task, we did this separately for quantity and quality. For *quality,* we computed the number of each type of pencil given to the self and subtracted 2 from the original values to create a high-value scale and a low-value scale, both of which ranged from −2 to 2 with 0 as the midpoint. For *quantity,* we computed the total number of pencils given to the self and subtracted 4 from the original value to create a scale ranging from −4 to 4 with 0 as the midpoint. For the control task, we computed the total number of erasers given to the self and made similar calculations with regard to pencil quantity to create a scale ranging from −4 to 4 with 0 as the midpoint. Each of these scales was defined such that the most positive value indicated maximum self-advantage, 0 indicated fairness, and the most negative value indicated maximum self-disadvantage.

Results and discussion

Preliminary analyses yielded no differences in the patterns of results regardless of whether the 9 participants who unexpectedly showed a preference for low-value pencils were included in the analyses. To highlight our research goal, here we report analyses with these 9 participants excluded even though this exclusion was not described in our preregistration. Preliminary analyses also yielded no significant main effects or interactions involving gender or task order on either the pattern measures or the magnitude measures ($ps > .10$), so the data for these two factors were combined for subsequent analyses.

Pattern measures

The percentages of participants who were qualitatively fair, quantitatively but not qualitatively fair, and unfair on the experimental task within each age group are shown in Fig. 1. As can be seen from the figure, a majority of 7-year-olds (71.4%; $p < .001$ compared with the 50% chance level)

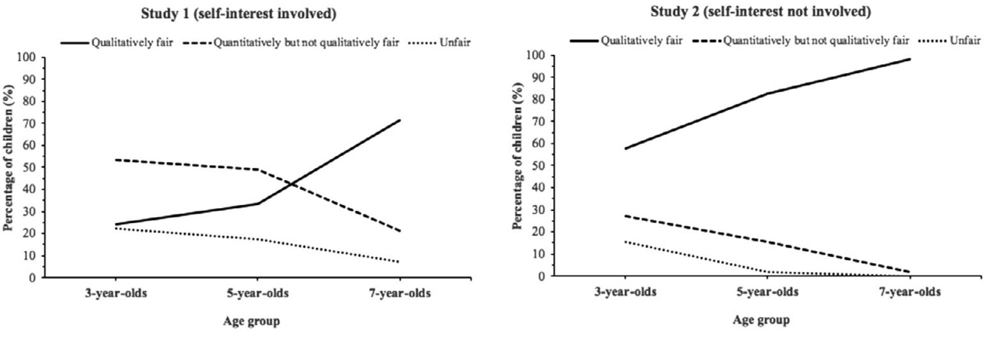

Fig. 1. Percentages of children who showed each pattern of fairness on the experimental task in Study 1 (self-interest involved) and Study 2 (self-interest not involved).

showed qualitative fairness. However, this was not the case for 3- and 5-year-olds; a majority of participants in both age groups showed quantitative fairness involving an equal distribution of items regardless of value (77.6% and 82.5% for 3- and 5-year-olds, respectively; *p*s < .001 compared with 50%). For participants who were quantitatively but not qualitatively fair, 93.0% (66 of 71) gave themselves a qualitative advantage (i.e., more high-value and fewer low-value items for self vs. other). For those who were unfair, 92.6% (25 of 27) gave themselves at least one form of advantage (see Table A1 in the Appendix for more details about response patterns in Study 1).

On the control task, the majority of children within each age group behaved fairly (58.6%, 80.7%, and 92.9% for 3-, 5-, and 7-year-olds, respectively; $p > .10$ for 3-year-olds and $ps < .001$ for 5- and 7-year-olds compared with 50%).

In accordance with the preregistration (https://aspredicted.org/blind.php?x=7dn94n) for this study, a hierarchical binary logistic regression analysis was performed, with children's decision making about qualitative fairness (0 = unfair, 1 = fair) on the experimental task as the predicted variable. First, children's decision making about fairness on the control task (0 = unfair; 1 = fair) was entered into the model. This block was significant, $\Delta\chi^2(1, N = 171) = 8.38$, $p = .004$, and the model was also significant, $\chi^2(1, N = 171) = 8.38$, $p = .004$, -2 log likelihood (-2LL) = 225.01, Nagelkerke $R^2 = .06$. Children's decisions to be fair on the control task were positively associated with their decisions to be qualitatively fair on the experimental task, $\beta = 1.14$, $SE\ \beta = .42$, Wald = 7.48, $df = 1$, $p = .006$, odds ratio (OR) = 3.14, 95% confidence interval (CI) = 1.38–7.12. Next, children's age-corrected standard scores of executive functioning, theory of mind understanding scores, and age group (0 = 3-year-olds, 1 = 5-year-olds, 2 = 7-year-olds) were entered into the model. By adopting the variable selection method of backward elimination, this second block was still significant, $\Delta\chi^2(2, N = 171) = 23.45$, $p = .000$, and the model was also significant, $\chi^2(3, N = 171) = 31.83$, $p = .000$, -2LL = 201.56, Nagelkerke $R^2 = .23$. Children's decision making about fairness on the control task was no longer significant, $\beta = .65$, $SE\ \beta = .46$, Wald = 2.04, $df = 1$, $p > .10$, OR = 1.91, 95% CI = .79–4.67. The only effect included in the final model was a significant effect of age group, Wald = 21.44, $df = 2$, $p = .000$, with children's decision making about fairness on the control task partialled out.

