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Children use partial resource sharing as a cue to friendship



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ABSTRACT

Resource sharing is an important aspect of human society, and how resources are distributed can provide people with crucial information about social structure. Indeed, a recent partiality account of resource distribution suggested that people may use unequal partial resource distributions to make inferences about a distributor's social affiliations. To empirically test this suggestion derived from the theoretical argument of the partiality account, we presented 4- to 9-year-old children with distributors who gave out resources unequally using either a partial procedure (intentionally choosing which recipient would get more) or an impartial procedure (rolling a die to determine which recipient would get more) and asked children to make judgments about whom the distributor was better friends with. At each age tested, children expected a distributor who gave partially to be better friends with the favored recipient (Studies 1–3). Interestingly, younger children (4- to 6-year-olds) inferred friendship between the distributor and the favored recipient even in cases where the distributor used an impartial procedure, whereas older children (7- to 9-year-olds) did not infer friendship based on impartial distributions (Study 1). These studies demonstrate that children use third-party resource distributions to make important predictions about the social world and add to our knowledge about the developmental trajectory of understanding the importance of partiality in addition to inequity when making social inferences.

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Introduction

People frequently distribute resources among others, and knowing how, when, and why people give resources to one another is crucial to navigating the complex social world. Indeed, early in development children distribute resources themselves (for a review see Hook & Cook, 1979) and make social judgments about how resources are distributed (e.g., LoBue, Nishida, Chiong, DeLoache, & Haidt, 2011; Shaw, DeScioli, & Olson, 2012). They can also learn critical invisible social information by monitoring others' access to and distribution of resources. For example, children expect people who control resources to be more powerful and hold a higher position in the social hierarchy (Gülgöz & Gelman, 2016) and make sophisticated inferences about who owns resources based on who possesses them (e.g., Nancekivell, Van de Vondervoort, & Friedman, 2013).

A recent partiality account of resource distribution (Shaw, 2013) suggested that one particularly important piece of social information that people may be able to ascertain from observing third-party resource distributions is the strength of people's social allegiances (DeScioli & Kurzban, 2009, 2013). That is, people may infer that when a distributor gives more to one person over another, this is because the distributor likes, or is better friends with, the favored recipient. This account further predicts that these inferences about social relationships should be strongest when the giving is *partial* (based on an individual's social identity) rather than *impartial* (based on an unbiased procedure or cultural norm). Indeed, the partiality account argues that people object to inequality and claim that it is unfair when it is based on personal allegiances (i.e., is partial) but not when it is based on impartial rules. However, these critical predictions regarding inferences about relationships based on partial resource distribution have not yet been tested. Here, we investigated whether children use third-party preferential resource distributions to infer patterns of friendship and when children begin to restrict their inferences about friendship to cases of partial, but not impartial, unequal resource distribution.

Although studies have asked about how social relationships affect resource distribution, the past research focused on how children's own social relationships affect first-person decisions about whom to share with and on how knowing other people's social relationships affects children's expectations about whom third parties will be more likely to share with. For example, preschool aged girls are more likely to share food resources with friends compared with non-friends (Birch & Billman, 1986), and 4- to 6-year-olds will share stickers with friends even at a cost but will not take the same cost to share with non-friends or strangers (Moore, 2009). In addition, preschoolers guide others to share more with friends and family members compared with strangers (Olson & Spelke, 2008) and expect other people to preferentially share with friends compared with disliked peers (e.g., Paulus & Moore, 2014). However, these studies merely tell us that children do nice things for their friends (such as giving them more resources than they give non-friends) and also expect other people to be nicer toward their friends. This research does not tell us whether or not children hold the abstract understanding that how resources are distributed broadcasts a signal to uninvolved third parties about likely patterns of friendship. In our studies, we asked whether children understand the signal value of resource distribution for detecting friendships, even in cases where the child is not involved in any aspect of the distribution.

If the partiality account of fairness (Shaw, 2013) is correct, then children should understand that third-party patterns of giving can serve as a signal of social allegiances. Specifically, children should infer that a distributor is better friends with a recipient who is favored, or that the distributor likes the recipient of spoils more than the non-recipient. Importantly, under this account, advanced reasoning about resource distribution would require understanding that *partial giving* signals friendship, whereas *impartial giving* does not. Therefore, although children may initially assume that giving someone more resources indicates friendship, as children mature into adults they should begin to limit their inferences of friendship to cases where the giving is partial (Shaw, 2013) and should not infer friendship when the giving is predicated on an impartial procedure (e.g., rolling a fair die) or a culturally agreed-on rule (e.g., rewarding higher merit) (Baumard, Mascaro, & Chevallier, 2012; Hook & Cook, 1979). Indeed, if one gives a recipient more based on an impartial procedure or merit, adults certainly do not see the distribution as partial or infer that the distributor favors that person

(Choshen-Hillel, Shaw, & Caruso, 2015). Even children demonstrate sensitivity to partiality in their own decisions about how to distribute resources; for example: 5- to 8-year-olds will create inequity by giving more to one person than another by using impartial rather than partial procedures (Grocke, Rossano, & Tomasello, 2015; Shaw & Olson, 2014) and will give someone more when it is clear that the person worked harder or is more deserving (Hook & Cook, 1979).

