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Rectifying inequities in resource collection in young children

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Abstract

Numerous studies have documented children's understanding of fairness through their ability to rectify inequities when distributing resources to others. Understanding fairness, however, involves more than just applying norms of equity when distributing resources. Children must also navigate situations in which resources are collected from them for a common good. The developmental origins and the trajectory of equitable resource collection are understudied in the literature on children's prosocial behavior. Experiment 1 presented 4- to 8-year-olds ($N = 130$) with characters who started with different amounts of resources that were available for both personal use and a group project in school. Participants were asked how a teacher should fairly collect resources from the two characters, contrasting the teacher taking the same amount of resources from each individual (preserving the inequity) or leaving each individual with the same amount of resources (rectifying the inequity). Four- and 5-year-olds responded randomly; 6- to 8-year-olds preferred to rectify the inequity. Experiment 2 reproduced this finding on a new group of 5- to 7-year-olds ($N = 69$), eliciting justifications for their choice. Justifications in terms of fairness related to equitable choices. Experiment 3 reproduced this finding again in a new group of 5- to 7-year-olds ($N = 77$), contrasting children's preference for equitable resource collection with that of resource distribution. Children were more likely to rectify an inequity when collecting resources than when distributing resources to individuals who started with an inequity. This difference was driven more by the younger children in the sample. We discuss potential mechanisms for these findings in terms of children's developing concepts of fairness.

KEYWORDS

children's prosocial behavior, rectifying inequities, resource collection

Research Highlights

- Across three experiments, children developed preferences for equitable collection of resources by age 6.
- Preferences for equitable resource collection were more likely to be justified by appealing to concepts of fairness.
- Although preferences for equitable resource collection emerged slightly before equitable resource distribution, these data suggest children develop a unified mechanism for prosocial resource allocation.



1 | INTRODUCTION

Numerous studies have investigated the ways in which children distribute resources to others and how children interpret the ways others distribute resources (e.g., Damon, 1975; Shaw & Olson, 2012). For example, infants and toddlers prefer to distribute resources by giving the same number of resources to recipients; they also expect others to do the same (e.g., Buyukozer Dawkins et al., 2019; Geraci & Surian, 2011; Geraci et al., 2022; Schmidt & Sommerville, 2011; Sloane et al., 2012). Infants and toddlers also appreciate that individuals who distribute resources equally should be praised or rewarded (e.g., DesChamps et al., 2016; Meristo & Surian, 2013; Ziv et al., 2021), much like they appreciate the merit of other forms of prosocial behavior (e.g., Geraci, 2021; Geraci & Surian, 2021; Hamlin et al., 2011; Paulus et al., 2020; Surian & Franchin, 2017).

For the most part, children's appreciation of fairness has come from studying distributive behavior. For example, when children observe resources distributed among others, do they prefer equal or equitable distributions? We define *equal* distributions as ones in which recipients are given the same number of resources. We define *equitable* distributions, in contrast, as ones in which recipients end up with or move toward having the same amount of resources, or when recipients receive resources consistent with factors that have led up to the distribution.

The literature on infants and toddlers mentioned above mostly focuses on whether infants prefer equal distributions; in these studies, the recipients initially start with no resources and given the same or different numbers of resources. As mentioned above, there is clear evidence that infants prefer equal distributions, but also that young children endorse certain kinds of equitable distributions. For example, preschoolers expect recipients to receive an equal distribution of rewards when they collaborate with similar effort. If the collaboration is done through an unequal amount of work, however, then they endorse that the individual who worked harder should get more (e.g., Baumard et al., 2012; Kanngiesser & Warneken, 2012). Similarly, preschoolers make inferences about the value of the resources in their allocations. Three- to 6-year-olds create equal distributions when asked to give resources to others (in terms of number of objects), but give away the objects they value less to less preferred others (Blake & Rand, 2010; Chernyak & Sobel, 2016). During the preschool years, children are integrating their understanding of social norms of fairness with information about the recipients and resources to make inferences about how distributions should occur.

There are also cases where children show more of a developmental trajectory in generating or endorsing equitable distributions, particularly when recipients start with different amounts of resources prior to the distribution. Preschoolers have been labeled as believing "fair = equal" (Wittig et al., 2013, p. 324), but when they are older, they move beyond this understanding. For instance, Rizzo and Killen (2016) introduced 3- to 8-year-olds to characters who performed equal work to acquire resources. One character started with a lot of resources while the other had none. While 3- and 4-year-olds mostly distributed resources equally to these two characters, starting around age 5, chil-

dren began to give more resources to the character who started with less. This result is consistent with other studies that show children start to rectify inequities in their distributions around the ages of 5–7 (e.g., Elenbaas & Killen, 2016; Elenbaas et al., 2016; Rizzo et al., 2020; Schmidt et al., 2016; Sobel & Blankenship, 2021; although see Essler et al., 2020 and Li et al. (2014) for some evidence that suggests earlier development between the ages of 3–5). By age 5, children also protest when a character gives more resources to a wealthy recipient than a poorer one (Wörle & Paulus, 2018), suggesting that they possess a "norm of charity" (p. 67).

