Some Equalities Are More Equal Than Others: Quality Equality Emerges Later Than Numerical Equality

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Mark Sheskin
Ecole Normale Supérieure de Paris

Amber Nadal
Brigham Young University - Provo Main Ca…

Jenny Nissel
University of Texas at Austin

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Some Equalities Are More Equal Than Others: Quality Equality Emerges Later Than Numerical Equality

Mark Sheskin
Yale University

Amber Nadal
Point Loma Nazarene University

Adam Croom
University of Pennsylvania

Tanya Mayer, Jenny Nissel, and Paul Bloom
Yale University

By age 6, children typically share an equal number of resources between themselves and others. However, fairness involves not merely that each person receive an equal *number* of resources ("numerical equality") but also that each person receive equal *quality* resources ("quality equality"). In Study 1, children (N = 87, 3–10 years) typically split four resources "two each" by age 6, but typically monopolized the better two resources until age 10. In Study 2, a new group of 6- to 8-year-olds (N = 32) allocated resources to third parties according to quality equality, indicating that children in this age group understand that fairness requires both types of equality.

Fairness is a core part of human social life (Haidt & Joseph, 2007; Henrich et al., 2006; Rozin, Lowery, Imada, & Haidt, 1999; Shweder, Much, Mahapatra, & Park, 1997). Indeed, fairness may be a specifically human concern (e.g., Jensen et al., 2013; Silberberg, Crescimbene, Addessi, Anderson, & Visalberghi, 2009; Sheskin & Santos, 2012), as even the strongest evidence for concerns about fairness in nonhumans is limited to cases where the animal itself (not another) gets cheated (e.g., Brosnan & De Waal, 2003; Brosnan & Waal, 2012; Hopper, Lambeth, Schapiro, Bernacky, & Brosnan, 2013; Proctor, Williamson, de Waal, & Brosnan, 2013). Fairness may be a characteristic part of human social life because humans show high levels of joint activity (Clutton-Brock, 2009) and often have the option to pursue joint projects only with others who have a proven history of fair behavior (Baumard, André, & Sperber, 2013).

Consistent with the importance of fairness for human social interactions, studies with infants suggest that an appreciation of fairness emerges quite early in development (Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sloane, Baillargeon, & Premack, 2012). Furthermore, once children are old enough to enact distributions among third parties (around 3 years old), they provide fair distributions across a wide variety of cultures (Rochat et al., 2009). This fairness preference is so strong that 6- to 8-year-olds will discard a resource to avoid an unequal division (Shaw & Olson, 2012).

The Slow Emergence of Costly Fair Behavior

Although even infants understand fairness, children show a slow emergence of fair behavior when their own welfare is at stake. Young children tend to accept unfair advantages provided by an experimenter (Blake & McAuliffe, 2011; LoBue, Nishida, Chiong, DeLoache, & Haidt, 2011). When allocating resources themselves, selfishness gives way to fairness only over many years of development (Benenson, Pascoe, & Radmore, 2007; Blake & Rand, 2010; Birch & Billman, 1986; Gummerum, Hanoch, Keller, Parsons, & Hummel, 2010; House et al., 2013; Paulus, 2015; Rochat et al., 2009; Sally & Hill, 2006). Most dramatically, children switch from taking costs at age 5 to gain an advantage over another child (e.g., choosing "1 for self and 0 for other" over "2 each"; Sheskin, Bloom, & Wynn, 2014) to taking costs at age 8 to avoid an advantage over another child (e.g., choosing "0 each" over "4 for self and 1 for other"; Blake & McAuliffe, 2011).

There are many reasons why children's fair behavior toward others might emerge slowly over

Correspondence concerning this article should be addressed to Mark Sheskin, Psychology Department, Yale University, 2 Hillhouse Ave, New Haven, CT 06511. Electronic mail may be sent to msheskin@gmail.com.

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development (Blake et al., 2014). Age-related increases in empathy and theory of mind might lead to increased prosocial behavior (Edele, Dziobek, & Keller, 2013; Gummerum et al., 2010; Takagishi, Kameshima, Schug, Koizumi, & Yamagishi, 2010; but see Cowell, Samek, List, & Decety, 2015), because empathy often leads to prosocial behavior (Batson, Duncan, Ackerman, Buckley, & Birch, 1981) and theory of mind allows individuals to recognize negative mental states and understand that others may respond negatively to unfair behavior. Additionally, early prosocial motivation might be obscured at younger ages by social comparison emotions (envy and schadenfreude) that decrease with age (Steinbeis & Singer, 2013). Finally, older children might act more prosocially due to increasing concerns over their reputation (Engelmann, Over, Herrmann, & Tomasello, 2013; Fu & Lee, 2007; Leimgruber et al., 2012; Shaw et al., 2014; Sheskin, Chevallier, Lambert, & Baumard, 2014) and increasing inhibitory control to suppress reputation-damaging behaviors (Steinbeis, Bernhardt, & Singer, 2012).