Here, we asked whether children also use information about partiality and impartiality when making third-party inferences about friendship from unequal resource distribution. Specifically, we presented 4- to 9-year-olds with vignettes in which a distributor gave more resources to one character than another, and subsequently asked children whether the distributor was better friends with the recipient of the extra resource, was better friends with the non-recipient, or was equally friendly with the recipient and non-recipient. We predicted that children would infer friendship between the distributor and the recipient of the spoils. Because we were particularly interested in whether children understand that *partiality* signals friendship, in the first study we randomly assigned children to one of two conditions. In the Partial condition, the distributor created the inequality in a partial manner by intentionally giving an extra resource to one of two equally deserving recipients. In the Impartial condition, the distributor also created inequality by giving an extra resource to one character, but the distributor determined which character got the extra resource by using an impartial procedure—rolling a fair die. Thus, although the distributor in the Impartial condition still gave more to one character, the giving was not partial. If children expect preferential *unequal giving* in general to signal friendship, then they might infer friendship between the distributor and the recipient in both conditions. On the other hand, if children expect *partiality* to signal friendship, then they might infer friendship between the distributor and the recipient only in the Partial condition.

We predicted that older children would understand that partial inequality implies favoritism, but impartial inequality does not. We know that between the ages of 5 and 8 years children increasingly develop an understanding of partiality. For example, children at this age begin to realize that social relationships (such as being someone's friend vs. enemy) can affect whether decisions are fair or biased (Mills & Grant, 2009), and at the same age children become increasingly tolerant of inequality that is created through an impartial method such as using a randomization device (Shaw, Choshen-Hillel, & Caruso, 2016; Shaw & Olson, 2014). Due to these age differences in understanding partiality, we divided our sample into two age groups: younger children (4–6-years old) and older children (7–9-years old). Overall, we predicted that children of all ages should be able to use unequal giving as a signal to social affiliation and, therefore, would predict a giver to be better friends with the person to whom he gave more. However, we predicted that only older children would understand the importance of partiality, and therefore would be more likely than younger children to refrain from inferring friendship between the distributor and the recipient of the extra resource in cases where the inequality was created using an impartial procedure. That is, with age children may refine their predictions about the signal value of unequal giving based on their understanding of whether the giving actually indicated partiality on the part of the distributor.

General method

Participants were tested on-site at a science museum in a midwestern U.S. city and had written parental consent before participating. The institutional review boards at the university and the museum approved all procedures. The studies took place between summer of 2015 and fall of 2016. Due to variability in the daily number of visitors, we set our stopping criterion for data collection as the end of the day on which there were at least 20 participants per age group per condition for each study; this sample size was based on previous research on children's understanding of fairness and partiality (e.g., Shaw & Olson, 2012). In Studies 1 and 2, participants were assigned to condition in a counterbalanced order (e.g., in Study 1 participants were assigned to either the Partial condition or the Impartial condition in alternating order). The studies were designed to be run quickly on the museum floor, so we did not have parents fill out detailed demographic forms and instead collected only information about children's age (to divide the sample into younger and older children) and gender (to gender match the characters in the study to the participants).

Study 1

Method

Participants

A total of 120 participants were assigned to either the Partial or Impartial condition. The Partial condition included 33 younger children ($M_{\text{age}} = 5$ years 4 months, $SD = 10$ months; 21 girls) and 28 older children ($M_{\text{age}} = 8$ years 0 months, $SD = 12$ months; 14 girls). The Impartial condition included 27 younger children ($M_{\text{age}} = 5$ years 6 months, $SD = 11$ months; 11 girls) and 32 older children ($M_{\text{age}} = 8$ years 6 months, $SD = 11$ months; 11 girls).

Procedure

In each condition (Partial or Impartial), children were introduced to three gender-matched characters, placed in a triangle with a central character on top and two characters on the bottom (Fig. 1). The top character, the distributor, gave out five erasers to the recipients on the bottom. The distributor first gave two erasers to each recipient and then gave the last eraser to one of the two recipients (side counterbalanced across participants), meaning that one recipient received three erasers, whereas the other received two. Children were then asked who the character on top was better friends with (see Appendix for scripts). Children's choices were recorded as picking either the recipient of the extra eraser, the non-recipient, or both characters.

What differed between the conditions was how the final eraser was distributed. In the Partial condition, the distributor intentionally chose which of the two bottom recipients received the final eraser. In the Impartial condition, however, the distributor rolled a fair die to determine which character would receive the final eraser. If participants understood that rolling the die was an impartial procedure, and they form inferences about friendship based on partiality, then children in the Impartial condition should be less likely to use the unequal outcome to make an inference about the distributor's friendship than children in the Partial condition.

Results

No gender differences were found in this study or any subsequent studies, so we collapse across gender for the remainder of this article. In addition, all reported p values are two-tailed.

First, we asked whether children's patterns of responses were significantly different in the Partial condition and Impartial condition. To do this, we ran 3 (Choice) \times 2 (Condition: Partial vs. Impartial) chi-square tests for both age groups. Whereas younger children did not show different responses in the Partial and Impartial conditions, $\chi^2(2, N = 60) = 0.01, p = .994$, Cramer's $V = .01$, older children did $\chi^2(2, N = 60) = 29.45, p < .001$, Cramer's $V = .70$, suggesting that older children pay attention to whether inequity is created using partial or impartial procedures when reasoning about friendship patterns (Table 1).

Children in the Partial condition expected the distributor to be friends with the recipient of the extra eraser. A one-way likelihood ratio chi-square revealed that younger children chose the recipient more often ($n = 20$) than the non-recipient ($n = 6$) or both characters ($n = 7$), $\chi^2(2, N = 33) = 11.09, p = .004$, and follow-up binomial pairwise comparisons suggested they chose the recipient of the extra eraser significantly more often than the non-recipient ($p = .009$) or both characters ($p = .02$). Older children also chose the recipient ($n = 24$) more than the non-recipient ($n = 0$) or both characters ($n = 4$) in the Partial condition, $\chi^2(2, N = 28) = 35.43, p < .001$, and follow-up binomial pairwise comparisons suggested that they chose the recipient significantly more often than the non-recipient ($p < .001$) or both characters ($p < .001$). Finally, a 3 (Choice) \times 2 (Age) chi-square test revealed that the tendency to choose the recipient of the extra eraser as the distributor's friend was stronger for older children compared with younger children, $\chi^2(2, N = 61) = 6.28, p = .033$, Cramer's $V = .33$.