In most of these studies, children are told that one recipient is poor and the other wealthy, or shown a large inequity between the two (often that one character has a 6:1 advantage over the other, or greater). Sobel and Blankenship (2021) examined children's decisions to resolve relatively smaller inequities. They introduced 3- to 8-year-olds to two characters who had a different number of resources (one had 3, the other 1), and then a third character, who was going to distribute four more resources among them. Children were asked whether that third character should divide the resources such that each recipient got two, preserving the initial inequity, or divide the resources unequally, so that each recipient now had the same amount at the end (rectifying the inequity). By age 7, children reliably chose to rectify the inequity. They further showed that while children need the appropriate numerical knowledge to rectify the inequity, such knowledge was not sufficient for making such an inference. To rectify the inequity in this study, children had to solve a system of equations,¹ which might have been why children did not demonstrate a clear preference for equity until age 7; if children only have one resource to distribute and are told that one person has 3 and the other has 1, even 4-year-olds give that resource to the individual with only 1, see Li et al., 2014). This mathematical capacity might be necessary, but it is not sufficient for rectifying inequities. For example, in Sobel and Blankenship's study, asking children to take the perspective of the character who started with fewer resources related to younger children being more likely to rectify the inequity.

All of the studies discussed so far use resource distribution as the primary method for investigating fairness. Fair resource distribution and resource exchange has been posited to provide the basis for developing moral inferences and understanding prosocial behavior (e.g., Lucas et al., 2008; Rutland & Killen, 2017). But understanding and engaging in fair behavior involves more than just making equitable resource distributions. Living among others involves appreciating cooperative social contracts (e.g., Bregant et al., 2016), which extend beyond how resources are distributed. If children's preferences for equity in their distribution of resources signify a broader concept of fairness, we would expect to see preferences for other kinds of equitable behaviors. To this end, the goal of the present studies is to consider children's inferences about equity from the perspective of collecting resources, instead of distributing resources to others. If children are developing a broad conception of fair behavior, reciprocity and justice, then they should show similar patterns in their endorsement of equity in resource distribution as well as resource collection.



Resource collection in general is an underexplored topic within developmental science. Classically, it has been explored by a handful of studies on children's understanding of taxation. For instance, an important transition to adulthood is the realization that societies function on the collection of resources from individuals for the purpose of redistribution for common projects and programs (e.g., taxes). Strauss (1952) documented that children between the ages of 6–10 understood that taxes existed, but did not recognize their purpose or the relation between taxes and public goods or works (see also Furth et al., 1976; Jahoda, 1979; Schug, 1987). More generally, adults' beliefs in an equitable society, which includes the belief that taxes are fair, relates to individuals' well-being and their belief in the strength of their society (e.g., Wilkinson & Pickett, 2009) as well as people's willingness to comply with laws (e.g., Batrancea et al., 2019; Hofmann et al., 2008). These findings suggest the importance of understanding the developmental origins of equitable resource collection and its relation to resource distribution.

To give an overview of the present investigation, Experiment 1 considers the basic question of whether children collect resources from others based on equality (taking the same number of resources from everyone, regardless of their starting state) or equity (taking a different amount of resources from individuals to rectify inequities in starting state). Experiment 2 then reproduces this finding on a new sample where we observed the most age-related change in Experiment 1, while also asking children to justify their response. The question is whether equitable resource collection relates more to children's understanding of fairness, as opposed to other ways of justifying their collections. Experiment 3 then reproduces the finding again, while also contrasting children's judgment about equitable collection with a similar case of equitable distribution.

2 | EXPERIMENT 1

Four- to 8-year-olds were shown a set of child characters in a classroom, who had all brought in resources for two projects – one they would do themselves and the other they would do together as a class. Each child character brought in a different number of resources, and children were introduced to a pair of characters who had different amounts (in particular, one had three, the other two). Children were asked what the teacher should do when collecting resources for the class project, take an equal amount from the two characters, preserving the initial inequity or take an amount that left them with an equal amount at the end, rectifying the inequity.

The method we used was an extension of the method used by Sobel and Blankenship (2021), in which the characters started with a small inequity, and children had to respond by making a forced choice about what resources to take, instead of freely taking resources from the characters. We did this for two reasons. First, this method specifically required children to choose an end state in which the initial inequity was either preserved or rectified. Second, this method established a baseline to compare with an analogous resource distribution task (used in Experiment 3).

2.1 | Methods

2.1.1 | Participants

One hundred thirty children between the ages of 47.60 and 107.90 months participated (70 girls, 60 boys, $M_{age} = 77.69$ months, $SD = 18.40$). The sample was divided into five groups of 26 children at each of the ages between 4 and 8. Children were recruited from a database of birth records and tested in a laboratory at Brown University (about 10% of the sample), or recruited from the floor of Providence Children's Museum (PCM), and tested in a dedicated space at the museum (about 90% of the sample). Data collection took place between October 2018 and August 2019.

Sample size was chosen based on an a priori power analysis for a binomial logistic regression, performed in GPower, assuming a large effect size (Odds Ratio = 3.0), $\alpha = 0.05$, $\beta = 0.20$, and a two-tailed analysis. This analysis posited a sample of 131, but museum data collection prevented us from completing the full sample. Children's racial and ethnic identities as well as other demographic information were not recorded based on the agreement between the research laboratory and the museum. However, there was a set of investigations done by this research group at PCM where demographic information was able to be collected ($N = 318$). Table 1 shows the racial/ethnicity sampling statistics (based on self-reported, open-ended categories) as well as information about parental education level and household income. We believe that these statistics are also representative of the present sample, and the diversity of the population, as measured by the 2020 Census.

