Beyond Principles: Children Determine Fairness Based on Attention and Exactness

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Abstract

Fairness depends on the principles that people use to justify their actions, and on the outcomes that they produce. Here we propose that, from early in childhood, we also judge fairness based on whether we believe the resulting outcomes were caused by the underlying principles. In Experiment 1 we show that four- five- and six-year-olds believe that an agent who paid attention when distributing resources is more fair than an agent who was distracted when distributing resources, even when they both produce identical outcomes. In Experiment 2 we show that children of the same ages believe that an agent who counts when distributing resources is more fair than an agent who does not count, even when both agents attend to how they distribute their resources and produce identical outcomes. Together, our findings suggest that children do not judge fairness based on the outcome alone, and they add to a growing body of work suggesting that, from early childhood, our intuitions about fairness are tightly linked with intuitions about exactness.

Keywords: cognitive development; social cognition; fairness.

Introduction

From early in childhood, humans have a propensity to help each other (Warneken & Tomasello, 2006; 2007) and cooperate (Warneken, Chen, & Tomasello, 2006). By working together, we can achieve things we could not have done alone, while minimizing the costs and risk involved. Despite its usefulness, cooperation can create a secondary problem: deciding how to share or divide what has been earned.

Our intuitions about what kinds of distributions count as fair are at work from early in childhood, but they continue to develop over time (Blake, McAuliffe, & Warneken, 2014; Kenward & Dahl, 2011; Kuhlmeier, Dunfield, & O'Neill, 2014; Olson & Spelke, 2007). In resource distribution tasks, young children prefer to distribute resources equally (Sloane, Baillargeon, & Premack, 2012; Gercai & Surian, 2011; Liénard, Chevallier, Mascaro, Kiura, & Baumard, 2013), and they expect others to do the same (LoBue, Nishida, Chiong, DeLoache, & Haidt, 2011). This preference is so strong that it prevails even when the agents differ in their merit or their need (Damon, 1975; Huntsman, 1984), or in their prosocial behavior (Kenward & Dahl, 2011). When children are the recipients of a distribution, they are even more likely to be adamant about an equal distribution or one that benefits themselves (Smith, Blake, & Harris, 2013; Blake & McAuliffe, 2011). It is not until at least their sixth birthday that children begin to systematically produce and endorse more complex fairness rules (Damon, 1975; Blake & McAuliffe, 2011; Schmidt, Svetlova, Johe, & Tomasello, 2016; Fehr, Bernhard, Rockenbach, 2008; Smith, Blake, & Harris, 2013; although see Sloane, Premack & Baillargeon, 2012; Baumard, Mascaro, & Chevallier, 2012 for evidence of early understanding of merit).

Yet, being fair is not only a matter of having justifiable principles and producing the right outcome. To be fair, the principle must produce the outcome. In other words, for us to judge an agent as fair, we must believe that a motivation to be fair guided the agent's actions. For example, consider a manager who is determining the bonuses that two employees will receive at the end of the year. Suppose this manager believes that the employee who worked more should receive a higher bonus, but, because of a deadline, she ignores the employees' progress reports and randomly assigns them to different bonus categories. Chances are that the bonuses will not reflect a merit-based distribution. But even if they did, we would not grant that the manager was fair, even if we agree that the outcome was fair. For us to judge that the manager is fair, her belief that merit matters should have caused the distribution.

Although much research has focused on children's understanding of which outcomes count as fair (Sloane, Baillargeon, & Premack, 2012) and which principles justify them (Schmidt, Svetlova, Johe, & Tomasello, 2016), far less is known about children's intuitions on the relation between principles and outcomes. One possibility is that children uniquely focus on the outcome when judging if an agent is fair, without considering whether there is a reasonable principle underneath. This view is consistent with children's preference for equal distributions of resources and their difficulty distinguishing between legitimate and arbitrary principles (DeJesus, Rhodes, & Kinzler, 2014; Schmidt, Svetlova, Johe, & Tomasello, 2016). Alternatively, however, children may also judge fairness based on evidence that the actions are the consequence of a motivation to act fairly. Under this view, children may endorse equal distributions because they can infer that the agent's motivation to be egalitarian likely produced the outcome. Similarly, children may be more likely to reject unequal distributions because they struggle to recognize that these distributions may result from attempting to implement an exact fairness principle or to infer which principles are guiding their actions.