Numerical Equality and Quality Equality

Although most studies involve allocations of identical resources, studies involving resources that vary in quality are important because fairness requires not just *numerical* equality (i.e., each person receives an equal number of resources) but also *quality* equality (i.e., each person receives equal quality resources). For example, when presented with two puppet recipients and four stickers (two yellow and two brown), 3- to 5-year-olds comply with numerical equality but violate quality equality: They split the stickers "two each" but give both stickers of their preferred color to their preferred puppet (Chernyak & Sobel, 2015). As with numerical equality, children may place a greater emphasis on quality equality as they age (Rochat et al., 2009; Shaw & Olson, 2013).

In two studies, we investigate the emergence of quality equality across a wider age range than previous research, including children from age 3 to age 10. We investigate when children understand quality equality, compared to when they behave with quality equality, including the possibility that children may not behave completely fairly even up to the age of 10 years.

Study 1

Children distributed four toys of varying quality to themselves and another child "who will get here later in the day, after you leave." The "other child" was described using gender-matched pronouns. In contrast to previous research, we did not call attention to the variation in resource quality (e.g., "special" and "plain" resources in Rochat et al., 2009). Furthermore, each resource was distinct rather than the resources consisting of a set of identical low-value resources and a set of identical high-value resources (e.g., sets of erasers and sets of $20 bills in Shaw & Olson, 2013). These design choices avoid task demands drawing attention to the possibility that quality *should* be equally distributed (see also Smith et al., 2013). We asked half of the children "Where *should* you put the toys so that it's *fair*?" and half "Where do you want to put the toys?"

Method

Participants

We tested 87 children, not including 3 children excluded for not completing the study, 3 for experimenter error, and 1 for a camera error. Data were collected from July 2012 through December 2012. The included participants were thirty 3- to 5-year-olds (M_{age} = 4.63 years, SD = 0.775 years), thirty-one 6- to 8-year-olds (M_{age} = 7.59 years, SD = 0.883 years), and twenty-six 9- to 11-year-olds (M_{age} = 9.95 years, SD = 0.691 years). The target of 30 participants per age group was preplanned; the exact number was determined by scheduling constraints. Additionally, because no 11-year-olds were run before we hit our target sample size, we hereafter report the oldest age group as "9- to 10-year-olds."

Children were recruited from a database of families who had participated in previous studies at our laboratory, and a nearby children's museum. The majority were female (61%) and White (91%). Participants were randomly assigned to condition within each age group, resulting in equal numbers of children in each condition for the youngest and oldest age groups, and 15 children in the "should" condition and 16 children in the "want" condition for the middle age group.

Procedure

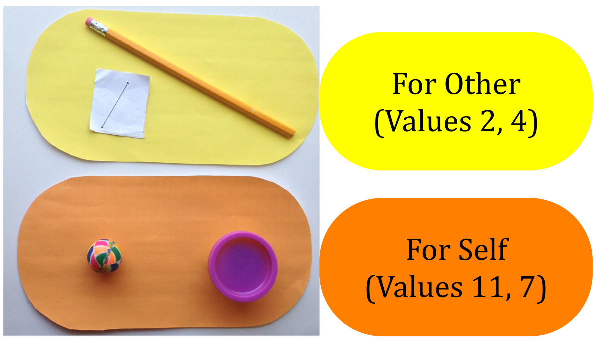
The study consisted of the following three parts:

1 *Toy distribution*: The experimenter showed four toys to be distributed and explained that any toys put on an orange oval in front of the child would go to the child him- or herself, whereas any toys put on a yellow oval opposite the child would go to another child "who will get here

later in the day, after you leave" (see Figure 1, top left). Depending on the condition, the experimenter asked either how the child "wanted" or how the child "should" place the toys.

2 *Sticker ranking*: This part served as a distractor task before ranking the toys and as a training task for the toy ranking. The experimenter showed 20 stickers, one at a time, and the child sorted them between "cool" and "not cool" piles. Then, the child rank ordered the stickers in the "cool" pile, by choosing first the "best" sticker in the group, then the "next best" sticker, then the "next best" sticker, and so on. This process was repeated for the "not cool" pile. The initial sorting into piles was designed to help with the rank ordering: It provided an opportunity for the child to consider each sticker in isolation and reduced the number of items the child needed to simultaneously consider during rank ordering.