A priori comparisons showed that both 3- and 5-year-olds were significantly less likely than 7-year-olds to show qualitative fairness (24.1%, 33.3%, and 71.4% for 3-, 5-, and 7-year-olds, respectively), βs = -1.87 and -1.55, $SE\ \beta$s = .44 and .41, Walds = 17.83 and 14.18, *df*s = 1 and 1, *p*s = .000 and .000, ORs = .15 and .21, 95% CIs = .07–.37 and .10–.48 for 3- versus 7-year-olds and 5- versus 7-year-olds, respectively, whereas 3- and 5-year-olds did not differ from each other (24.1% and 33.3%, respectively; $p > .10$). Thus, age group predicted children's capacity to show qualitative fairness on the experimental task above and beyond the contribution of their capacity to show fairness on the control task (see Table A2 in the Appendix for more details).

A second hierarchical logistic regression analysis was performed on children's decision making about quantitative fairness (0 = unfair, 1 = fair) on the experimental task. First, children's fairness on the control task (0 = unfair, 1 = fair) was entered into the model. This block was significant, $\Delta\chi^2(1, N = 171) = 40.39$, $p = .000$, and the model was also significant, $\chi^2(1, N = 171) = 40.39$, $p = .000$, $-2LL = 108.78$, Nagelkerke $R^2 = .36$. Children's decisions to be fair on the control task were positively associated with their decisions to be quantitatively fair on the experimental task, $\beta = 2.93$, $SE\ \beta = .50$, Wald = 33.95, $df = 1$, $p = .000$, OR = 18.80, 95% CI = 7.01–50.43. Next, children's executive functioning scores, theory of mind understanding scores, and age group were entered into the model. By adopting the similar variable selection method, this second block was still significant, $\Delta\chi^2(1, N = 171) = 40.39$, $p = .000$, and the model was also significant, $\chi^2(2, N = 171) = 44.49$, $p = .000$, $-2LL = 104.68$, Nagelkerke $R^2 = .39$. Children's decision making about fairness on the control task remained significant, $\beta = 2.92$, $SE\ \beta = .51$, Wald = 32.10, $df = 1$, $p = .000$, OR = 18.58, 95% CI = 6.76–51.06. After this effect was partialled out, the only effect included in the final model was a small but significant effect of executive functioning, $\beta = .04$, $SE\ \beta = .02$, Wald = 3.90, $df = 1$, $p = .048$, OR = 1.04, 95% CI = 1.00–1.08. Thus, children's executive function skills positively predicted their capacity to show quantitative fairness on the experimental task above and beyond the contribution of their capacity to show fairness on the control task (see Table A2 in the Appendix for further details).

Magnitude measures

We first looked at the number of prizes that participants gave to themselves. Overall, participants gave themselves an average of 4.26 pencils on the experimental task, including 2.88 high-value pencils and 1.38 low-value pencils (see Fig. 2 for scores from magnitude measures with respect to high-value and low-value pencils for each age group). Participants gave themselves an average of 4.25 erasers on the control task.

In accordance with our preregistration, we conducted analyses of covariance (ANCOVAs) on the three magnitude measures for the experimental task, including the number of erasers distributed to the self on the control task, executive functioning, and theory of mind understanding scores as covariates as well as age group as the fixed factor. For the magnitude measure with respect to high-value pencils, the only significant effect was of age group, $F(2, 165) = 7.82$, $p = .001$, $\eta^2 = .09$, with post hoc analyses indicating that, compared with 7-year-olds, 3- and 5-year-olds gave themselves significantly