The two age groups showed significantly different patterns of responses in the Impartial condition, according to a 3 (Choice) \times 2 (Age) chi-square test: $\chi^2(2, N = 59) = 20.65, p < .001$, Cramer's $V = .59$. Younger children continued to be more likely to choose the recipient ($n = 16$) than the non-

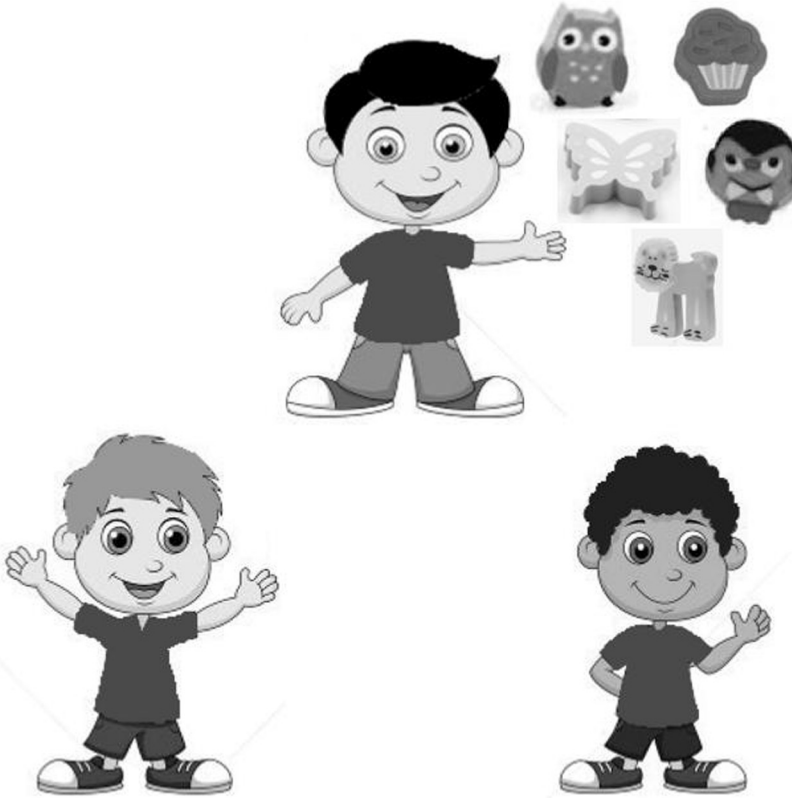


Fig. 1. Experimental setup for Study 1. Children were told a short vignette involving three characters. All characters were gender-matched to the participant. The top character had small erasers and distributed those erasers between the bottom two characters. After the distribution, children were asked who the top character was better friends with.

Table 1

Percentage of children in each age group of each condition of Study 1 and Study 2 who gave each response when asked about friendship.

Partial condition				Impartial condition			
Age (years)	Recipient (%)	Not (%)	Both (%)	Age (years)	Recipient (%)	Not (%)	Both (%)
<i>Study 1</i>							
4–6	61	18	21	4–6	59	19	22
7–9	86	0	14	7–9	16	3	81
<i>Giver</i>				<i>Non-giver</i>			
<i>Study 2</i>							
4–6	72.5	5	22.5	4–6	26	26	48
7–9	76	8	16	7–9	32	20	48

recipient ($n = 5$) or both characters ($n = 6$), $\chi^2 (2, N = 27) = 8.22, p = .016$, and indeed chose the recipient option significantly more often than the non-recipient ($p = .026$) or both characters ($p = .052$) according to follow-up binomial pairwise comparisons. However, older children were more likely to choose both characters ($n = 26$) than the recipient ($n = 5$) or the non-recipient ($n = 1$), $\chi^2 (2, N = 32) = 33.81, p < .001$, and according to follow-up binomial pairwise comparisons chose both characters

significantly more often than the recipient ($p < .001$) or the non-recipient ($p < .001$). Thus, when the unequal giving was impartial, older children expected equal friendship between the distributor and the other two characters, whereas younger children continued to infer friendship between the distributor and the recipient of the extra resource.

Discussion

We found that children make inferences about patterns of friendships based on third-party resource distribution. In addition to using their own social relationships when deciding how to distribute resources with friends compared with non-friends (Birch & Billman, 1986; Moore, 2009), children understand that third-party resource distribution can provide information about others' social affiliations. In particular, children at both ages expected someone who intentionally gave more to one person to be better friends with that person (Partial condition).

However, whereas younger children continued to expect the distributor to be better friends with the character to whom he or she gave the extra eraser, even when the inequity was caused by an impartial procedure, older children considered the method used for distribution and did not expect the distributor to be better friends with the recipient when the recipient was given the extra eraser by an impartial procedure. This suggests that both younger children and older children are able to infer that getting more from someone indicates a likely friendship; however, only older children fully understand the importance of whether the inequity demonstrated *partiality* when making predictions about likely social relationships. Older children in our study understood that inequity caused by impartial procedures does not provide information about social affiliation (see General discussion for an extended discussion of why younger children may fail to grasp this).