3 *Toy ranking*: This part followed the same procedure as the sticker ranking (including the initial sorting into piles). The children sorted and then rank ordered 11 toys, of which four were identical copies of the ones that the child had previously allocated in the toy distribution part of the study (see Figure 1, bottom).



Rank	1	2	3	4	5	6	7	8	9	10	11
Value	11	10	9	8	7	6	5	4	3	2	1

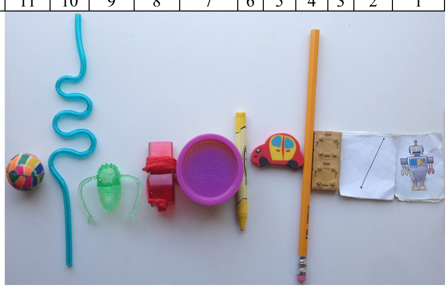


Figure 1. Sample generosity score calculation. The top left of the figure shows an example allocation of the toys to self and other. The bottom of the figure shows the rank order and corresponding values for an example toy ranking (most favored on the left to least favored on the right). As shown in the schematic at top right, the sticker (Value 2) is allocated to other, the pencil (4) to other, the bouncy ball (11) to self, and the Play-Doh (7) to self: Generosity score = 2 + 4 − 11 − 7 = −12.

Initial Preparation of the Data

We can analyze the data in three complementary ways. First, we can analyze toy distributions according to our expectation of their value: bouncy ball and Play-doh equally high value, pencil and arrow sticker equally low value. Taking three or more toys is unfair in both number and quality, taking both high-value toys and giving away both low-value toys is fair in number but unfair in quality, and distributing one high-value toy and one low-value toy per person is fair in both number and quality.

Second, we can perform the same analysis but use each child's own rank ordering of the toys: Whichever two toys are ranked highest of the four (in the rank ordering of all 11 toys) are the high-value toys for a given child, whereas the other two are the low-value toys for that child. This subjective quality analysis has the advantage that it is responsive to individual variation in toy preferences, but the disadvantage that a child's later ranking of the toys may be influenced by their earlier choices (due to the endowment effect; Kahneman, Knetsch, & Thaler, 1991). Fortunately, we found that the two analyses diverged in only 8 (9.2%) of 87 cases and provided inferentially identical results. To avoid redundancy, we report only one set of the analyses (the subjective quality set).

Finally, we can perform an analysis with a continuous "generosity score" that tracks the relative value of the toys allocated to each person. The generosity score was calculated for a child by (a) assigning a point value to each toy based on its rank order and then (b) adding the values of any toys transferred to the other child and subtracting the values of any toys kept for self. Thus, a negative generosity score indicates taking an advantage for oneself, whereas a positive score indicates giving an advantage to the other child. An example generosity score is calculated in Figure 1.

Results

Distribution Patterns

We ran a binary logistic regression to predict whether a child split the toys "two each, or not" (i.e., number equality) using as predictor variables age in years (centered), our dichotomous condition variable ("want" vs. "should"), and their interaction. Older children were significantly more likely to split "two each" (B = 0.392, SE = 0.161, Wald = 5.894, p = .015), and children in the "should" condition were significantly more likely to split "two each" (B = 2.197, SE = 1.006, Wald = 4.690, p = .030). There was no interaction (B = 0.702, SE = 0.403, Wald = 3.025, p = .082).

Likewise, a binary logistic regression to predict whether a child split the toys "one good and one bad toy per person, or not" (i.e., quality equality) found significant effects for age (B = 0.383, SE = 0.191, Wald = 4.012, p = .045) and condition (B = 1.394, SE = 0.544, Wald = 6.343, p = .012) but not their interaction (B = 0.112, SE = 0.257, Wald = 0.189, p = .664).

As shown in Table 1, children in the younger two age groups took quality advantages even when they acted with numerical equality. Of the six ways the toys can be divided into "two each" (numerical equality), only one of them (17%) allocates both of the better toys for the subject (quality advantage). Comparing each age group to random responding (17%) with binomial tests, 10 of 30 children in the youngest group chose "two each," and 5 of the 10 (50%) kept both the better toys (p = .017), 26 of 31 children in the middle group chose "two each" and 13 of the 26 (50%) kept both the better toys (p < .001). In contrast, 24 of the 26 children in the oldest group chose "two each" and only 5 (21%) kept both the better toys (p = .371).