Here we propose that, from early childhood, we judge fairness based on whether the agent's actions reveal that the outcome was caused by a motivation to act fairly. Most directly, this predicts that children should prefer agents who pay attention while they distribute resources over agents who do not, even if both agents produce identical material outcomes. We test this prediction in Experiment 1.

In addition, children may not only judge fairness based on attentiveness, but also on precision. A growing set of studies suggest that people associate fairness with numerical exactness. First, adults believe that for fairness principles to be applied correctly, the application cannot be qualitative or approximate; it must be exact (Maier, et al., *in prep*).

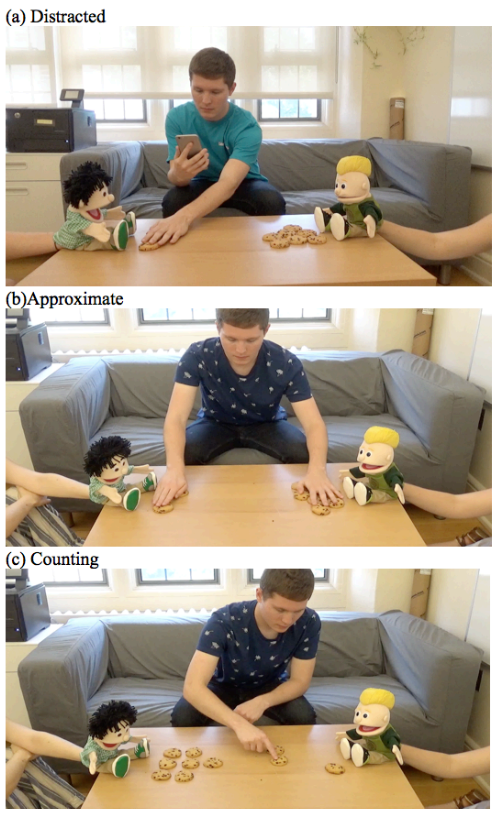

Figure 1. Frames from the videos used in Experiment 1 (distracted vs approximate) and Experiment 2 (approximate vs counting). The distracted agent (Experiment 1) looked at his phone and did not pay attention as he distributed cookies to the two puppets. The approximate agent (Experiments 1 and 2) paid attention as he distributed cookies in an approximate manner. The counting agent (Experiment 2) counted each cookie as he gave them to the puppets. Both experiments used different actors for each agent, and the role of each actor was counterbalanced across participants

Second, in some contexts, children judge distributions as fair based on numerical equality rather than on mass or value equality (Piaget, 1999; Sheskin, Bloom, & Wynn, 2014), suggesting an early focus on number in fairness. Third, children who can count rely on this procedure to produce their intended distributions (Chernyak, Sandham, Harris, & Cordes, 2016), suggesting that they are motivated to produce exact, rather than approximate, distributions. Finally, in the Tsimane'—a farming-foraging society in the Bolivian Amazon—, mastery of counting predicts how children distribute resources (Jara-Ettinger, Gibson, Kidd, & Piantadosi, 2015). In this last study, children who could count were significantly more likely to give more cookies to agents who worked harder, relative to children who could not count, suggesting that innumerate children avoided merit-based distributions, possibly because they did not know how to apply the principle. Critically, because among the Tsimane', children master counting at highly variable ages (Piantadosi, Jara-Ettinger, & Gibson, 2014), it was possible to establish an effect of number knowledge on fairness while controlling for age and years in school.

Thus, although most research on number in fairness has focused on how children distribute resources, this interaction suggests that children may believe that fairness principles ought to be applied with precision. Based on this, we predict that children will believe that agents who count when they distribute resources are more fair, provided that the resulting distribution is also fair. We test this prediction in Experiment 2.