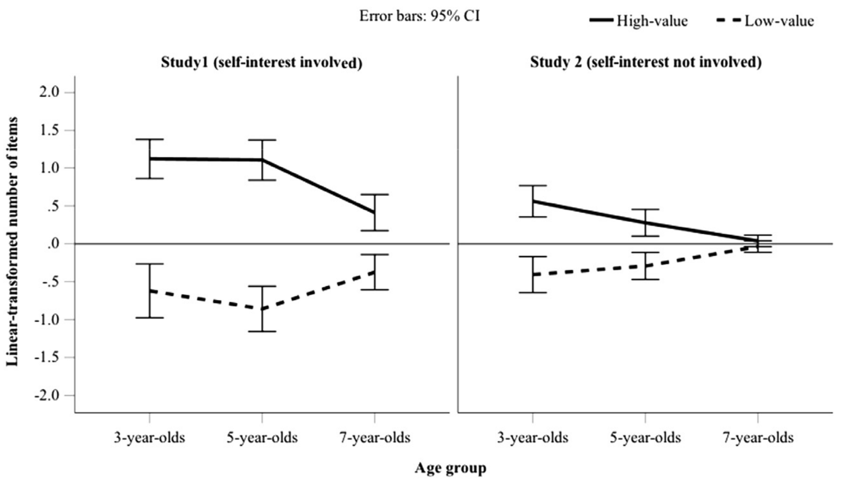

Fig. 2. Numbers of items on the experimental distribution task in Study 1 (for self) and Study 2 (for the target recipient). Values were linear-transformed by subtracting 2 from the original number to create a scale with 0 as the midpoint. CI, confidence interval.

more high-value pencils (3.12, 3.11, and 2.41 for 3-, 5-, and 7-year-olds, respectively; *ps* $< .05$ for 3- vs. 7-year-olds and 5- vs. 7-year-olds; $p > .10$ for 3- vs. 5-year-olds).

For the magnitude measure with respect to low-value pencils, there were two significant effects. One was an effect of age group, $F(2, 165) = 3.98$, $p = .021$, $\eta^2 = .05$, with post hoc analyses indicating that, compared with 7-year-olds, 3- and 5-year-olds gave themselves fewer low-value pencils (1.38, 1.14, and 1.62 for 3-, 5-, and 7-year-olds, respectively; $p < .05$ for 5- vs. 7-year-olds; $.05 < p < .10$ for 3- vs. 7-year-olds; $p > .10$ for 3- vs. 5-year-olds). The other significant effect concerned the number of erasers for the self on the control task, $F(1, 165) = 9.96$, $p = .002$, $\eta^2 = .06$, indicating that the number of erasers children gave themselves on the control task was positively associated with the number of low-value pencils they gave themselves on the experimental task ($\beta = 0.33$).

Finally, for the magnitude measure with respect to the total number of pencils given to the self, the only significant effect was an effect of the number of erasers for the self on the control task, $F(1, 165) = 48.73$, $p = .000$, $\eta^2 = .23$; for other factors, *ps* $> .10$, suggesting that the number of erasers children gave themselves on the control task was positively associated with the number of pencils (regardless of value) they gave themselves on the experimental task ($\beta = 0.47$).

In summary, we found that, starting at 3 years of age, most children displayed some form of fairness when distributing high-quality and low-quality prizes between themselves and another child. However, the older and younger children differed in the form of fairness that they showed; the most common pattern for 7-year-olds was qualitative fairness, whereas for 3- and 5-year-olds it was quantitative fairness. Contrary to our predictions, we did not find clear evidence that children's cognitive abilities were associated with either form of fairness (although there was one significant positive correlation between executive functioning and the pattern measure of quantitative fairness, the effect was very small). Taken together, these findings suggest that 7-year-olds, but not younger children, show qualitative fairness when making distributions between themselves and another child.

Study 2

The central finding of Study 1 was that 7-year-olds, but not younger children, showed qualitative fairness when self-interest was at stake. This raises the question of why most young children did not show qualitative fairness even though they did show quantitative fairness. One explanation is that 3- and 5-year-olds do not understand that fairness involves quality as well as quantity, so they might not be able to take quality into consideration when making decisions about fairness. An alternative possibility is that they do understand that fairness requires both quality and quantity but fail to act accordingly in order to promote their own interests (see Sheskin et al., 2016).

The aim of Study 2 was to further test these possibilities. We adopted a third-party version of the experimental task in order to eliminate the potential role of self-interest. Children were asked to distribute the same set of four high-quality and four low-quality prizes, but between two other children rather than between themselves and another child. If young children's understanding of fairness does not involve quality, they should generally fail to show qualitative fairness, as was seen in Study 1. However, if young children's understanding of fairness does involve quality but they are motivated by a desire to advance their own interests, they should show qualitative fairness.