The slow emergence of quality equality is also illustrated in Figure 2, which shows the percent of children taking each type of advantage, broken down by age and condition. Children almost never take numerical advantages after age 5, but even the oldest children (9- to 10-year-olds) take quality advantages when asked what they "want" to do.

Generosity Scores

Children showed significantly negative generosity scores, M = −6.612, SD = 11.36, t(84) = −5.37, p < .001. (This analysis excludes one outlier value of −38; this and all subsequent analyses are inferentially identical if the outlier is included.) Even the subset of children who distributed the toys numerically equally showed significantly negative scores, M = −4.68, SD = 8.35, t(59) = −4.343, p < .001.

A regression found a significant effect for age (β = .342, t = 2.256, p = .027) but not for condition (β = .108, t = 1.019, p = .311) or the interaction

Table 1
Pattern of Behavior by Age and Condition

				Younger			Middle			Older		
Self	Other	Numerical	Quality	B	W	S	B	W	S	B	W	S
AByz		Advantage	Advantage	13	6	7	1		1	1	1	
ABy	z	Advantage	Advantage	2	2							
ABz	y	Advantage	Advantage									
Ayz	B	Advantage	Advantage	1	1							
Byz	A	Advantage	Advantage									
AB	yz	Fair	Advantage	5	3	2	13	7	6	5	4	1
Ay	Bz	Fair	Fair	2		2	5	2	3	6	2	4
Az	By	Fair	Fair				3	1	2	5	2	3
By	Az	Fair	Fair	1		1	2		2	3	1	2
Bz	Ay	Fair	Fair				2	2		2		2
yz	AB	Fair	Disadvantage	2	1	1	1		1	3	2	1
z	ABy	Disadvantage	Disadvantage	1		1						
y	ABz	Disadvantage	Disadvantage									
B	Ayz	Disadvantage	Disadvantage	1	1		1	1		1	1	
A	Byz	Disadvantage	Disadvantage	1	1		3	3				
	AByz	Disadvantage	Disadvantage	1		1						
Total participants				30	15	15	31	16	15	26	13	13

Note. The 16 possible distributions of two high-value toys ("A" and "B") and two low-value toys ("y" and "z"), and the number of children in each age group who chose each distribution. Column "B" includes children in "both" conditions, column "W" includes children in the "want" condition, and column "S" includes children in the "should" condition. The modal response in each column is shaded: Younger children typically take all the toys in both conditions, middle children typically take both the better toys in both conditions, and older children have a different modal response depending on the condition.

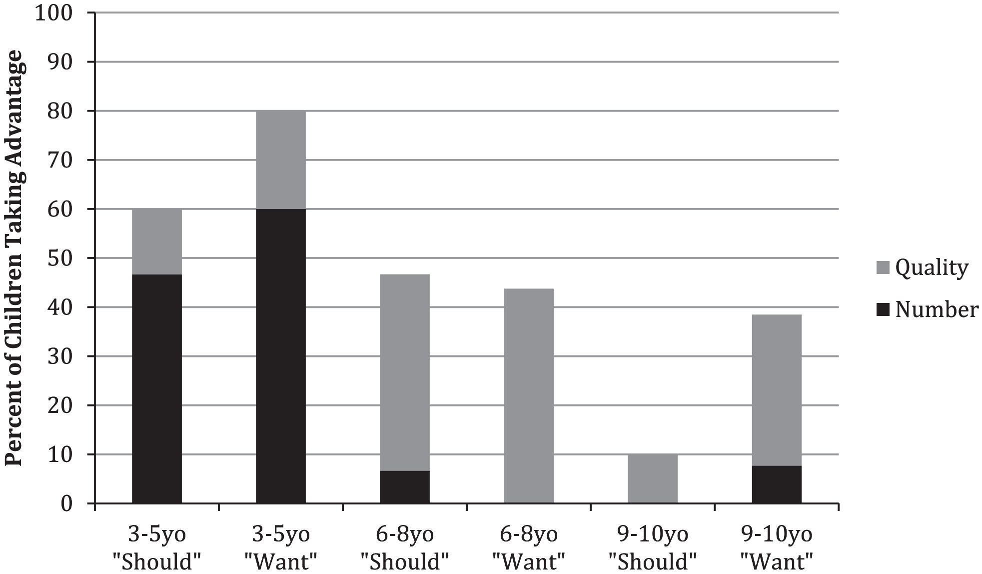


Figure 2. The disjunction between numerical and quality equality. The percent of children taking each type of advantage in Study 1, broken up by age and condition. Children almost unanimously avoid number advantage by age 6 but continue taking quality advantages through age 10.