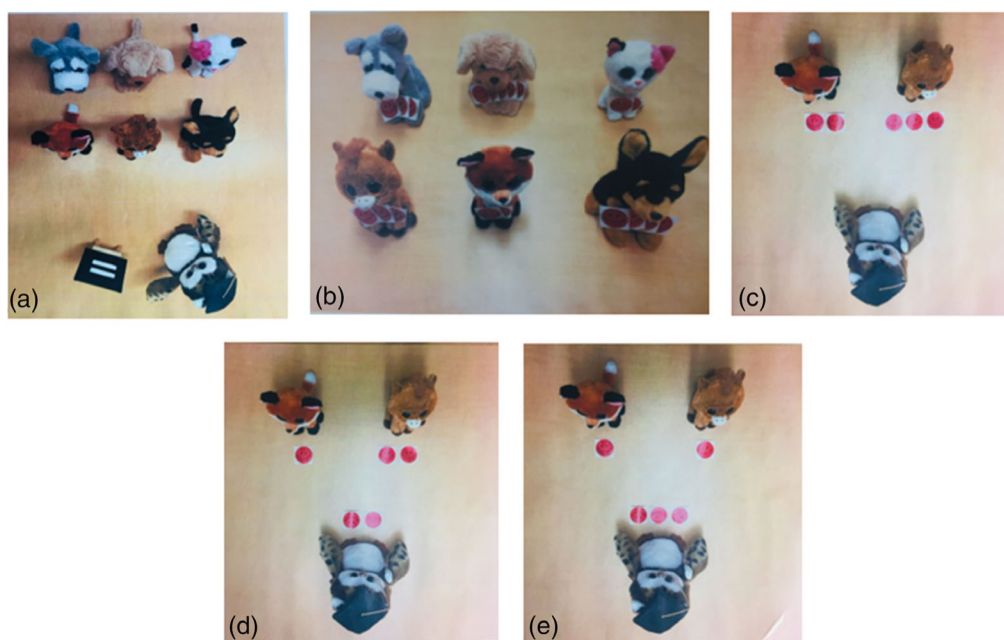
2.1.2 | Materials and procedures

Children were shown a set of photos, shown in Figure 1. In the first photo, there were six stuffed animals facing a larger stuffed owl (called Mr. Owl) standing next to a bulletin board with an equal sign on it. The second photo showed the same six stuffed animals, each with a pile of stickers next to them. Two of the animals had two stickers. Two had three stickers. One had four stickers and one had five stickers. The third photo depicted one of the animals with three stickers and one of the animals with two stickers together with Mr. Owl. The animals used here were Fox and Pony, although who had two stickers and who had three were counterbalanced, so pictures representing each situation were created. Finally, the fourth and fifth photos showed the same three characters. In one, Fox and Pony with one sticker each, and the rest of the stickers were with Mr. Owl. In the other, whomever started with three stickers now had two, and whomever started with two stickers now had one and the others were with Mr. Owl.

All studies reported here were approved by the Brown University IRB under protocol #1701001674. For all studies reported here, parents were present during children's participation. The experimenter showed the child the first picture of the six stuffed animals across from the Owl (see Figure 1a). She said, "Here's a classroom. This is Mr. Owl [indicating the owl stuffie] and all of his students [indicating the other

TABLE 1 Demographic information from studies run by research group collected at providence children's museum

	White/Caucasian	Black/African American	Hispanic/Latinx	Asian/Asian American	Mixed Race/Ethnicity	Native American	Not responding
Racial/Ethnic Category	53%	3%	7%	4%	16%	0.3%	17%
	Some High School	High School Diploma/GED	Some College, No Degree	Assoc. Degree	BA	MA or Higher	Not responding
Parent Education	1%	7%	14%	8%	31%	36%	3%
	Below 30K	30K–50K	50K–70K	70K–90K	90K–120K	Above 120K	Not responding
Household Income	7%	13%	14%	14%	21%	23%	8%

**FIGURE 1** Stimuli used in resource collection procedure. Children are initially introduced to the teacher Mr. Owl and the class, and they are told that the class is a fair class (a). Students bring in stickers for a class art project and an individual art project. Students bring in different numbers of stickers (b). Mr. Owl looks at Pony and Fox who brought in different number of stickers (c). Children are asked what Mr. Owl should do: take one sticker from each of Pony and Fox (d) or take two stickers from the character with more and one from the character with less, leaving them with the same number (e)

six stuffed animals]. Mr. Owl says that everyone in the classroom must be fair [pointing to the equal sign on the blackboard]. This is a fair classroom. Mr. Owl says that tomorrow, everyone is going to do art projects and the students must bring in stickers for the projects.”

The experimenter then showed the second picture of the six stuffed animals with different amounts of stickers (Figure 1b). She said, “So the next day, the students come in with stickers.” She then points out how many stickers each of the animals have and said, “Let’s see what Mr. Owl does with Fox and Pony.”

The experimenter then introduces the third picture (shown in Figure 1c) in which Fox and Pony are facing Mr. Owl. One has three stickers; the other two (counterbalanced, but for this demonstration Pony will have three stickers and Fox two). The experimenter points out

how many stickers Pony and Fox have. The experimenter then says, “Mr. Owl needs stickers for the art project, but Pony and Fox need stickers for their part of the project too. So, what should Mr. Owl do?” At this point, she introduces the fourth and fifth pictures (Figure 1d,e), which depict the possible responses to this test question. She describes them by saying, “Do you think Mr. Owl should take one sticker from Pony and one sticker from Fox? [indicating this on the appropriate picture] or should Mr. Owl take two stickers from Pony and one sticker from Fox? [indicating this on the other picture].” Children were then given the opportunity to respond by pointing to the picture that depicted their choice.

After children responded, we gave them a comprehension check question. The experimenter took the picture that showed the initial



inequity between Pony and Fox and asked whether Pony had more stickers, Fox had more stickers, or they had the same.