Study 2

Whereas older children inferred a specific link between partial giving and patterns of friendship, younger children expected a distributor to be better friends with the person who was given more resources, even when this inequality was created with an impartial procedure. We interpreted this result as indicating that children at all of the ages we tested inferred social affiliation based on preferential giving and favoritism; children expected the distributor to be better friends with the person to whom he or she gave more resources. However, it is also possible that younger children were not using the distributor's giving to form an inference about his or her specific social relationships at all. In fact, because younger children chose the recipient as the better friend regardless of the nature of the distribution, their choices could have been based on any of the following: expecting the distributor to be better friends with the favored recipient, expecting all people to be better friends with people who have more resources, expecting that the person who received more is more likeable in general, or personally preferring the character with more resources. Indeed, children like people with more resources, and ascribe positive features to wealthier individuals, even if individuals obtained their resources by luck alone (e.g., Li, Spitzer, & Olson, 2014; Olson, Banaji, Dweck, & Spelke, 2006; Shutts, Brey, Dornbusch, Slywotzky, & Olson, 2016). Therefore, younger children may have chosen the recipient of the extra resource as being better friends with the distributor in both the Partial and Impartial conditions of Study 1 because they liked the character with more resources or because they expected other people to like the character with more resources. It is also possible that younger children's choices in Study 1 were due to a recency bias; because the recipient was always pointed to last (because he or she was given the final eraser), young children may have chosen the recipient based on low-level cueing to that character.

In Study 2, we investigated these alternatives by asking whether younger children's expectations about friendship merely rely on the fact that the recipient ended up with more resources or whether even the younger children are inferring that the distributor's giving indicates a specific friendship between the distributor and the recipient of the spoils. If younger children infer friendship based on the outcome of the distribution alone, or merely choose to point to the most recently cued location, then they should continue to pick the recipient when asked about the friendship of an involved third

party. However, if these younger children understand that partial giving signals a specific friendship between the people involved in the giving interaction, then they should infer friendship between the distributor and the recipient of favorable treatment, but not necessarily between an uninvolved third-party and the recipient.

Method

Participants

A total of 121 participants were assigned to either the Giver condition or the Non-giver condition. The Giver condition included 40 younger children ($M_{\text{age}} = 5$ years 7 months, $SD = 9$ months; 21 girls) and 25 older children ($M_{\text{age}} = 8$ years 8 months, $SD = 12$ months; 17 girls). The Non-Giver condition included 31 younger children ($M_{\text{age}} = 5$ years 6 months, $SD = 11$ months; 24 girls) and 25 older children ($M_{\text{age}} = 8$ years 5 months, $SD = 11$ months; 8 girls).

Procedure

Children heard a vignette like the Partial condition of Study 1 except that there was an extra character who did not have any erasers to distribute. The four characters were the Giver (a partial distributor), the Non-giver (an uninvolved third party), and the two recipients. To help children track the roles, the Giver and Non-giver wore different colors than the recipients, and different colors than each other, and they were referred to by their shirt color. The Giver condition was a direct replication of the Partial condition of Study 1 except that children were introduced to an extra character, the Non-giver, who did not participate in the interaction (see Appendix for scripts). The Non-giver condition was similar except that at the end of the study children were asked the friendship question for the Non-giver rather than for the Giver (distributor). Participants also answered a memory question about which character gave out erasers by pointing to either the Giver or the Non-giver.

Results

Fully 97% of children correctly answered the memory question. All participants were included in the analyses, but results did not change if participants who failed the memory check were excluded.

Importantly, friendship responses in the Giver and Non-giver conditions differed significantly from each other. In both age groups, 3 (choice) \times 2 (Giver vs. Non-giver) chi-square tests found that children had different friendship inferences based on which character they were asked about: younger children: $\chi^2(2, N = 71) = 16.14, p < .001$, Cramer's $V = .48$; older children: $\chi^2(2, N = 50) = 9.77, p = .008$, Cramer's $V = .44$. Therefore, even younger children were not always biased toward picking the character who ended up with more resources, or toward picking the character who was pointed to most recently (always the recipient); their responses about friendship varied depending on whether they were asked about the Giver or the Non-giver.

As expected, children's choices in the Giver condition replicated the Partial condition of Study 1. Younger children's friendship choices differed from chance $\chi^2(2, N = 40) = 29.45, p < .001$; they chose the recipient ($n = 29$) more often than the non-recipient ($n = 2$; binomial $p < .001$) or both characters ($n = 9$; binomial $p < .001$). Older children's responses also differed from chance $\chi^2(2, N = 25) = 20.72, p < .001$; they chose the recipient of the extra eraser ($n = 19$) more often than the non-recipient ($n = 2$; binomial $p < .001$) or both characters ($n = 4$; binomial $p = .002$). Results for the Giver condition did not differ significantly across age groups, $\chi^2(2, N = 65) = 0.58, p = .750$, Cramer's $V = .09$.

However, children's inferences about friendship were different in the Non-giver condition. Older children did not respond differently from chance $\chi^2(2, N = 25) = 2.96, p = .228$. Numerically more children in the older age group chose both characters ($n = 12$) than the recipient ($n = 8$) or the non-recipient ($n = 5$). Similarly, younger children's friendship inferences did not differ from chance $\chi^2(2, N = 31) = 3.16, p = .206$, but numerically more children chose both characters ($n = 15$) than the recipient ($n = 8$) or the non-recipient ($n = 8$). The results for the Non-giver condition did not differ across age groups, $\chi^2(2, N = 56) = 0.39, p = .824$, Cramer's $V = .08$.

Discussion

Replicating our previous results, children in both age groups continued to use partial giving to infer that the distributor was better friends with the recipient of the extra resource than the one who did not receive the extra resource. Extending our previous results, we found that this inference was not merely based on liking the character who had more resources. Children in both the younger and older age groups did not expect the character with more resources to be better friends with an uninvolved third party and, if anything tended to infer that the uninvolved character would have equal friendship with the recipient and the non-recipient. Thus, even younger children were sensitive to each character's role in the distribution and selectively chose the recipient as the friend of the partial distributor, suggesting that children of all ages that were tested make specific inferences about the distributor's social affiliations based on how he or she distributes resources.