Here we test these predictions on four-, five-, and six-year-olds. The lower age range is chosen because because children under four do not know how to count (Wynn, 1990) and children under five do not have a mature understanding of the meaning of number words (Davidson, Eng, & Barner, 2013). The highest age is chosen because research suggests that children may not rely on merit earlier (Damon, 1975; Huntsman, 1984; although see Baumard, Mascaro, & Chevallier, 2012). Thus, while we expect that all children will judge fairness based on attentiveness and precision, we may also find a developmental trajectory that results from children's developing appreciation of merit, or their acquisition of number and counting.

Experiment 1: Attention and Fairness

In Experiment 1 children watched two agents distribute a total of ten cookies to two puppets. Before the cookies were distributed, children were told that both puppets were asked to clean up their classroom and one of the puppets worked very hard, while the other puppet did not. Both agents gave the hard-working puppet seven cookies and the puppet who did not work very hard three cookies. One agent was distracted when distributing the cookies by looking at his phone (Figure 1a). The other agent paid attention to his actions and split the cookies into two groups in a single motion (Figure 1b). If children take an agent's attention into account, children should believe that the attentive agent is more fair than the distracted agent. If, instead, children focus on the outcome alone, independent of how it was produced, children should see both agents as equally fair and respond at chance.

Methods

Participants 48 children (mean age 5.43 years, range 4.0-6.8 years) were recruited and tested at a local museum, schools, and in lab. Eight additional participants were recruited but not included in the study by decision of a coder (see Results).

Stimuli The stimuli consisted of a short story, a picture of two puppets, and two videos, each of which depicted an agent distributing a total of ten cookies to the puppets (see Figure 1). The stories and the videos were all shown to the child on a computer.

Procedure Participants were tested individually in a quiet area, and the child was seated at a table directly across from the experimenter. The experimenter showed the child a picture of the two puppets, and began by introducing the puppets: “Here we have two friends. This is Michael and this is Joey.” Children were then told that at school, the teachers had asked Joey and Michael to help clean the classroom. Either Joey or Michael worked very hard and cleaned a lot, and the other puppet did not work very hard and did not clean very much. Introduction order and role of each puppet was counterbalanced across participants. Children were asked “which friend worked very hard?” and “which friend did not work very hard?” If a child responded incorrectly, the experimenter repeated the story and asked the questions again (no child responded incorrectly more than once). The experimenter then explained that when the friends finished cleaning, the two teachers decided to split a set of cookies between the two friends, and she showed the videos of the two agents distributing the cookies (order counterbalanced; see Figure 1).

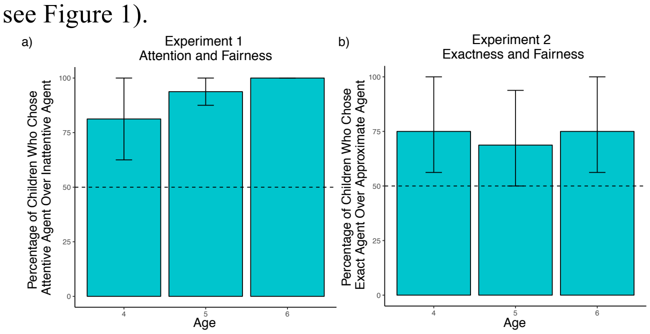

Figure 2. (a) Results from Experiment 1. Each bar shows the percentage of children who said that the attentive agent was more fair than the inattentive agent. Vertical bars show 95% bootstrapped confidence intervals. (b) Results from experiment 2. Each bar shows the percentage of children who said that the exact agent was more fair than the approximate agent.

In one of the videos, the teacher was holding his phone in one hand while using his other hand to distribute cookies, and he was clearly looking at his phone the entire time (Figure 1a). The teacher pushed seven cookies towards the child who worked hard, and pushed three cookies towards the child who did not work very hard. After the video, the experimenter explained to the child, “This teacher was distracted and not paying attention because he was looking at his phone, and [Joey] got seven cookies and [Michael] got three cookies.” In the other video, the teacher was looking at the cookies and put his hands in the middle of the pile and split the cookies to two sides so that the child who worked hard received seven cookies and the child who did not work very hard received three cookies (Figure 1b). After the video, the experimenter explained to the child, “This teacher was looking at the cookies and paying attention when he split them up, and [Joey] got seven cookies and [Michael] got three cookies.” To control for any actor effects, each kind of distribution was recorded with two different actors and the videos were counterbalanced across participants. Video order, distracted and approximate teacher, and hard-working and not hard-working child were all counterbalanced across participants.