2.2 | Results

Deidentified data, stimuli, and analysis code are available at https://osf.io/rcwg3/?view_only=3d182b36d9324e74ad787a97424f14a3. We gave children who chose the equitable collection (leaving both characters with one sticker) a score of 1 and children who chose the equal collection (leaving the characters with an inequity) a score of 0. Boys and girls did not differ in their responses, $\chi^2(1) = 0.10$, $p = 0.75$. We also considered if responses differed based on our counterbalancing, but no significant result was found, Wald $\chi^2(7) = 7.26$, $p = 0.40$. As a result, we did not consider these variables further.

To analyze the effect of age, we constructed a Generalized Linear Model assuming a binomial logistic dependent measure, looking at children's age in months as the independent variable. This revealed a main effect of age, $B = 0.04$, $SE = 0.01$, 95% CI [0.02, 0.07], Wald $\chi^2(1) = 13.26$, $p < 0.001$. Four-year-olds (38%) and 5-year-olds (38%) chose the equitable collection no different from chance values (50%), both Binomial tests, $p = 0.33$. Six-year-olds (73%), 7-year-olds (77%), and 8-year-olds (85%) chose the equitable collection greater than chance levels, all Binomial tests, all p -value < 0.03 .

Finally, we considered performance on the comprehension check. One hundred twenty-three children (95% of the sample) responded correctly on this question. When the seven children who did not respond correctly were excluded from the sample, the same pattern of significant results was obtained.

2.3 | Discussion

Between the ages of 4 and 8, children change their inferences about how a teacher should balance taking resources from students with different initial amounts so that the student can have their own resources, but also contribute to the group project. Four- and 5-year-olds chose equally between these two options. The 6- to 8-year-olds in this study reliably chose to rectify the inequity, with age 6 being a transition point in the way children responded. This suggests further investigation around this age group to examine potential mechanisms for the shift in children's responses.

3 | EXPERIMENT 2

Experiment 2 examined the age-related change described in Experiment 1 in terms of children's ability to articulate mechanisms of fairness. Five- to 7-year-olds were presented with the same measure as in Experiment 1, but also asked to articulate the reason behind their choice. The goal of this investigation was to consider whether children who made an equitable choice justified their response in terms of the fairness of the action.

3.1 | Methods

3.1.1 | Participants

Sixty-nine children between the ages of 60 and 95 months participated (28 girls, 41 boys, $M_{age} = 77.84$ months, $SD = 10.66$). Sample size was chosen based on an a priori power analysis for a binomial logistic regression, performed in GPower, assuming a large effect size (Odds Ratio = 3.0), $\alpha = 0.05$, $\beta = 0.20$, and a two-tailed analysis. The sample was divided into three groups of 23 children at each age (5-, 6-, and 7-year-olds) to ensure that age was not skewed. Children were recruited from a database of birth records and tested in a university laboratory (about 20% of the sample), or recruited from the floor of the same children's museum as in Experiment 1, and tested in a dedicated space at that institution (about 80% of the sample). Data collection took place between January and July, 2022. Children's racial and ethnic identities were not recorded, but children were recruited from a predominantly white, middle-class urban community. Those tested in person at the museum had similar demographics as in Experiment 1.

3.1.2 | Materials and procedures

The same materials from Experiment 1 were used here. The procedure was identical, except that after children made their choice between the equal and equitable collection, they were asked to justify their choice, with the experimenter saying, "Why did you choose that picture?"

3.1.3 | Coding

Choices were recorded in the same manner as Experiment 1. Children's justifications were coded in three ways. First, we considered whether the justification was from the perspective of one of the students or from Mr. Owl (e.g., "Mr. Owl needs lots of stickers for the class project"). Second, we considered whether the justification contained a reference to the number of stickers the students had left or the number of stickers taken from the students (e.g., "Because he takes one from each"; "Now they are equal"). Finally, we considered whether children mentioned fairness in their justification (e.g., "Because that is the fair thing to do"). These three codes were not mutually exclusive, so children could mention any or all of these factors in their justification. Two undergraduate research assistants coded these justifications. Agreement was 90% with disagreement resolved by the fourth author.

3.2 | Results

Overall, 75% of the sample chose to make the equitable response. No child failed the numerical comprehension check. Boys and girls did not differ in their responses, $\chi^2(1) = 0.26$, $p = 0.61$. We also considered if responses differed based on our counterbalancing, but no significant

TABLE 2 Spearman correlations (i.e., $r_s(67)$ -values) and p -value (in parentheses) among Equitable Choices, Age, and Justification in Experiment 2

	Takes Mr. owl's perspective	Mentions number or equality	Mentions fairness	Age in months
Makes equitable choice	0.21 $p = 0.08$	0.004 $p = 0.98$	0.33* $p = 0.005$	0.29* $p = 0.02$
Takes Mr. Owl's perspective		0.43 $p < 0.001$	0.14 $p = 0.25$	0.32* $p = 0.008$
Mentions numeracy			-0.08 $p = 0.51$	0.10 $p = 0.42$
Mentions fairness				0.10 $p = 0.40$

result was found, Wald $\chi^2(7) = 5.19$, $p = 0.64$. As a result, we did not consider these variables further.

When looking at children's justifications, 84% of the sample of children mentioned Mr. Owl's perspective in their justification, 83% of the sample mentioned the number of resources the students had remaining or that Mr. Owl took, and 33% mentioned fairness. Table 2 shows the zero-order correlation matrix among children's age, choice of equitable decision, and the three ways in which they could justify their decision. As can be seen in that table, there were significant correlations between children's equitable response and their age, $r_s(67) = 0.29$, $p = 0.02$, and whether they justified their response in terms of fairness, $r_s(67) = 0.33$, $p = 0.005$.