Method

Participants

As in Study 1, we tested 180 children. Participants were 60 3-year-olds (3.39–4.11 years; $M = 3.82$, $SD = 0.19$; 30 boys), 60 5-year-olds (5.21–6.09 years; $M = 5.67$, $SD = 0.27$; 30 boys), and 60 7-year-olds (7.08–7.64 years; $M = 7.37$, $SD = 0.15$; 30 boys) who were recruited from the same schools as in Study 1. None of the children had participated in Study 1. All participants were Han Chinese and from middle-class backgrounds. Like Study 1, this study was preregistered (https://aspredicted.org/blind.php?x=7dn94n).

Design and procedure

Participants were tested by the same experimenter in one-on-one sessions at their schools. As in Study 1, at the beginning of the session, participants were presented with a high-value pencil and a low-value pencil and were asked which they preferred. Also as in Study 1, the vast majority (170 of 180) agreed with our high-value and low-value classifications, with the remaining 10 participants (1 3-year-old, 2 5-year-olds, and 7 7-year-olds) unexpectedly preferring the low-value pencil.

Participants then answered five simple questions as a pretext for distributing prizes. Our goal was to keep the procedure as similar as possible to Study 1, but with the possible influence of self-interest eliminated by asking participants to distribute the pencils to two other children and not to themselves. However, one challenge was that in Study 1 participants answered simple questions as a pretext for receiving the prizes they would be asked to distribute. That procedure made children feel good about correctly answering questions, being praised by the experimenter for doing so, and receiving prizes. We wanted to hold the procedure as constant as possible but were concerned that it would upset participants if they needed to give away all the prizes they received. To address this issue, participants answered the same five questions and were praised for doing so in the same way, but they were told that they would receive a prize at the end of the study. Children were given this prize, a small toy, after they completed the distribution tasks.

The distribution tasks were conducted in the same manner as in Study 1 except that participants were asked to distribute the eight prizes (i.e., four high-value and four low-value pencils) between two other children rather than between themselves and another child. The two recipients were gender-matched to the participant and were described as children who had completed the study earlier in the day and should have received some of the pencils as prizes for doing a good job. Recipients were also described as having the same pencil preference as the participant.

We conducted a similar set of manipulation checks as in Study 1 and also included the question "Can you yourself keep any of these pencils?" to ensure that participants understood how to complete the task.

The rest of the procedure was the same as in Study 1. Participants completed the same two cognitive ability measures (the NIH Toolbox Flanker Inhibitory Control Test and the Chinese version of the theory of mind understanding scale) on the following day.

Data preparation

As in Study 1, we made similar classifications of participants' distributions and established similar *pattern* measures in terms of whether they showed *qualitative* fairness as well as whether they showed *quantitative* fairness.

We established similar *magnitude* measures regarding the degree to which participants behaved unfairly versus fairly separately for quantity and quality. We attempted to make these measures as similar as possible to the ones used in Study 1, but with the two other children as potential recipients. We designated one of the recipients as the *target recipient* for the purpose of conducting data analysis in a manner parallel to what was done in Study 1. We conducted similar counting and subtraction procedures as in Study 1, but we later calculated the absolute values of the obtained values. We did this because in Study 2 the purpose was to examine how unfairly the participant behaved with regard to the two recipients. Thus, for each of these measures, the scale was defined with 0 as fair, with more positive values indicating a greater degree of unfairness.

Results and discussion

As in Study 1, preliminary analyses yielded no differences in the patterns of results regardless of whether or not the 10 participants who unexpectedly showed a preference for low-value pencils were included in the analyses. Following the approach of Study 1, we present the analyses with those participants excluded even though the exclusions were not described in our preregistration. Preliminary analyses also yielded no significant main effects or interactions involving gender on the pattern measures or the magnitude measures ($ps > .10$), so these data were combined for subsequent analyses.

Pattern measures

The percentages of participants who were classified as qualitatively fair, quantitatively fair but not qualitatively fair, and unfair for each age group are shown in Fig. 1 (see Table A1 in the Appendix for further details about the responses). As can be seen from the figure, the children within each age group tended to show qualitative fairness (57.6%, 82.8%, and 98.1% for 3-, 5-, and 7-year-olds, respectively; $p > .10$ for 3-year-olds and $ps < .001$ for 5- and 7-year-olds compared with the 50% chance level).