($\beta = -.039$, $t = -0.258$, $p = .797$). As shown in Figure 3, increasing age was correlated with increasing generosity, $r = .331$, $p = .002$. The youngest age group had a mean generosity score significantly below zero, $M = -10.89$, $SD = 14.93$, $t(27) = -3.860$, $p = .001$. The middle age group likewise had a negative score, $M = -6.16$, $SD = 8.16$, $t(31) = -4.205$, $p < .001$. However, the oldest age group did not differ significantly from zero, $M = -2.54$, $SD = 8.67$, $t(25) = -1.494$, $p = .148$. These results corroborate the results from the regression, indicating increasing generosity with age.

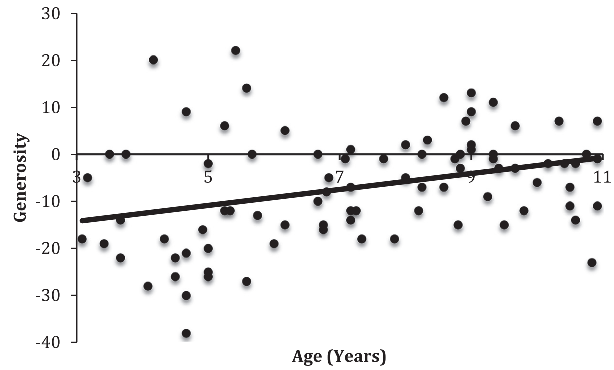


Figure 3. Increasing generosity with age. The correlation between age and generosity score in Study 1. Increasing age correlates with increasing score, and scores are not significantly different from 0 in 9- to 10-year-olds.

Discussion

We found that quality equality emerges slowly over development, especially when children are asked how they *want* to behave: 3- to 8-year-olds tended to take quality advantages even when they acted with numerical equality, and even 9- to 10-year-olds took quality advantages when asked how they wanted to allocate resources.

Why might a child act with numerical equality but not quality equality? One possibility is that children do not understand that resources should be distributed according to quality equality. A second possibility is that they know fairness requires quality equality, but fail to live up to this standard when personal welfare is at stake. In Study 2, we use a third-party version of our task to eliminate any selfish motivation. We focus on the middle age group (6- to 8-year-olds) because (unlike the youngest age group) they consistently show at least numerical equality.

Study 2

Method

Participants

We tested a new group of thirty-two 6- to 8-year-olds ($M_{age} = 7.50$ years, $SD = 0.942$ years). This count does not include one child who was excluded for not completing the study. The majority were male (72%) and White (80%). Data were collected from July 2013 through August 2013.

Procedure

The procedure was almost identical to Study 1, with three changes:

1 Children allocated the toys to two cartoon characters. The characters were gender matched to the child, and we avoided names that parents told us were familiar to the child (e.g., a friend or family member).
2 The placemats to allocate the four toys were white and placed side by side (each near one of the two cartoon characters) rather than orange in front of the child and yellow opposite the child.
3 Every child was asked how they should divide the toys to be fair. We dropped the previous manipulation (in which half of the children were asked how they wanted to put the toys) because the purpose of Study 2 was to see whether any understanding of quality equality could be detected in 6- to 8-year-olds, and therefore we wanted to use the strongest possible case (i.e., what *should* be done in a *third-party* context).

Results

Distributional Patterns

As in Study 1, results were inferentially identical whether we used the "objective" or subjective" quality analyses. Indeed, only two children show different results between the alternative approaches to analyzing the data: one who switched from fair quality to unfair quality and a second who switched in the opposite direction.

In the third-party scenario, 6- to 8-year-olds tended to distribute the toys according to quality equality, one good toy and one bad toy per person (22 of 32, binomial with probability 2 of 16, $p < .001$). This proportion is significantly more than 6- to 8-year-olds in Study 1 (12 of 31, Fisher's exact, $p = .023$). Thus, 6- to 8-year-olds understand that fairness requires quality equality in a third-person situation (Study 2), even though they do not act with quality equality in a first-person situation (Study 1).