To consider the unique contribution of these two variables, we constructed a stepwise binomial logistic regression, first considering the role of age, and then whether children generated a justification in terms of fairness. The first model was significant $\chi^2(1) = 6.22$, $p = 0.01$. Overall, the second model was also significant, $\chi^2(2) = 14.83$, $p < 0.001$, as was adding the fairness code from the first model to construct the second model, $\chi^2(1) = 8.62$, $p = 0.003$. In this second, final model, age (in months) was a significant predictor, $B = 0.07$, $SE = 0.03$, Wald $\chi^2(1) = 4.79$, $p = 0.03$, Odds Ratio = 1.07 as was whether children generated a justification that appealed to fairness, $B = 2.45$, $SE = 1.09$, Wald $\chi^2(1) = 5.10$, $p = 0.02$; Odds Ratio = 11.59. Indeed, 96% of the children who mentioned fairness in their justification chose an equitable collection, significantly different from chance responding, Binomial test, $p < 0.001$. Only 65% of children who did not appeal to fairness in their justification did so, only a marginal trend, Binomial test, $p = 0.054$.

3.3 | Discussion

Experiment 2 reproduced the age-related change demonstrated in Experiment 1 while also narrowing in on the age range of that change; in particular, the older children in this sample of 5- to 7-year-olds were more likely to make equitable collections. Experiment 2 also showed that, independent of age, justifying one's choice in terms of fairness also related to making an equitable collection. The development of reliably

choosing to make equitable decisions in resource collection was related to children's ability to articulate fairness as a mechanism for doing so, and possibly their conceptions of fairness, generally construed.

To consider whether children's judgments of equitable collection related to their broader concepts of fairness, in Experiment 3, we considered the relation between choices to make equitable collections and choices to make equitable distributions. Here, we used the distribution task from Sobel and Blankenship (2021), to attempt to equate this measure with the collection measure. The goal was to consider whether equitable resource collection was correlated with equitable resource distribution.

4 | EXPERIMENT 3

4.1 | Methods

4.1.1 | Participants

Seventy-seven children between the ages of 59.60 months and 96.00 months participated (45 girls, 32 boys, $M_{age} = 75.15$ months, $SD = 10.88$). Sample size determined through power analysis, based on GPower for an inequality between two dependent proportions, assuming a large effect size (Odds Ratio = 3.0), $\alpha = 0.05$, $\beta = 0.20$, and a one-tailed analysis (because Experiment 1 suggested a directional hypothesis). Three other children were tested, but not included in the final sample, as they were out of the relevant age range (one young 4-year-old and two older 8-year-olds). The sample was collected between January 2019 and October 2021. Unlike Studies 1–2, because data collection was performed during the height of the COVID pandemic, 17 children were tested in person and 60 children were tested remotely on zoom. Children were tested from a list of birth records, flyers posted at children's schools, and through interaction at a local children's museum and a local zoo. Children's racial and ethnic identities were not recorded, but children were recruited from a predominantly white, middle-class urban community. Those tested in person at the museum were sampled from similar demographics as in Experiment 1.

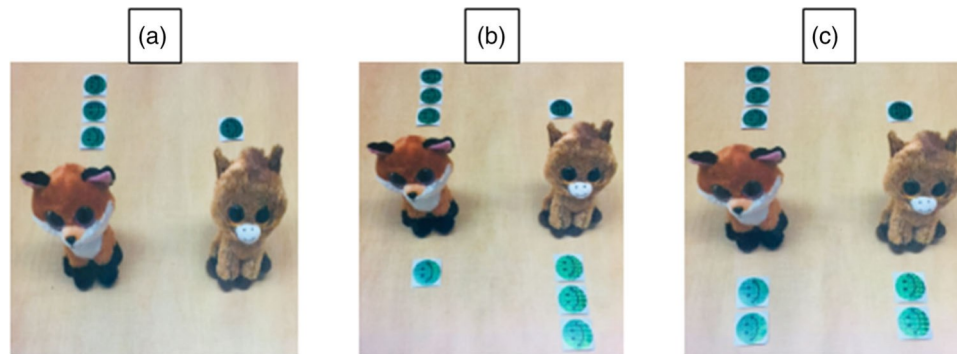


FIGURE 2 Stimuli used in distribution trial of Experiment 3. The initial picture depicting the inequity was shown to children (a). Children had to choose how to distribute four new resources to the two stuffed animals: by resolving the inequity (b) or by distributing equally, preserving the inequity (c)

4.1.2 | Materials

The same pictures from Experiment 1 were used for the resource collection trial. The resource distribution trial used three pictures of the same two stuffed animals, shown in Figure 2: Fox and Pony. In the first (Figure 2a), one stuffed animal had three stickers, the other had one sticker (different colored stickers were used to indicate these were different resources and the animal with more stickers was counterbalanced so pictures with both initial distributions were created). In the second picture (Figure 2b), Fox and Pony now had the same number of stickers (four each). In the third picture (Figure 2c), the animal who initially had three stickers now had five and the animal who initially had one sticker now had three.

4.1.3 | Procedure

For children tested in person, the procedure for the resource collection trial was the same as in Experiment 1. The procedure for the resource distribution trial was as follows. The experimenter introduced the first picture in which the characters had an uneven number of stickers. For the purposes of this demonstration, Pony will start with one sticker and Fox three. The experimenter showed the child the picture and explained that the characters each had a certain number of stickers. The experimenter then said, "I found four more stickers. I'm going to give them to Fox and Pony. Do you think I should give two stickers to Fox and two stickers to Pony [introducing a picture in which Fox now has five and Pony has three], or do you think I should give three stickers to Pony and one sticker to Fox [introducing a picture with Fox and Pony now both have four stickers]?" After children responded, they were asked a comprehension check question in which they were shown the original picture depicting the inequity and asked which character had more stickers or if they had the same. Due to experimental error, six children were not asked the comprehension questions for either the collection or distribution trials.