We conducted binary logistic regression analyses on both pattern measures of qualitative fairness and quantitative fairness, including age-corrected standard scores of executive functioning, theory of mind understanding scores, and age group (0 = 3-year-olds, 1 = 5-year-olds, 2 = 7-year-olds) as predictors. With outlier removal, we found that the final model for qualitative fairness was significant, $\chi^2(2, N = 168) = 30.41$, $p = .000$, $-2LL = 141.54$, Nagelkerke $R^2 = .26$. The only effect included in the model was a significant effect of age group, Wald = 16.86, $df = 2$, $p = .000$. A priori comparisons suggested that the percentage of children who showed qualitative fairness increased with age (57.6%, 82.8%, and 98.1% for 3-, 5-, and 7-year-olds, respectively), βs = −3.60, −2.40, and −1.20, $SE\ \beta$ = 1.04, 1.07, and .44, Walds = 11.91, 5.07, and 7.48, dfs = 1, 1, and 1, ps = .001, .024, and .006, ORs = .03, .09, and .30, 95% CIs = .00–.21, .01–.73, and .13–.71 for 3- versus 7-year-olds, 5- vs. 7-year-olds, and 3- versus 5-year-olds, respectively. No other effects were significant, $ps > .10$ (see Table A3 in the Appendix for more details).

For quantitative fairness, the model was significant, $\chi^2(2, N = 168) = 15.69$, $p = .000$, $-2LL = 60.13$, Nagelkerke $R^2 = .25$. The only effect included in the final model was an age effect, which was not significant, Wald = 4.73, $df = 2$, $p = .094$. A priori comparisons showed that the only difference was between 3- and 7-year-olds, suggesting that children in the youngest group were less likely than those in the oldest group to display quantitative fairness (84.7%, 98.3%, and 100% for 3-, 5-, and 7-year-olds, respectively); for 3- versus 7-year-olds, $\beta = -2.33$, $SE\ \beta = 1.07$, Wald = 4.73, $df = 1$, $p = .030$, OR = .10, 95% CI = .01–.79; for 3- versus 5-year-olds and 5- versus 7-year-olds, $ps > .10$. No other effects were significant, $ps > .10$ (see Table A3 in the Appendix for more details).

Magnitude measures

Overall, participants gave the target recipient an average of 4.05 pencils, including 2.30 high-value ones and 1.75 low-value ones (see Fig. 2 for magnitude measure scores with respect to high-value and low-value pencils by age group).

We conducted multivariate ANCOVAs separately on the three magnitude measures by including executive functioning and theory of mind understanding as covariates as well as age group as the fixed factor. With outlier removal, we found that age was the only significant effect across the three magnitude measures, $Fs(2, 163)$ = 4.68, 5.45, and 5.06, ps = .011, .005, and .007, η^2s = .05, .06, and .06, respectively, for age effects on magnitude measures with respect to the number of high-value pencils, low-value pencils, and all pencils regardless of value.

Pairwise comparisons indicated that 5- and 7-year-olds were significantly less unfair than 3-year-olds regarding quality (high-value pencils: Ms = .53, .28, and .04 for 3-, 5-, and 7-year-olds, respectively; low-value pencils: Ms = .55, .30, and .04 for 3-, 5-, and 7-year-olds, respectively; $ps < .05$ for both 5- vs. 3-year-olds and 7- vs. 3-year-olds) as well as quantity (total number of pencils regardless of value: Ms = .19, .02, and .00 for 3-, 5-, and 7-year-olds, respectively; $ps < .05$ for 5- vs. 3-year-olds and 7- vs. 3-year-olds). However, 5- and 7-year-olds did not differ from each other on any of these three measures ($ps > .05$). No other effects were significant ($ps > .05$).

In sum, we found that when children made distributions that did not involve self-interest, qualitative fairness was the most common pattern within each age group. There was no evidence that children's cognitive abilities were associated with their capacity to show either form of fairness.

General discussion

We asked 3-, 5-, and 7-year-olds to distribute high-quality and low-quality items between themselves and another child such that their self-interest was at stake (Study 1) and between two other children such that it was not (Study 2). In the only previous study that focused directly on this topic, Sheskin et al. (2016) found that children failed to show qualitative fairness prior to 10 years of age when their self-interest was involved even though they showed the capacity to do so by 6 years of age when no self-interest was involved. In a pair of preregistered studies, we built on these findings by separating concerns with fairness from possible effects of social signaling and from possible assumptions about the recipients' preferences being different from their own. We also tested whether even younger children (i.e., 3- and 5-year-olds) would show qualitative fairness in the absence of self-interest motives.