Favoritism Score

As in Study 1, we could also use the toy rankings to compute a continuous dependent variable for each child. However, this was not a "generosity score" as in Study 1 but rather a "favoritism score," reflecting the extent to which the child gave more to one character over the other. The generosity scores from Study 1 can be converted to favoritism scores by taking the absolute value of each. Comparing the favoritism scores from the 6- to 8-year-olds in the two studies allows us to determine the extent to which 6- to 8-year-olds tend to give more value to one person when personally involved in a distribution (i.e., because they can give more value to themselves).

The mean favoritism score for the 6- to 8-year-olds in Study 1 was 8.10 ($SD = 6.17$). The mean favoritism score in Study 2 was 6.391 ($SD = 5.873$). There were two outliers in Study 2 (more than 2 standard deviations from the mean), and without them the mean favoritism score was 5.267 ($SD = 3.991$). The mean favoritism score in Study 2 is significantly lower than the mean favoritism score for the same age group in Study 1, t test adjusted for inequality of variances, $t(51.591) = 2.135$, $p = .038$. Thus, 6- to 8-year-olds distribute value to two recipients more equally when they are not one of the recipients (Study 2) compared to when they are (Study 1).

Discussion

In Study 2, 6- to 8-year-olds demonstrated an awareness that fairness requires quality equality. In a third-party scenario, the most common response was to provide one good toy and one bad toy per person. This was significantly different from the behavior of 6- to 8-year-olds' in Study 1, in which the most typical response was to provide both of the better toys to one of the people (oneself).

General Discussion

We find that children's early fairness behavior (around age 6) is focused on numerical equality and that even 9- to 10-year-olds show only a fragile commitment to quality equality. We also find that children's unfairness regarding quality is not due to a failure to understand quality equality. In Study 1, children were more likely to act with quality equality when asked how they "should" rather than how they "wanted" to behave. In Study 2, 6- to 8-year-olds provided equal benefits among third parties.

Why might children show a later-emerging and weaker commitment to quality equality compared to numerical equality? First, although children understand that quality equality is part of fairness, young children might see complying with quality equality as less important for maintaining their moral reputation: It is obvious that someone has taken a numerical advantage when they have more resources, but evaluating whether someone has taken a quality advantage requires additional investigation and is open to debate regarding the worth of each resource. It is less dangerous to violate a moral ideal (such as quality equality) when it is harder for others to clearly identify violations (DeScioli & Kurzban, 2013). Thus, quality equality may only emerge as it is internally motivated by an increasing personal value on fairness (e.g., Kogut, 2012).

Relatedly, acting with numerical equality might be sufficient to satisfy a young child's limited desire to be fair, while quality equality is precluded by a competing selfish motivation (or lack of willpower to give valuable toys). Thus, increases in inhibitory control might be implicated in the increase in fair behavior (e.g., Howard, Johnson, & Pascual-Leone, 2014).

An alternative we think is less likely is that, when young children take quality advantages, they are behaving rationally—they consider that they know their own quality preferences but *not* the preferences of the other child and therefore conclude that they should maximize their own preferences, because they do not know that giving away toys they value to another child will satisfy that child's preferences (e.g., "I know that *I* like the bouncy ball and Play-Doh, but have no way of knowing if the other child likes them—wouldn't it be a shame if I gave away one of the ones I really like, and the other child doesn't even like it!"). However, this alternative predicts that older children should be *more* likely than younger children to take both of the better toys for themselves, because older children are more likely to consider that others have preferences that differ from their own and are better able to reflect on the implications this has for allocating the toys (Rafetseder, Schwitalla, & Perner, 2013). In contrast to this prediction, we found that older children were *less* likely to take quality advantages.

Future research might address several limitations present in this study. First, unlike some other studies, we did not ask children to justify their responses (e.g., Gummerum, Keller, Takezawa, & Mata, 2008). Second, although our interpretable results based on the generosity scores suggest that the scores were sufficiently reliable for our task, future research might increase the utility of our novel measure by establishing the test–retest reliability of toy rankings and whether children think others have similar toy preferences. Finally, future research should investigate differences in quality equality across different kinds of participants and recipients (e.g., varying in relationship, need, and merit). For example, previous research has sometimes found gender differences in prosocial behavior, with many studies finding higher prosocial behavior in girls than in boys (e.g., Ongley, Nola, & Malti, 2014)—though other studies find the opposite (e.g., Derks, Lee, & Krabbendam, 2014).

In sum, we suggest that a commitment to quality equality emerges quite slowly and later than a commitment to numerical equality. Although previous research has focused on the 6- to 8-year-old age range as the critical range for the emergence of fair behavior (e.g., Blake & McAuliffe, 2011), we find here that fairness that includes quality equality has a much slower emergence.

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