Study 3

We argue that, as predicted by the partiality account of fairness, the first two studies suggest that children are able to use partial unequal resource distributions in order to infer patterns of friendship between the distributor and the recipient of the spoils. This demonstrates that when children are asked to make an inference about friendship, they do. However, it is possible that children would not spontaneously infer friendship on seeing a preferential resource distribution. That is, children may have made the inference about friendship only on hearing a forced-choice question about whom the distributor was better friends with and might not have spontaneously used the distribution itself as evidence of friendship and favoritism. If we had instead asked them "Who did a better job?" or "Who was more powerful?" children may also have picked the person who received more. Therefore, we designed an additional study to measure children's spontaneous inferences in which, before mentioning anything about friendship or affiliation, we asked children "why?" the distributor gave more to one person than the other.

Specifically, after introducing participants to the three characters in the study, and showing an unequal distribution, we asked children, "Why did he [the distributor] give out the last eraser to this person [the recipient who received more]?" If children spontaneously infer social allegiances due to the partial favoritism, then we predicted that they should be likely to mention "friendship" or "liking this person better" as the reason for preferential giving in their open-ended responses because these types of responses each indicate that the distributor is more socially connected to the recipient than to the non-recipient. Children could, of course, make multiple inferences in this case: thinking that the distributor gave more because the recipient liked erasers more, because the recipient needed the erasers more, because the recipient did a better job, because the recipient was more powerful, or because of some "other" reason such as "just because." Indeed, because open responses can be extremely variable and hard to code for younger children, this type of open-ended "why" measure is likely to underestimate children's inferences of friendship. Therefore, after children responded freely, we also asked them a forced-choice question about whether the distributor gave out the last resource to the recipient because they were friends, or because the recipient liked erasers. This question builds on our previous results, and investigates whether children, from a young age, are more likely to think that preferential treatment is based on social alliances as compared with other potentially relevant factors, such as the recipient's preferences.

Method

Participants

A total of 63 participants were tested, including 37 younger children ($M_{\text{age}} = 5$ years 6 months, $SD = 11$ months; 20 girls) and 26 older children ($M_{\text{age}} = 8$ years 6 months, $SD = 11$ months; 12 girls). An additional 2 younger children were tested but were excluded due to experimenter error.

Procedure

Children heard a vignette like the Partial condition of Study 1 except that all references to potential social relationships (e.g., that the children went to school together) were removed and children were

not told that they were going to be asked about friendship. After seeing the distributor give out the resources, children were asked an open-ended question about why the distributor gave the last resource out the way he or she did. Because children's responses to open-ended questions can be difficult to code and are often unrelated to the task at hand (particularly for the youngest children), after the open-ended question, participants were asked a forced-choice question of whether the distributor gave the recipient the extra resource because they were friends, or because the recipient liked the resource (see Appendix for script).

Results

Based on reviewer feedback and on the fact that previous research has established that merit, need, and power are important principles that dictate resource distribution (Gülgöz & Gelman, 2016; Hook & Cook, 1979; Pietraszewski & Shaw, 2015; Sigelman & Waitzman, 1991), we created four categories to code children's open-ended responses: friendship, merit, need, and power. Two independent research assistants, who were blind to the hypotheses, coded the open-ended responses based on whether they fell into these four categories. Although coders were told that the categories were not mutually exclusive, they did not place any response into more than one category. The research assistants were given the following instructions for determining these categories. For the friendship category they were told to code "yes" for responses indicating that the distributor was socially allied with, or better connected to, the recipient such as responses saying that the distributor was better friends with the recipient or liked the recipient better. For the merit category, they were told to code "yes" for responses indicating that the recipient of the extra eraser did a better job or worked harder or that giving the recipient more was more fair. For the need category, they were told to code "yes" for responses indicating that the recipient liked or needed the erasers more or responses referencing the fact that the recipient did not have many erasers. For the power category, research assistants were told to code "yes" for responses saying anything related to social status or power or about the recipient being in charge. Any responses that did not fit these categories were categorized as "other", which accounted for 69.4% of responses.

We then looked at children's responses in the "other" category and examined whether there was any other meaningful, commonly mentioned category. We found that children frequently referred to niceness. Therefore, we added "niceness" as a category and had two different independent coders who were blind to the hypothesis of the study read children's responses and rate whether they were about niceness (about either the distributor or the recipient being nice). Agreement between the coders was high; for each of the coded categories (friendship, power, merit, need, and niceness), the coders agreed on a high proportion of responses (agreement > 92%; Cohen's kappas > .78). Disagreements were resolved by having a third-blind coder rate the statements in any case where the first two coders did not agree. In all cases, the third coder agreed with one of the original coders, and those ratings were used.

Older children spontaneously inferred friendship as the primary motivation behind the distributor's unequal partial distribution. In particular, they inferred that the distributor and the recipient were "friends," "better friends," or "best friends" (46% of responses) more often than they mentioned the recipient's merit (0% of responses), the recipient's need (4% of responses), the recipient's power (0% of responses), or the distributor's or recipient's niceness (19% of responses). Thus, even without providing any information about the characters' relationships and without prompting children to think about friendship, older children expected an unequal partial distribution to be due to favoritism and friendship. Younger children on the other hand were less likely to spontaneously mention friendship. Although they occasionally mentioned friendship (16.5% of responses), merit (3% of responses), need (5.5% of responses), or niceness (25% of responses), the vast plurality of their responses fell into the "other" category (50%) and tended to indicate a lack of knowledge (e.g., "I don't know") or to be unrelated to the question (e.g., "Ghostbusters") (Table 2). These results are in line with work from previous studies suggesting that young children have more difficulty in providing explicit reasoning and justifications for others' decisions (e.g. Damon, 1977; Killen & Stangor, 2001).