The overall pattern of results is consistent with that observed by Sheskin et al. (2016), who found that children often failed to show qualitative fairness when their self-interest was at stake. Specifically, when the children in Study 1 made distributions between themselves and another child, the most common pattern for the 7-year-olds was to show qualitative fairness, but the most common pattern for the 3- and 5-year-olds was to show quantitative fairness only. In Study 2, when distributions were made between two other children and self-interest was not at stake, the most common pattern for all three age groups was to show qualitative fairness. Thus, younger children's failure to show qualitative fairness in Study 1 was not because they did not take quality into consideration; instead, it appeared to be driven by self-interest. Our findings suggest that the basic patterns observed by Sheskin et al. (2016) hold even when looking at actual distribution behavior rather than predicted behavior.

Our findings go beyond those of Sheskin et al. (2016) by including a non-Western sample. In addition, this research is the first to show that even 3-year-olds have the capacity to show qualitative fairness if self-interest is not at stake, suggesting that their conceptions of fairness may include quality as well as quantity. Given that prior work with Western samples indicates that these effects in the dictator game are not seen prior to 4 years of age (e.g., Rochat et al., 2009), future research will be needed to explore possible task effects and cross-cultural differences.

Sheskin et al. (2016) found that children did not show qualitative fairness when self-interest was at stake prior to 10 years of age, but we found evidence of qualitative fairness in this context by 7 years of age. One reason for this discrepancy may be that in our procedure we explicitly told children that the recipients shared their stated pencil preference, which made them unlikely to infer that the recipients would find the pencils they considered low value to be an acceptable substitute for the high-value ones. Regardless of the reason, it is notable that both studies found that qualitative fairness emerges later in development than quantitative fairness, and this suggests that only the older children acted in ways that were in accordance with their beliefs. These findings are generally consistent with prior work suggesting that advantageous inequity aversion (as shown by cases in which one child receives more than another; Fehr & Schmidt, 1999) tends to emerge relatively late in development if it emerges at all (Blake et al., 2015) and that as children develop their beliefs and their behaviors tend to converge (Blake et al., 2014). Our findings are also consistent with prior research suggesting that older children are more likely to make donation decisions that take into account the welfare of others even when reputational concerns are minimized (Blake & Rand, 2010).

The current findings, together with those of Sheskin et al. (2016), also build on evidence that young children are sensitive to quality differences between items (e.g., Chernyak & Sobel, 2016; Shaw et al., 2014; Shaw & Olson, 2013), and they extend prior work suggesting that young children's preferences guide their decisions about giving away resources (Birch & Billman, 1986; Blake & Rand, 2010; see also Shaw & Olson, 2013). Our findings further suggest that the value that young children place on a resource can sometimes outweigh other values such as being fair.

The current findings reinforce the point made by Shaw et al. (2014) that children sometimes find ways to prioritize their own interests when questions of fairness come into play. That work suggests that children sometimes act unfairly when they believe that others will not find out. In the current study, which did not invoke concerns with social signaling, a majority of children in all age groups showed quantitative fairness between themselves and another child in Study 1, but both 3- and 5-year-olds prioritized their own interests over showing qualitative fairness.

Although we did not find clear evidence that executive function and/or theory of mind are associated with children's distribution decisions, it should be noted that this does not mean that cognitive processes do not play an important role. Other research suggests that other cognitive factors, such as numerical cognition (Chernyak, Harris, & Cordes, 2019), are likely to be important.

Future research will be needed to address the limitations of this study. One limitation is that we used equality as a proxy for fairness even though the two concepts are distinct (Starmans et al., 2017), and it is possible that children assumed that equal distributions would not be entirely fair because there might have been differences in outcomes or effort regarding how different individuals performed the task even though we gave them no reason to suggest that this was the case. In addition, children were told that the reason why they received pencils or erasers was because they had done a good job, and perhaps that made them give more consideration to merit than they might have otherwise. A related limitation is that children might have assumed that they were giving away prizes that they had already earned (see Shaw et al., 2014, concerning the distinction between fairness and generosity). However, one can also view this assumption as posing an even stronger test of overcoming self-interest given that even young children show endowment effects (Hood, Weltzien, Marsh, & Kanngiesser, 2016).

A second limitation of the current research is that we did not seek to determine why children made the distributions they did. We chose not to assess children's explanations to prevent children from learning that the experimenter would find out about their distribution decisions given the importance of ruling out possible social signaling effects. However, because we did not include these assessments, we cannot be sure that children's actions were necessarily motivated by self-interest and that there could have been other reasons for their decisions that we did not assess. Future research in which children are asked to justify their distribution decisions will be needed (e.g., Elenbaas, Rizzo, Cooley, & Killen, 2016; Rizzo & Killen, 2016).