Children tested on Zoom were led through the same procedure using a PowerPoint presentation, in which the experimenter narrated the trials, showing the pictures one at a time. Because physical points

by the participants could not be deciphered, children were asked to verbalize their answers to all questions.

4.2 | Results

We coded the collection trial in the same manner as Experiment 1. We gave children who chose to make an equitable distribution (resulting in both characters having the same number of stickers at the end) a score of 1 and children who chose the equal distribution (leaving both characters with an inequity) a score of 0. Figure 3 shows the performance of children in the two conditions, juxtaposed with their performance in Experiment 1. Boys and girls did not differ in the responses on either question, both $\chi^2(1)$ -values < 0.41, both p -values > 0.52. We also considered if responses differed based on our counterbalancing, but no significant result was found, Wald $\chi^2(7)$ -values = 11.96 and 9.61 for the collection and distribution cases respectively, both p -values > 0.11. That is, children did not differ on either trial based on which trial they received first. As a result, we did not consider these variables further. There was also no difference between responses of children on both trials tested on Zoom and those tested in person, both $\chi^2(1)$ -values < 2.43, both p -values > 0.11. All children responded correctly on the comprehension check for the resource collection trial and all but two children (96%) responded correctly on the comprehension check for the resource distribution trial. Excluding those two children did not change the results reported below, so we included them in the final analysis.

Fifty-two percent of the sample chose to distribute resources to the two characters equitably, whereas 60% of the sample chose to collect resources from the two characters equitably. To consider children's age and the difference between the trials, we constructed a Generalized Estimating Equation, assuming a binomial logistic distribution on responses to the two test trials, with age (in months), trial type, and which trial they received first as dependent variables, considering a factorial model. This analysis resulted in a main effect of age, with older children more likely to make an equitable response, $B = 0.09$, $SE = 0.03$, 95% CI [0.02, 0.16], Wald $\chi^2(1) = 6.92$, $p = 0.009$. There was also a main effect of trial type, with children making equitable