After watching the videos, the experimenter showed participants side-by-side pictures of the two teachers and asked “Which teacher was more fair when he gave the children the cookies?” Finally, the experimenter asked a two-part question for inclusion: “which teacher was paying attention and split the cookies up? and which teacher was distracted?”

Results and Discussion

Participants who failed the inclusion questions were excluded from analysis and replaced (n = 5), and an additional 3 children were excluded due to experimenter error, as determined by a coder. Children were coded as responding as predicted if they chose the teacher who was paying attention as more fair. Of the 48 children included in the study, 91.7% (n=44) responded as predicted (95% CI: 85.4-100%[1]).

Next, we tested for any developmental change. A logistic regression showed a marginal effect of age on children’s judgment of an approximate distribution being more fair: older children were marginally more likely to choose the teacher that did an approximate distribution as more fair (β=2.17; p = .052). See Figure 3.

Finally, we analyzed performance within each age group. 81.25% of four-year-olds responded correctly (n = 13 out of 16; 95% CI: 62.5-100%), 93.75% of five-year-olds responded correctly (n = 15 out of 16; 95% CI: 87.50%-100%), and 100% of six-year-olds responded correctly (n = 16 out of 16). See Figure 2. Altogether, these results suggest that although children’s belief that attentive agents are more fair becomes stronger as a function of age, children at all ages are nonetheless more likely to believe that an attentive agent is more fair than an inattentive agent.

Experiment 2: Exactness and Fairness

In Experiment 2, we tested whether children consider exactness when judging which of two agents is more fair. In this task, children again saw two teachers give two puppets cookies. One agent distributed the cookies one by one while silently counting (Fig 1c). The second agent divided the cookies approximately, by splitting them in a single motion (Fig 1b). Thus, in Experiment 2, the “approximate” agent was the same agent as the “attentive” agent in Experiment 1. As in experiment 1, both agents gave seven cookies to the hard-working puppet and three cookies to the puppet who did not work very hard. Children were asked which of the teachers was more fair when distributing cookies. If children take into account exactness when determining fairness, they should

[1] All reported intervals are 95% bootstrapped confidence intervals using 10,000 samples.

believe that the teacher who counted each cookie was more fair than the teacher who approximately split up the cookies. If, however, children only take into account the outcome or the attentiveness, then children should respond at chance.

Methods

Participants 48 children (mean age 5.49 years, range 4.0-6.9 years) tested at a local museum, schools, and in lab. Seven additional participants were recruited but not included in the study be decision of a coder (see Results).

Stimuli The stimuli in Experiment 2 were identical to the stimuli used in Experiment 1 with one exception. Instead of a video of a teacher being distracted, children were shown a video of a teacher counting each cookie individually.

Procedure Experiment 2 was identical to Experiment 1 with the difference that the video of the distracted agent was replaced with a video of a counting agent (Fig 1C). When children watched the video of the agent who split the cookies approximately, they heard an identical explanation to the one in Experiment 1: “This teacher was looking at the cookies and paying attention when he split them up, and [Joey] got seven cookies and [Michael] got three cookies.” When children watched the video of the agent who counted, the experimenter said, “This teacher was paying attention and looking at the cookies and he counted each cookie as he gave it to the children and [Joey] got seven cookies and [Michael] got three cookies.” Video order, approximate and exact teacher actors, and hard-working and not hard-working child were all counterbalanced across trials.

As in Experiment 1, children were shown side-by-side pictures of the two teachers and asked the test question, which teacher was more fair when he gave the children the cookies. Children were then asked the inclusion questions: “which teacher just split the cookies up? And which teacher counted each cookie?”

