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PAPER

Children's and adults' judgments of equitable resource distributions

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Abstract

This study explored the criteria that children and adults use when evaluating the niceness of a character who is distributing resources. Four- and five-year-olds played the 'Giving Game', in which two puppets with different amounts of chips each gave some portion of these chips to the children. Adults played an analogous task that mimicked the situations presented to children in the Giving Game. For all groups of participants, we manipulated the absolute amount and proportion of chips given away. We found that children and adults used different cues to establish which puppet was nicer: 4-year-olds focused exclusively on absolute amount, 5-year-olds showed some sensitivity to proportion, and adults focused exclusively on proportion. These results are discussed in light of their implications for equity theory and for theories of the development of social evaluation.

Introduction

> *I tell you the truth, this poor widow has put more into the treasury than all the others. They all gave out of their wealth; but she, out of her poverty, put in everything – all she had to live on. (Mark 12:43–44)*

What is a fair way to distribute resources? To date, there has been considerable research into children's developing sense of what constitutes an equitable distribution (e.g. Damon, 1977, 1975; Hook, 1978; Lane & Coon, 1972; Leventhal & Anderson, 1970; Streater & Chertkoff, 1976). In these studies, children must divide a reward between multiple participants, each of whom has contributed different amounts of work towards completing the task. Previous work using tasks like this has suggested that children undergo radical developmental shifts in their preferences for dividing resources. Children start off self-interested; they allocate rewards to themselves, even if others may have worked harder (Hook, 1978; Lane & Coon, 1972). They then transition to a period of strict equality, at around the age of five or six, in which they allocate rewards equally despite variations in effort by participants (Larsen & Kellogg, 1974; Lerner, 1974). Then, children exhibit an understanding of ordinal equity, in which they give more rewards to the hard worker, but not nearly in accordance with the proportion of work done (Coon, Lane & Lichtman, 1974; Streater & Chertkoff, 1976). Finally, as adolescents, participants start to show signs of proportional equity, and distribute rewards in strict proportion to the amount of work done by each party (Hook, 1978; Lane, Messe & Phillips, 1971; see Damon 1977 and Hook & Cook 1979 for overviews of this sequence).

Many researchers (Damon, 1975; Damon, 1977; Hook, 1978; Hook & Cook, 1979) saw this developmental trend as a natural result of the unfolding of logico-mathematical and physical understanding. Young children do not use proportional equity when dividing resources because they *cannot* use it. In support of this, Hook (Hook & Cook, 1979; Hook, 1978) and Damon (1975) suggest that there is a correspondence between the age at which children can distribute equitably and their ability to succeed at Piagetian tests of proportional reasoning, such as constructing proportionally similar triangles and rectangles (Inhelder & Piaget, 1964), or equating proportion of large and small pies necessary to fill up different sizes of dolls (Damon, 1975, after Piaget, Inhelder & Szeminska, 1960).

To date, most tests of children's proportional understanding have involved highly verbal and explicit tasks. For example, Piaget and colleagues (e.g. Piaget & Inhelder, 1975) showed children two jars, each containing a mixture of target and non-target items, and asked them which jar has the best chance of yielding a target item if one drew randomly. They found that concrete operational children (before age 7) were comparing

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numerators only. That is, when the comparison was 3/10 vs 2/6, the correct answer is 2/6, but children would choose 3/10, because 3 is bigger than 2.

Some studies, however, suggest that the picture for young children is not so dire. Yost, Siegel and Andrews (1962) discovered that if one makes the target objects in these tasks more interesting (toys, instead of chips or balls), children by 5 years of age can exhibit sensitivity to both numerator and denominator, and choose correctly on the basis of probability. A number of other researchers (e.g. Spinillo & Bryant, 1991; Goswami, 1992; Singer-Freeman & Goswami, 2001; Mix, Levine & Huttenlocher, 1999) have also observed early-childhood competence with respect to understanding proportion, and a rudimentary understanding of proportion has even been observed in infants. McCrink and Wynn (2007) showed 6-month-old infants arrays containing different numbers of blue circles and yellow semi-circles. After being habituated to arrays exhibiting a particular ratio of blue to yellow objects, infants looked longer at test when shown an unfamiliar ratio of blue:yellow objects. On the whole, these recent studies using more sensitive measures demonstrate that children exhibit some signs of reasoning about proportional equivalence during early childhood.

Motivated by this work, the present study aims to revisit the question of children's judgments about fair and unfair distributions. To do this we used a context that we called the 'Giving Game'. The Giving Game is conceptually related to those designs found in studies of the development of distributive justice/equity. In this game, we present 4-year-olds, 5-year-olds and adults with two puppets, each of whom gives some amount of resources to the participant. There is a 'rich' puppet, who always has 12 chips, and a 'poor' puppet, who always has 4 chips. The amounts given are manipulated to be (a) greater on both the proportional and the absolute dimensions, (b) proportionally equal, (c) absolutely equal, or (d) in conflict on these two dimensions. Instead of using a performance measure such as accurate distribution of resources, we used as our measure which puppet the child thought was 'nicer'.