Importantly, when asked the same question in a slightly easier, forced choice, manner, children in both age groups understood that friendship likely guided the distributor's decisions about how to give

out resources. That is, when asked whether the distributor gave out the last resource to the recipient because they were friends or because the recipient liked erasers, children in both age groups chose the “friendship” option significantly more often than the “likes erasers” option (younger children: friendship $n = 31$, likes erasers $n = 6$, binomial $p < .001$; older children: friendship $n = 19$, likes erasers $n = 7$, binomial $p = .029$) (Table 3), and children’s responses to this question did not differ based on age (Fisher’s exact test $p = .353$).¹ Thus, when a distributor preferentially gave resources to one of the recipients, children expected friendship between the distributor and the recipient of the spoils to be the reason behind the unequal distribution.

Discussion

These results demonstrate that children reason about the link between unequal partial resource distributions and social alliances even when not asked directly about whom the distributor is better friends with. In fact, children, particularly in the older age group, inferred liking and friendship as the rationale behind an unequal partial distribution when asked an open-ended question about the distribution. Approximately half of the older children spontaneously mentioned friendship as the reason for the distributor’s display of partiality. Furthermore, children at all ages tested expected the reason behind unequal giving to more likely be based on the distributor having a friendship with the recipient than based on the recipient’s preference for erasers. Thus, rather than merely reflecting on the distribution, and reasoning about friendship only when asked directly about friendship by the experimenter, children invoke social alliances on seeing an unequal partial resource distribution, and expect favoritism to be based on patterns of social relationships, such as friendship.

General discussion

In three studies we provide empirical evidence for a theoretical prediction from the partiality account of fairness: Children use unequal giving in third-party resource distributions to make predictions about friendship. We found that children think that if a distributor gives more to one recipient than to another recipient, then the distributor is more likely to like, or be better friends with, the favored recipient. Importantly, children inferred that giving more indicated a specific friendship between the distributor and the recipient of the spoils; they did not use unequal distributions to infer friendship between an uninvolved third party and the recipient of the spoils. Furthermore, children expected strength of friendship to be a primary driver of unequal distributions; when asked why the distributor gave the recipient more, children inferred that the most likely reason for the resource favoritism was liking or friendship. However, there was an interesting developmental change in children’s reasoning about partiality and friendship, which was also predicted by past research and the partiality account of fairness: Whereas older children inferred friendship only based on unequal *partial* distributions, younger children inferred friendship even when the unequal giving was based on an *impartial* procedure. This work suggests that children can make sophisticated inferences about patterns of social affiliation based on resource distribution, and that an understanding of the nuances of partiality develops across childhood.

These results provide converging evidence for an emerging understanding of partiality during middle childhood. Previous work has demonstrated that older children (7 or 8 years) endorse impartial procedures more strongly than younger children (4–6 years) (Shaw & Olson, 2012, 2014; Shaw et al., 2016). We found that at similar ages children begin to believe that giving more to someone using an impartial procedure does not mean that the distributor likes that person more. Although the documented age difference between younger and older children fits with previous findings on partiality (Mills & Grant, 2009; Shaw & Olson, 2014), the precise nature of the developmental change requires further study. Past research shows that younger children understand the difference between partial

¹ In fact, although it may appear that older children were less likely than younger children to choose friendship in the forced choice question, 4 of the 7 older children who picked the “likes erasers” in the forced choice question mentioned friendship spontaneously in response to the open-ended question and may have changed their answer because they found it to be pragmatically strange for the experimenter to ask them again after stating the importance of friendship.

Table 2

Percentage of children in each age group in Study 3 who mentioned friendship, merit, need, power, or niceness, or who made other responses to the open-ended question.

Spontaneous "Why" responses						
Ages (years)	Friendship (%)	Power (%)	Merit (%)	Need (%)	Niceness (%)	Other (%)
4–6	16.5	0	3	5.5	25	50
7–9	46	0	0	4	19	31

Table 3

Percentage of children who chose "friendship" versus "likes erasers" when asked the forced-choice question about why the distributor made her decision.

Ages (years)	Forced-choice responses	
	Friendship (%)	Likes resource (%)
4–6	84	16
7–9	73	27

and impartial processes in some situations. For example, when using a "wheel of fortune" to determine how resources are going to be allocated, 3- to 5-year-olds preferred to play with a fair wheel (which gives equal opportunity to everyone) than an unfair wheel (which is biased toward one person) and were more likely to accept outcomes that were determined by the fair wheel as "fair" (Grocke et al., 2015; Shaw & Olson, 2014). Thus, even younger children seem to appreciate that some procedures for creating unequal outcomes are more fair or impartial than others. Therefore it is possible that younger children know that there is a difference between impartial procedures and partial procedures and would prefer impartial procedures, but they may have a hard time in integrating their social judgments with this understanding (Shaw & Olson, 2014) and might not understand which specific justifications are appropriate for creating inequity (Schmidt, Svetlova, Johe, & Tomasello, 2016). In this case, if younger children were explicitly told or shown that a procedure was impartial or fair, their responses might be more likely to resemble those of older children, such that they may understand that if the unequal giving was fair, it would not give information about the distributor's friendship.

These age differences also lead to interesting novel predictions about the developmental trajectory of reasoning about how resource distributions affect inferences about patterns of friendship. In particular, it is possible that humans begin with an expectation that giving someone more indicates liking or friendship between the distributor and the recipient of the spoils, and that throughout development what they learn is the importance of partiality as well as whether a procedure is partial or impartial. In fact, inferences relating unequal partial giving to friendship may develop even earlier in life than tested here. Indeed, infants form expectations about resource distributions (e.g., Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sloane, Baillargeon, & Premack, 2012) and about patterns of social affiliation based on important social features (e.g., Liberman, Kinzler, & Woodward, 2014; Liberman, Woodward, Sullivan, & Kinzler, 2016; Powell & Spelke, 2013), suggesting that they may also be able to link patterns of resource sharing to patterns of friendship. Then, later in life, these predictions and hypotheses about social relationships may be narrowed as children learn about whether the methods of resource distribution are partial or impartial (Shaw, 2016).