Results and Discussion

As in experiment 1, children who failed to respond correctly to the inclusion questions were excluded from analysis and replaced (n = 6), and one additional child was excluded due to experimenter error. Children were coded as responding correctly if they chose the teacher who counted as more fair. Of the 48 children who responded correctly to the inclusion questions, 72.92% responded correctly to the test question (95% CI: 60.42-85.42%).

A logistic regression predicting preference for the counting agent as a function of age revealed no significant age effects, (β=-0.08; p = .83). See Figure 3.

Finally, we evaluated performance within each age group. 75% (95% CI: 56.2-100%) of four-year-olds responded correctly (n = 12 out of 16); 68.8% (95% CI: 50-93.8%) of five-year-olds responded correctly (n = 11 out of 16), and 75% (95% CI: 56.2-100%) of six-year-olds responded correctly (n = 12 out of 16). See Figure 2.

General Discussion

The results of this study suggest that from early in childhood, we judge fairness based on whether the agent who distributed resources did so attentively and with precision. In Experiment 1 we found that four- five- and six-year-olds judged an agent who paid attention while distributing resources as more fair than an agent who distributed resources while distracted, even when both agents produced identical material distributions. In Experiment 2 we found that children as young as four-years-old judge an agent who counted when distributing resources as more fair than an agent who distributed the resources approximately, even when they both attended to their actions and produced identical material distributions. Together, these findings suggest that children judge fairness based not only on the outcome of the distribution, but also on evidence that the outcome was produced by a motivation to act fairly.

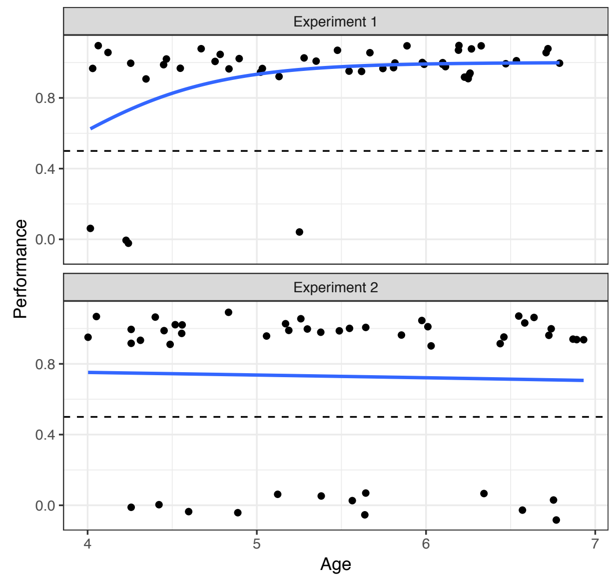

Figure 3. Logistic regression predicting participant’s choices as a function of age. In both plots, 1 indicates the predicted response (attentive agent in Experiment 1, and exact agent in Experiment 2). Each point represents a participant and the blue line represents the logistic regression. For visualization purposes each point has been jittered on the y-axis, but not on the x-axis.

In Experiment 1 we contrasted an inattentive agent who distributed resources in an approximate way (Fig 1A) with an attentive agent who also distributed resources in an approximate way (Fig 1B). In Experiment 2, we contrasted an attentive agent who distributed resources in an approximate way (Fig 1B) with an attentive agent who distributed resources exactly (Fig 1C). Thus, although we did not directly contrast an inattentive agent who distributes resources in an approximate way (Fig 1A) with an agent who distributes resources in an attentive and exact way (Fig 1C), our experiments suggest that children should prefer the attentive and exact agent, as children favor attentiveness over inattentiveness (Experiment 1) and exactness over approximate distributions (Experiment 2). These findings are in line with previous research in other prosocial domains, such as testimony, that show children value intention over outcome (Vanderbilt, Heyman, & Liu, 2014) and that young children are particularly sensitive to cues of credibility and accuracy (Birch, Vauthier, & Bloom, 2008).