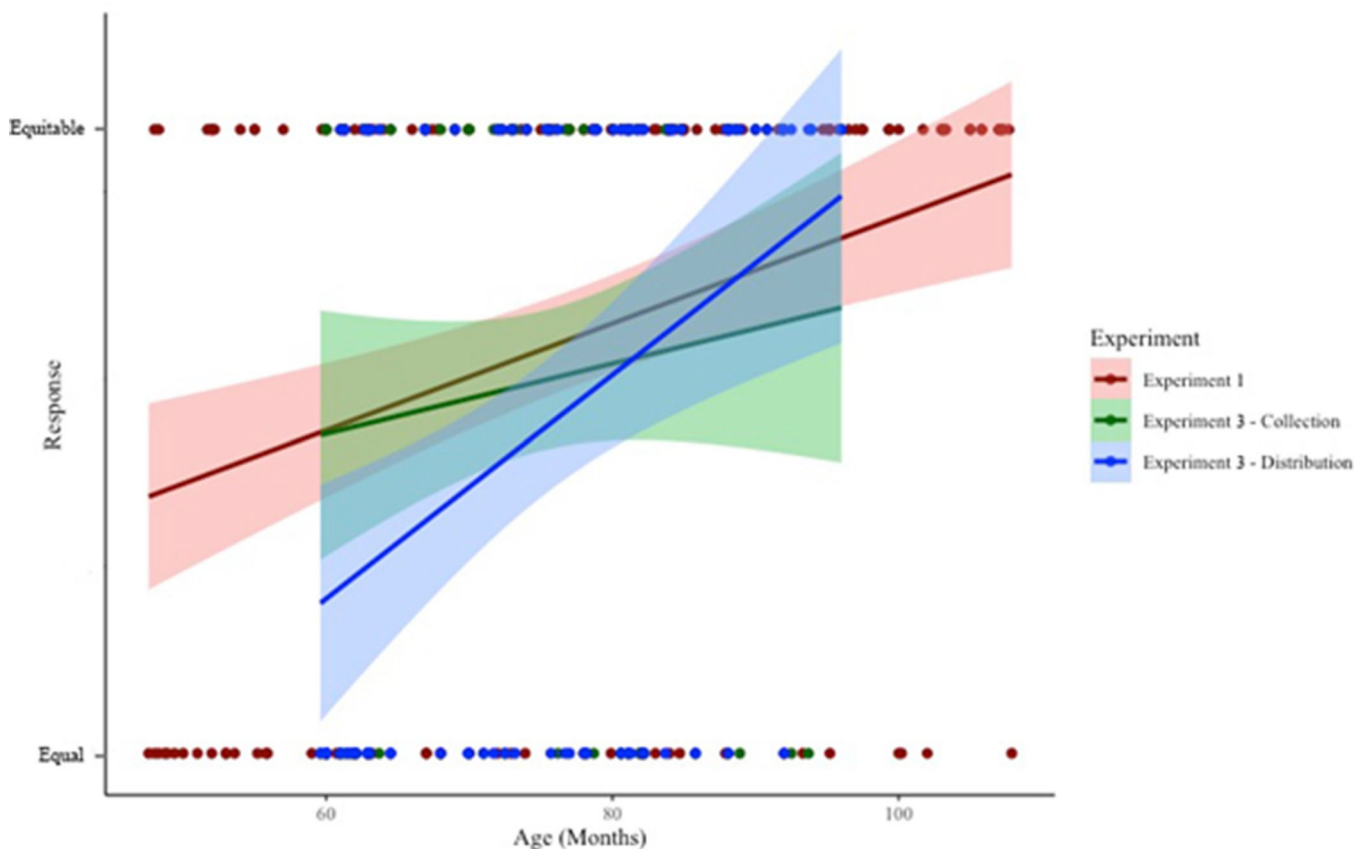


FIGURE 3 Best fitting curves with age (Spearman Correlations) for Equitable Resource Collection Trial in Experiment 1 for 4- to 8-year-olds (Red line), and Equitable Resource Collection (Green Line) and Resource Distribution (Blue Line) for 5- to 7-year-olds in Experiment 3. Shaded area represents standard deviations. Resource collection between the two experiments does not significant differ; resource collection and distribution differed for the younger children in Experiment 3

responses more when asked to collect resources than distribute them, $B = 5.52$, $SE = 2.42$, 95% CI [0.78, 10.26], Wald $\chi^2(1) = 5.21$ $p = 0.02$. There was also an interaction between trial type and age, $B = -0.07$, $SE = 0.03$, 95% CI [-0.13, -0.003], Wald $\chi^2(1) = 4.26$ $p = 0.04$. No other significant main effects or interactions were found.

To investigate the interaction further, we performed a median split by age on the sample. The younger children in the sample chose an equitable response on the collection trial 62% of the time, but only made an equitable response when asked to distribute resources 38% of the time, McNemar $\chi^2(1, N = 39) = 4.92$, $p = 0.02$. In contrast, the older children in the sample chose an equitable response on the collection trial 58% of the time, compared to 66% of the time on the distribution trial, not a significant difference, McNemar $\chi^2(1, N = 38) = 0.26$, $p = 0.61$. Similarly, performance on the distribution trial significantly correlated with age, as children made more equitable distributions as they got older, $r_s(75) = 0.38$, $p < 0.001$. The correlation between age and making an equitable response on the collection trial was not significant, $r_s(75) = 0.12$, $p = 0.32$.

Finally, performance on the resource collection and distribution trials were correlated, $r_s(75) = 0.27$, $p = 0.01$. This indicates that children who made the equity response on the collection trial were also more likely to do so on the distribution trial. This correlation remained

significant when children's age was factored out, $r_s(74) = 0.25$, $p = 0.03$.

4.3 | Discussion

Children's equitable resource collection showed similar age-related change to the data presented in Studies 1–2. Making an equitable response on the resource collection trial was also correlated with making an equitable response on the distribution trial, although younger children were more likely to make an equitable response on the collection than distribution trial. This correlation continued to be significant factoring out children's age.

That preferences for equitable collections appeared to emerge before preferences for equitable distributions suggest two possible interpretations. The first is that resource collection and resource distribution have different developmental origins, particularly regarding infants' appreciation of giving and taking as schemas for action (Tatone et al., 2015; see also Lakusta & Carey, 2015). These studies show that infants treat an event in which one agent gives another agent a resource as social in nature; they expect the giver to repeat that action in a new situation (i.e., to give again). Infants distinguish giving from



taking event, but taking events are not interpreted in the same manner – that is, infants do not interpret the taker as necessarily going to repeat that action (see also Tatone et al., 2021; Ziv et al., 2021, for further studies suggesting infants initially conceptualize collecting resources from others differently from distributing resources to others).

However, if infants have the social norms necessary to create equitable distributions (i.e., giving events), but not equitable collections (taking events), it is necessary to explain why we observed equity in resource collection emerging *before* equity in resource distribution. As a result, we favor a second interpretation, which is that resource distribution and resource collection are part of broader conception of fairness, supported by the observed correlation between equitable responses on the distribution and collection trials. Children might come to recognize these trials as asking similar questions, but with different demand characteristics.

In particular, a speculative possibility for why we observed equitable resource collection before that of equitable distribution in Experiment 3 is that on both trials making an equitable choice involves taking the perspective of the character who starts with fewer resources. Several studies have suggested that children's developing understanding of the social norms of distributive justice are related to their developing perspective taking and theory of mind abilities (e.g., Heck et al., 2018; Paulus & Moore, 2015; Sobel & Blankenship, 2021; Tsoi & McAuliffe, 2020). On this view, in the resource collection trial, the character who started with fewer resources also loses resources. This might make it salient to the child that the character wind up with the same amount as others to ensure fairness. In contrast, on the resource distribution trial, this character gains resources, which does not emphasize the contrast between this character and other as much. This speculation suggests a further investigation: If children are asked to take the perspective of the character with fewer resources (following the procedure used by Sobel & Blankenship, 2021), children might endorse equitable resource collections at even earlier ages. This would speak to better describing the mechanism that underlies the age-related change we have documented.

Our speculative explanation also assumes that children interpret the social context of the resource distribution and resource collection tasks similarly. Although the same characters are used, the resource collection trial specifically introduces children to Mr. Owl and the idea that in the classroom, everyone acts fairly, which is not explicitly stated in the resource distribution trial. Thus, even though there was no effect of trial order (i.e., children didn't differ in their judgments if they received the collection or distribution trial first, thus hearing about the context of the fair classroom by itself might not have influenced the results), further work should consider whether providing children with prompts about fairness and being in a fair group would get younger children to act more equitably.