Furthermore, there are many interesting open questions about children's understanding of the link between resource distribution and social structure. Although this research has been framed in terms of how patterns of resource distribution can be used to predict friendship, more work is needed to fully understand children's linking of resource distribution to social relationships. For instance, whereas we do not differentiate between liking and friendship, future research can investigate whether children's inferences are more about the specific and enduring positive relationship between the distributor and the recipient (friendship) or about ranking the distributor's relationship to the recipient as better than

the distributor's relationship to the non-recipient (liking him or her more). In addition, researchers can explore the breadth of social inferences that children can make based on resource distribution. For instance, children form expectations about power (Gülgöz & Gelman, 2016), social status (Shutts et al., 2016), and even personality traits (Tasimi, Dominguez, & Wynn, 2015) based on how resources are given out, and how many resources people end up with. We also know that children have expectations about who will win conflicts over resources (Pietraszewski & Shaw, 2015) and how friendships predict side taking in such conflicts (Pietraszewski & German, 2013). Thus, children might use the same behavior, resource distribution, to make myriad social inferences about the distributor, the recipient, their relationship, what people will do in the future, and each person's likely position in a broader social network. Relatedly, it would also be interesting to investigate individual differences in children's likelihood to make these inferences, and whether those differences are due to demographic factors such as parental education level and socioeconomic status.

Overall, these studies suggest that children are able to use simple third-party vignettes to form important expectations about the social world, and future research can investigate the extent of children's predictions connecting resource distribution to social structure.

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Appendix

Study scripts

All scripts had two versions, one for male participants and one for female participants such that the characters in the story were all gender matched to the participant. The examples here feature scripts used for boys. Scripts were read by an experimenter who pointed to each character as the character was mentioned in the vignette. The pointing sequences are indicated in parentheses in all scripts. In addition, every time the experimenter mentioned a number of erasers, the erasers were placed one at a time next to the person who was receiving them and were counted out (e.g., "He gives two to this boy. [Place one eraser down.] One. [Place second eraser down.] Two.")

Study 1

Partial condition

These boys [circle all kids] all go to school together. This boy [top] has five erasers. He can give his erasers to this boy [left] and this boy [right]. He gives two to this boy [left] and two to this boy [right]. Look, there is one more eraser left over. He [top] gives it to this boy. [Give to left boy or right boy based on counterbalancing.] Who is he [top] better friends with? This boy [left]? This boy [right]? Or both the same?

Impartial condition

These boys [circle all kids] all go to school together. This boy [top] has five erasers. He can give his erasers to this boy [left] and this boy [right]. He gives two to this boy [left] and two to this boy [right]. Look, there is one more eraser left over. He [top] decides to roll this die to decide which boy to give it to. If the die lands on yellow [point to yellow sides], he will give it to this boy [left] and if it lands on pink [point to pink sides], he will give it to this boy [right]. [Experimenter rolls the die.] Look, it landed on [point to side and label the color], so this boy [top] gives it to this boy [give out last eraser according to roll]. Who is he [top] better friends with? This boy [left]? This boy [right]? Or both the same?

Study 2

Giver

These boys [circle all] all go to school together. This boy in green [point to green] doesn't have any erasers to give out. This boy in purple [point to purple] has five erasers to give out. [Move green character out of the scene and move purple to center]. He [purple] can give his erasers to this boy [left] and this boy [right]. He [purple] gives two to this boy [left] and two to this boy [right]. Look, there is one more eraser left over. This boy [purple] gives it to this boy [left or right depending on counterbalancing]. Look, it's the boy in purple! Who is he [purple] better friends with? This boy [left]? This boy [right]? Or both the same?

Non-giver

These boys [circle all] all go to school together. This boy in green [point to green] doesn't have any erasers to give out. This boy in purple [point to purple] has five erasers to give out. [Move green character out of the scene and move purple to center]. He [purple] can give his erasers to this boy [left] and this boy [right]. He [purple] gives two to this boy [left] and two to this boy [right]. Look, there is one more eraser left over. This boy [purple] gives it to this boy [left or right depending on counterbalancing]. Look! The boy in green [point to green] is back! [Move green boy to center.] Who is he [green] better friends with? This boy [left]? This boy [right]? Or both the same?"

Study 3

This boy [top] has five erasers. He can give his erasers to this boy [left] and this boy [right]. He gives two to this boy [left] and two to this boy [right]. Look, there is one more eraser left over. He [top] gives it to this boy [give out based on counterbalancing]. Why do you think he [top] gave it to this boy [recipient based on counterbalancing]? [Record open ended response.] Do you think he [top] gave it to this boy [recipient] because they [top & recipient] are friends, or because he [recipient] likes erasers?

Supplementary material

All of the data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jecp.2017.02.002>.