Future research will also be needed to fully understand the shift from quantitative fairness to qualitative fairness that appears to emerge between 3 and 7 years of age. Although we saw no clear evidence that executive functioning or theory of mind plays a role in this process, it is possible that other cognitive factors such as numerical cognition (e.g., Chernyak et al., 2019) are involved. Children's growing understanding of social norms (Wörle & Paulus, 2018) and their changing views of fairness and equality (Rizzo & Killen, 2016) may also be important. Direct and indirect social experience may also play a role because as children grow up they engage in more frequent discussions with peers, parents, teachers, and other individuals about what is fair, and they are likely to overhear people talking about it. However, it should be noted that even adults who have extensive cognitive skills and social experience often prioritize self-interest over fairness.

In addition, future research should examine children's decision making about distribution across different contexts such as when the resources are necessary rather than just fun to have (Rizzo & Killen, 2016). It would also be useful to examine how children's distribution decisions are affected by the nature of the differences between specific high-value and low-value resources.

In summary, the current research is the first to show that by 3 years of age children are capable of distributing resources equally based on quality. It also demonstrates that 3- and 5-year-olds often fail to do so in the service of their own interests, a tendency that is no longer present among 7-year-olds.

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Appendix

Table A1
Children's response patterns in Study1 and Study 2.

Form of fair	Response type	Description		Study 1 (self-interest involved: self and other)			Study 2 (self-interest not involved: A and B)		
		Self/ Party A	Other/ Party B	3-year-olds ($n = 58$)	5-year-olds ($n = 57$)	7-year-olds ($n = 56$)	3-year-olds ($n = 59$)	5-year-olds ($n = 58$)	7-year-olds ($n = 53$)
Qualitatively fair	Fair	2H, 2 L	2H, 2 L	14	19	40	34	48	52
Quantitatively but not qualitatively fair	Self-advantage/	4H, 0 L	0H, 4 L	23	25	10	11	7	1
	unfair	3H, 1 L	1H, 3 L	5	2	1	5	2	
	Self-	1H, 3 L	3H, 1 L	3	1				
	disadvantage/ unfair	0H, 4 L	4H, 0 L			1			
Unfair	Self-advantage/	4H, 4 L	0H, 0 L	3					
	unfair	4H, 3 L	0H, 1 L	3	2				
		3H, 4 L	1H, 0 L	1					
		4H, 2 L	0H, 2 L		1				
		3H, 3 L	1H, 1 L	1	1		2		
		2H, 4 L	2H, 0 L						
		4H, 1 L	0H, 3 L		2	2			
		3H, 2 L	1H, 2 L	2	2		2		
		2H, 3 L	2H, 1 L	2		1			
	Mixed	1H, 4 L	3H, 0 L		1				
	Mixed	3H, 0 L	1H, 4 L	1			1		
	Self-	2H, 1 L	2H, 3 L			1	4	1	
	disadvantage/	1H, 2 L	3H, 2 L		1				
	unfair	0H, 3 L	4H, 1 L						
		2H, 0 L	2H, 4 L						
		1H, 1 L	3H, 3 L						
		0H, 2 L	4H, 2 L						
		1H, 0 L	3H, 4 L						
		0H, 1 L	4H, 3 L						

Note. H, high-quality item; L, low-quality item.

Table A2
Hierarchical binary logistic regression results for children's qualitative and quantitative fairness as predicted by fairness on the control task, executive functioning, theory of mind understanding, and age group in Study 1.

	Regression 1a: Children's *qualitative fairness* on the experimental task (Study 1: self-interest involved)																	
	Block 1						Block 2 (backward stepwise)											
							First						Final					
Predictor	β	*SE* β	Wald χ^2	*df*	OR	95% CI	β	*SE* β	Wald χ^2	*df*	OR	95% CI	β	*SE* β	Wald χ^2	*df*	OR	95% CI
Fairness on control task	1.14	.42	7.48**	1	3.14	1.38–7.12	.68	.46	2.23	1	1.98	.81–4.85	.65	.46	2.04	1	1.91	.79–4.67
EF							−.01	.01	1.35	1	0.99	.96–1.01						
ToM							−.03	.17	0.03	1	0.97	.70–1.35						
Age group									18.25***	2					21.44***	2		
Age group (1) 3- vs. 7-year-olds							−2.03	.54	14.39***	1	.13	.05–.38	−1.87	.44	19.69***	1	.15	.06–.34
Age group (2) 5- vs. 7-year-olds							−1.64	.44	14.20***	1	.19	.08–.46	−1.55	.41	14.18***	1	.21	.10–.48
Test	χ^2	*df*	−2LL		Nagelkerke R^2		χ^2	*df*	−2LL		Nagelkerke R^2		χ^2	*df*	−2LL		Nagelkerke R^2	
Model	8.38**	1	225.01		.06		33.28***	5	210.48		.24		31.83***	3	201.56		.23	
Block ($\Delta\chi^2$)	8.38**	1					24.90***	4	200.11				23.45***	2				