5 | GENERAL DISCUSSION

Three studies investigated how children collect resources from others. We contrasted whether children would endorse an equal collection

from individuals who started with different amounts of resources (leaving the two individuals with an inequity) or an equitable collection (rectifying the inequity). Experiment 1 showed that children begin to reliably endorse equitable resource collections (in which resources are collected unevenly to create an equal outcome) over equal collections (in which resources are collected evenly to preserve initial inequities) starting at age 6. Experiment 2 reproduced this finding, and showed that the preference for equitable resource collection was more likely to be justified by appealing to fairness. Experiment 3 showed that children's choice of equitable resource collections and equitable distributions were correlated, even when controlling for age, although reliably endorsing equitable collections emerged before endorsing equitable distributions.

These studies represent a novel way of conceptualizing children's inferences about equity and distributive justice, which move beyond the paradigm of asking children about how resources should be distributed. Although we speculate on whether equitable resource collection emerges earlier than equitable resource distribution, the broader findings here are that these two behaviors are related, and that equitable resource collection is justified by appeals to fairness as a mechanism for such decision-making. Understanding that cooperative behaviors involves endorsing certain kinds of resource collections speaks to the hypothesis that children develop a robust concept of fairness, which underlies various moral and prosocial behaviors (e.g., Rutland & Killen, 2017). These data suggest that children have a norm of equity, which they apply to decisions about how resources are appropriated.

Examining how children apply norms of equity when collecting resources from others leads to various questions for future investigations. First, it is unclear how children balance situational factors on the part of individuals, such as their merit or effort, or situational factors on the part of the resources, such as belief about their value or the value of the public work. For instance, the present study simply establishes that there is an initial inequity in the number of resources the students bring in without describing the causes of this inequity, which might affect how children conceptualize fair resource allocation (Rizzo et al., 2020). Similarly, the present study establishes that the resource collection is for a class project – a discretionary project that child participants (or the characters in the story) might care about differently. Would children change their behavior if the project was more entitlement-based – that is, if Mr. Owl collected stickers to ensure that later all members of the class had stickers for subsequent individual projects?

Second, we suggested that an impetus for studying equitable resource collection was the small literature on children's understanding of taxation. Tax structures – the most obvious analog for resource collection – are progressive, but also proportional. Given inequities of different sizes, at what point do participants move from simply equating the end states to collecting proportionally based on them? This relates to how children integrate judgments of resource collection with their understanding of wealth and the status quo (e.g., Elenbaas, 2019; Elenbaas et al., 2016; Paulus, 2016; Zhang et al., 2021) as well as the extent to which children can make judgments about proportional distributions (McCrink et al., 2010). Moreover, the work on taxation is part of a larger body of literature suggesting a prolonged developmental

trajectory for various informal economic concepts (e.g., Leiser & Halachmi, 2006; Smith-Flores et al., 2021; Thompson & Siegler, 2000). Relations between choices to make equitable resource collection and distribution might serve as a cognitive foundation for these broader economic decisions and concepts. For example, resource collection might be a way of considering concepts of justice beyond inferences about equity; at some point, resource collection might seem punitive. If, for example, one student has 10 resources and the other has 2, is it fair to take 9 from the first and 1 from the second? At what point (if ever) do children recognize that making certain kinds of equitable collections might be less preferable than making others? Moreover, is this an individual difference that has meaning towards more mature economic concepts?

Third, while the present data suggest a similarity between the mechanism that underlies children's equitable resource collection and their equitable resource distribution, an open question is to what extent equitable decision making generalizes to other measures of prosocial behavior. For example, on measures of public works games, children begin to engage in conditional cooperation – cooperating in public investment if others do as well – around the same time as the equitable resource collection demonstrated here (e.g., House et al., 2013; Vogelsang et al., 2014). Are these mechanisms also related, and if so, how?

Fourth, an open question is the extent to which children engage in similar equitable resource collections when judgments include their first-person perspective. That is, when children themselves stand to lose resources, do they make similar inferences about distributive justice as they do about the third-party judgments used here? This might be important when one also considers that in these studies, children were tested with a parent present. Several studies have shown that children's prosocial behavior is affected by concerns for their reputation, and particularly starting around the age of 5, they recognize that others might be evaluating their prosocial decisions (e.g., Engelmann et al., 2013, 2018; Fu et al., 2016; Fujii et al., 2015; Leimgruber et al., 2012; see also Van Vugt & Hardy, 2010, for related results on adults). It is possible, then, that children's emerging preferences for equity, especially if they are a beneficiary of the inequity, would be affected by whether their decision was public or private.

While the questions raised here are all important lines of investigation for future research, they illustrate how the present studies present a novel paradigm for considering children's prosocial behavior and understanding of fairness. These findings represent an initial investigation into the ways in which children appreciate how resources are collected fairly, which we posit is the basis for a broader understanding of fairness and social contracts, as well as children's emerging folk economic concepts.

AUTHOR CONTRIBUTIONS

David M. Sobel and Jayd Blankenship conceptualized the project and designed Study 1. Jayd Blankenship collected data for Study 1. David M. Sobel and David G. Kamper conceptualized and design Study 2. David G. Kamper collected the data for Study 2. David M. Sobel, Jayd Blankenship, and Mary Rose Yockel conceptualized and designed Study 3. Jayd

Blankenship, Mary Rose Yockel, and David G. Kamper collected data for Study 3 and supervised coding and data entry for Studies 1–3. David M. Sobel analyzed data and wrote the first draft of the manuscript. All authors provided comments on the manuscript.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Deidentified data, scripts and results of power analyses are available at https://osf.io/rcwg3/?view_only=3d182b36d9324e74ad787a97424f14a3

ENDNOTE

¹Specifically, $3+x = 1+y$ and $x+y = 4$.

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