Our findings in Experiment 2 add to a growing body of work that suggests that children expect fairness principles to be applied in an exact manner. If children believed that being fair is only a matter of producing a qualitative outcome, they should have performed at chance. Instead, children preferred an agent who showed evidence of trying to produce an exact, rather than an approximate, distribution. This is consistent with other research suggesting that children rely on number when distributing resources (Chernyak, Sandham, Harris, & Cordes, 2016) and that knowledge of number influences which kinds of principles they implement (Jara-Ettinger, Piantadosi, Kidd, & Gibson, 2015).

In this experiment, we used meritocratic distributions where the harder-working agent always received more resources. While, in principle, children's preferences for attentiveness and exactness should hold for any kind of distribution, here we avoided using egalitarian distributions because equal distributions appear non-random (Bar-Hillel & Wagenaar, 1991). Thus, it is possible that if children watch an agent produce an exact distribution through a single motion, they may infer that the agent's actions do not reflect lack of precision, but rather exceptional competence.

In both of our experiments we explicitly used the word fair. While failure to find systematicity in children's answers could have been explained by children not understanding the meaning of this word, the consistent responses we found across age groups and studies strongly suggest children understand the word fair. Even if the word fair is not part of young children's speech, there is a wealth of evidence that comprehension comes before production (Gershkoff-Stowe & Hahn, 2012; Bergelson & Swingley, 2012).

In both of our experiments we matched the outcomes that the two agents produced. Therefore, the results of our experiments only show that children's intuitions about what is fair depend on whether the agent was paying attention and on whether the agent was attempting to produce an exact distribution, however, they do not reveal the relative importance of these features relative to the outcome. It is possible that children may rely more heavily on outcome than exactness. Suppose, for instance, that an agent carelessly distributes resources to two other agents, but gives more to the agent who worked the hardest. At the same time, a second agent attentively and very precisely distributes resources but gives more to whomever did the least amount of work. In this case, children may rely on exactness to make the opposite judgment: that the agent who carefully gave more resources to the child who did the least amount of work is less likely to be fair. Consequently, this suggests that children conceptualize exactness as more clearly revealing an agent's intention, without a unique connection between fairness and number. Future work may investigate this.

At a higher level, our proposal that people judge an event as fair only when the principle causes the outcome may be an instantiation of broader intuitions about intentions. Actions are perceived as intentional only when the intention causes the outcome (Chisholm, 1966; Davidson, 1980). For instance, in Davidson's (1980) classical example, a rock climber slips and is left hanging from a rope that a second rock climber is holding. This second climber realizes that if he does not let go of the rope, he will also slip and may die. By realizing this, the climber decides that he must let go of the rope to save himself at the cost of sacrificing his friend. While forming this intention, the climber gets nervous and the rope slips out of his hands. In this case, even though the rock climber had an intention to let go of the rope, and the outcome fulfilled his intentions, we do not accept that the rock climber intentionally released the rope because the intention did not directly produce the outcome. The same logic may be behind our intuitions about fairness. If so, children's judgments about fairness in our experiment may have been mediated by the belief that fairness is only intentional when the motivation produces the actions.

Our study raises questions about how the development of number cognition affects how we reason about distributions of resources. Number is not a universal cognitive tool (Frank, Everett, Fedorenko & Gibson, 2008) and the timeline of acquisition varies greatly across cultures (Piantadosi et al., 2014). Previous work has found that pre-numerical children appreciate the role of merit in fairness, but they still prefer egalitarian distributions (Sloane, Baillargeon, & Premack, 2012; Kannigiesser & Warneken, 2012), suggesting that this discrepancy may occur because of a lack of ability or a lack of confidence in how to produce appropriate merit-based distributions. Consistent with this, past work has established that among the Tsimane', children who can count are more likely to produce merit-based distributions, independent of their age (Jara-Ettinger, et al., 2015). However, it is unknown if this effect is guided by children's increased confidence with set manipulations, or if the acquisition of number changes how children conceptualize fairness. Future work may investigate that.

Altogether, our findings show that children's early intuitions about fairness are not uniquely driven by expectations of how resources ought to be distributed, but also by evidence that an agent was attentive to the distribution and attempting to implement a fairness principle. Moreover, that from early on in childhood, children may already expect that fairness principles should be implemented in an exact, rather than an approximate way.

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