	Regression 1b: Children's *quantitative fairness* on the experimental task (Study 1: self-interest involved)																	
	Block 1						Block 2 (backward stepwise)											
							First						Final					
Predictor	β	*SE* β	Wald χ^2	*df*	OR	95% CI	β	*SE* β	Wald χ^2	*df*	OR	95% CI	β	*SE* β	Wald χ^2	*df*	OR	95% CI
Fairness on control task	2.93	.50	33.95***	1	18.80	7.01–50.43	3.10	.59	28.03***	1	22.27	7.06–70.25	2.92	.52	32.10***	1	18.58	6.76–51.06
EF							.04	.02	4.29*	1	1.04	1.00–1.08	.04	.02	3.91*	1	1.04	1.00–1.08
ToM							−.09	.22	0.16	1	.92	.60–1.40						
Age group									1.06	2								
Age group (1) 3- vs. 7-year-olds							.12	.83	.02	1	1.13	.23–5.70						
Age group (2) 5- vs. 7-year-olds							−.48	.73	.44	1	.62	.15–2.57						
Test	χ^2	*df*	−2LL		Nagelkerke R^2		χ^2	*df*	−2LL		Nagelkerke R^2		χ^2	*df*	−2LL		Nagelkerke R^2	
Model	40.39***	1	108.78		.36		45.98***	5	103.19		.41		44.49***	2	104.68		.39	
Block ($\Delta\chi^2$)	40.39***	1					5.59***	4					4.10*	1				

Note. $N = 171$ (with data exclusion). OR, odds ratio; CI, confidence interval; EF, executive functioning; ToM, theory of mind understanding; LL, log likelihood.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table A3
Binary logistic regression results for children's qualitative and quantitative fairness as predicted by executive functioning, theory of mind understanding, and age group in Study 2.

Regression 2a (backward stepwise): Children's *qualitative fairness* on the experimental task (Study 2: Self-interest not involved)

	First						Final					
Predictor	β	*SE* β	Wald χ^2	*df*	OR	95% CI	β	*SE* β	Wald χ^2	*df*	OR	95% CI
EF	−.02	.02	1.72	1	.98	.95–1.01						
ToM	−.04	.18	.06	1	.96	.67–1.36						
Age group			14.88***	2					19.17***	2		
Age group (1) 3- vs. 7-year-olds	−3.94	1.14	12.01***	1	.02	.00–.18	−3.60	1.04	11.91***	1	.03	.00–.21
Age group (2) 5- vs. 7-year-olds	−2.47	1.08	5.21*	1	.08	.01–.71	−2.40	1.07	5.07*	1	.09	.01–.73
Test	χ^2	*df*	−2LL		Nagelkerke R^2		χ^2	*df*	−2LL		Nagelkerke R^2	
Model	32.23***	4	139.72		.27		30.41***	2	141.54		.26	

Regression 2b (backward stepwise): Children's *quantitative fairness* on the experimental task (Study 2: Self-interest not involved)

	First						Final					
Predictor	β	*SE* β	Wald χ^2	*df*	OR	95% CI	β	*SE* β	Wald χ^2	*df*	OR	95% CI
EF	.01	.02	.10	1	1.01	.96–1.06						
ToM	−.22	.29	.59	1	.80	.45–1.42						
Age group			4.70	2					4.73	2		
Age group (1) 3- vs. 7-year-olds	−19.89	5.51E3	1.30E5	1	3.37E9	–	−19.51	5.52E3	1.20E5	1	3.37E9	–
Age group (2) 5- vs. 7-year-olds	−18.37	5.51E3	1.00E5	1	2.87E8	–	−17.18	5.52E3	1.00E5	1	3.47E8	–
Test	χ^2	*df*	−2LL		Nagelkerke R^2		χ^2	*df*	−2LL		Nagelkerke R^2	
Model	16.44**	4	59.38		.26		15.69***	2	61.13		.25	

Note. $N = 168$ (with data exclusion and outlier removal). OR, odds ratio; CI, confidence interval; EF, executive functioning; ToM, theory of mind understanding; LL, log likelihood.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

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