References

- Baumard, N., Mascaro, O., & Chevallier, C. (2012). Preschoolers are able to take merit into account when distributing goods. *Developmental Psychology*, *48*, 492–498.
- Birch, L., & Billman, J. (1986). Preschool children's food sharing with friends and acquaintances. *Child Development*, *57*, 387–395.
- Choshen-Hillel, S., Shaw, A., & Caruso, E. (2015). Waste management: How reducing partiality can promote efficient resource allocation. *Journal of Personality and Social Psychology*, *109*, 210–231.
- Damon, W. (1977). *The social world of the child*. San Francisco: Jossey-Bass.
- DeScioli, P., & Kurzban, R. (2009). Mysteries of morality. *Cognition*, *112*, 281–299.
- DeScioli, P., & Kurzban, R. (2013). A solution to the mysteries of morality. *Psychological Bulletin*, *139*, 477–496.
- Geraci, A., & Surian, L. (2011). The developmental roots of fairness: Infants' reactions to equal and unequal distributions of resources. *Developmental Science*, *14*, 1012–1020.
- Grocke, P., Rossano, F., & Tomasello, M. (2015). Procedural justice in children: Preschoolers accept unequal resource distributions if the procedure provides equal opportunities. *Journal of Experimental Child Psychology*, *140*, 197–210.
- Gülgöz, S., & Gelman, S. (2016). Who's the boss? Concepts of social power across development. *Child Development*, doi:<http://dx.doi.org/10.1111/cdev.12643>.
- Hook, J., & Cook, T. D. (1979). Equity theory and the cognitive ability of children. *Psychological Bulletin*, *86*, 429–445.
- Killen, M., & Stangor, C. (2001). Children's social reasoning about inclusion and exclusion in gender and race peer group contexts. *Child Development*, *72*, 174–186.
- Li, V., Spitzer, B., & Olson, K. R. (2014). Preschoolers reduce inequality while favoring individuals with more. *Child Development*, *85*, 1123–1133.
- Liberman, Z., Kinzler, K. D., & Woodward, A. L. (2014). Friends or foes: Infants use shared evaluations to infer others' social relationships. *Journal of Experimental Psychology: General*, *143*, 966–971.
- Liberman, Z., Woodward, A. L., Sullivan, K. R., & Kinzler, K. D. (2016). An early emerging system for reasoning about the social nature of food. *Proceedings of the National Academy of Sciences of the United States of America*, *113*, 9480–9485.

- LoBue, V., Nishida, T., Chiong, C., DeLoache, J. S., & Haidt, J. (2011). When getting something good is bad: Even three-year-olds react to inequality. *Social Development, 20*, 154–170.
- Mills, C. M., & Grant, M. G. (2009). Biased decision-making: Developing an understanding of how positive and negative relationships may skew judgments. *Developmental Science, 12*, 784–797.
- Moore, C. (2009). Fairness in children's resource allocation depends on the recipient. *Psychological Science, 20*, 944–948.
- Nancekivell, S. E., Van de Vondervoort, J. W., & Friedman, O. (2013). Young children's understanding of ownership. *Child Development Perspectives, 7*, 243–247.
- Olson, K. R., Banaji, M. R., Dweck, C. S., & Spelke, E. S. (2006). Children's biased evaluations of lucky versus unlucky people and their social groups. *Psychological Science, 17*, 845–846.
- Olson, K. R., & Spelke, E. S. (2008). Foundations of cooperation in young children. *Cognition, 108*, 222–231.
- Paulus, M., & Moore, C. (2014). The development of recipient-dependent sharing behavior and sharing expectations in preschool children. *Developmental Psychology, 50*, 914–921.
- Pietraszewski, D., & German, T. C. (2013). Coalitional psychology on the playground: Reasoning about indirect social consequences in preschoolers and adults. *Cognition, 126*, 352–363.
- Pietraszewski, D., & Shaw, A. (2015). Not by strength alone. *Human Nature, 26*, 44–72.
- Powell, L. J., & Spelke, E. S. (2013). Preverbal infants expect members of social groups to act alike. *Proceedings of the National Academy of Sciences of the United States of America, 110*, E3965–E3972.
- Schmidt, M. F., & Sommerville, J. A. (2011). Fairness expectations and altruistic sharing in 15-month-old human infants. *PLoS One, 6*(10), e23223.
- Schmidt, M. F., Svetlova, M., Johe, J., & Tomasello, M. (2016). Children's developing understanding of legitimate reasons for allocating resources unequally. *Cognitive Development, 37*, 42–52.
- Shaw, A. (2013). Beyond "To share or not to share": The impartiality account of fairness. *Current Directions in Psychological Science, 22*, 413–417.
- Shaw, A. (2016). Fairness: What it isn't, what it is, and what it might be for. In D. C. Geary & D. B. Berch (Eds.), *Evolutionary perspectives on child development and education* (pp. 193–214). New York: Springer International.
- Shaw, A., Choshen-Hillel, S., & Caruso, E. (2016). The development of inequity aversion: Understanding when (and why) people give others the bigger piece of the pie. *Psychological Science, 27*, 1352–1359.
- Shaw, A., DeScioli, P., & Olson, K. R. (2012). Fairness versus favoritism in children. *Evolution and Human Behavior, 33*, 736–745.
- Shaw, A., & Olson, K. R. (2012). Children discard a resource to avoid inequity. *Journal of Experimental Psychology: General, 141*, 382–395.
- Shaw, A., & Olson, K. R. (2014). Fairness as an aversion to partiality: The development of procedural justice. *Journal of Experimental Child Psychology, 119*, 40–53.
- Shutts, K., Brey, E. L., Dornbusch, L. A., Slywotzky, N., & Olson, K. R. (2016). Children use wealth cues to evaluate others. *PLoS One, 11*(3), e0149360.
- Sigelman, C. K., & Waitzman, K. A. (1991). The development of distributive justice orientations: Contextual influences on children's resource allocations. *Child Development, 62*, 1367–1378.
- Sloane, S., Baillargeon, R., & Premack, D. (2012). Do infants have a sense of fairness? *Psychological Science, 23*, 196–204.
- Tasimi, A., Dominguez, A., & Wynn, K. (2015). Do-gooder derogation in children: The social costs of generosity. *Frontiers in Psychology, 6*. <http://dx.doi.org/10.3389/fpsyg.2015.01036>.