Use of this measure raises a distinct question: Will participants use just a single behavioural exemplar to make a social evaluation? There is considerable debate as to when children are willing to attribute stable, internal dispositions that predict future behaviour (Alvarez, Ruble & Bolger, 2001; Heller & Berndt, 1981; Heyman & Gelman, 1999; Rholes & Ruble, 1984), and which types of information lead to these evaluations (e.g. Boseovski & Lee, 2006). Some studies have found that young children are willing or able to make a global, social evaluation when given a very limited set of exemplars, such as a person being generous a single time (Alvarez *et al.*, 2001; Boseovski & Lee, 2006). In contrast, Heller and Berndt (1981) found that even children in middle childhood could not differentiate between an actor who behaved generously and an irrelevant control actor (although they could tell a generous from a selfish actor). The research with adults on trait attribution and evaluation suggests that as we become older we are rapidly and automatically evaluative (e.g. Newman, 1996; Todorov & Uleman, 2002).

The present design of the Giving Game allows us to test whether children and adults will judge niceness with limited information (one trial), and whether they do this on the basis of absolute number or proportion. Traditional studies of equity reviewed above suggest that the youngest children will act in a self-interested manner, and in all trials judge the puppet who gives them absolutely more as nicer. Adults, however, will focus more on proportion, appreciating – as in the quote from the Gospels at the start of the paper – that the extent of sacrifice is relevant when determining the niceness of a giver. We can also explore how children and adults react when absolute amount is controlled for (as in 3/4 vs 3/12) and when proportion is controlled for.

Method

Participants

Sixteen 4-year-olds and sixteen 5-year-olds were recruited at local daycares and preschools, as well as through a database of birth records, in Southern Connecticut. The 4-year-olds (5 males, 11 females) ranged from 4 years 1 month to 4 years 10 months, with a mean age of 4 years 6 months. The 5-year-olds (9 males, 7 females) ranged from 5 years 0 months to 6 years 0 months, with a mean age of 5 years 4 months. Sixteen undergraduate and graduate students (6 males, 10 females) were recruited from the same area in Connecticut.

Child-participant testing procedure

Each child participant was taken into a quiet room at a preschool or in the laboratory, where the study was videotaped. An experimenter then told the child that he or she was going to be playing the Giving Game. The experimenter told the child that the Giving Game was a game in which two animal puppets would show the child how many 'animal chips' they had and then would give the child as many or as few of the chips as they wanted. The experimenter then explained to the child that the 'animal chips' were like animal money, and asked the children if they knew what money was. No child said that they did not know what money was. The child was then told that they should get as many of these animal chips as possible so that later they could go shopping and get a toy with the chips at the animal store. The amount of money they needed for the animal store was left unspecified, so that the child would be motivated to get the chips but not count to a particular required number.

Given this simple check for understanding of money, one could question whether the children truly understood the question. Even if children do not know explicitly what having money entails, this concept was either instantiated (in the case of children who perhaps did not know what the word meant) or solidified (in the case of children who did have an idea of what the word meant) by the instructions that the children should try to get as many animal chips as they could, and then they would be able to go to the animal store at the end of the game. Thus, we created a scenario in which the puppets had something that was a resource, had the valence 'good', and that the children themselves had to get. A full and nuanced conception of money was not necessary for this study, and a rudimentary understanding (i.e. resources as positively valenced, something one wants to get and keep) was all that was needed for success on this task. The use of tokens linked to a desirable outcome, as opposed to the actual manipulation of desirable toys, was a way to motivate the child without distracting them in the moment of the study (after Yost *et al.* 1962). After this introduction, the experimenter presented the child with 10 trials involving two different puppets, with the two puppet characters changing every trial.

At the beginning of a trial, the experimenter introduced the child to two novel puppets, each of which had its own pile of animal chips placed in front of it. In each trial, one puppet had 12 chips and the other had 4 chips, with the right–left location of these puppets counterbalanced across trials (see Figure 1 for an example). After introducing the child to the two puppets, the experimenter then began the Giving Game. She asked each puppet in turn how many of their chips they wanted to give to the child. The puppet then 'whispered' its answer in the experimenter's ear, and the experimenter proceeded to slide the allotted amount of chips over to the child. Each puppet's given chips were kept separate from the others on the table, in order to help the child keep track of how many chips each puppet gave to the child relative to what that puppet started with. The experimenter then asked the child the question that would serve as our dependent measure[1]: 'Which puppet do you think is nicer?'

The experimenter told the child to indicate their choice explicitly via pointing, and maintained eye contact with the child until the choice was made. If the child did not point, the experimenter repeated the question and asked them to point again. Once a choice was made, the experimenter allowed the child to keep the given chips, removed the puppets, and then set up for the next trial with a different, unique, set of puppets.

The trials presented differed only in the *absolute amount* and *proportion of chips* given to the child by each of the two puppets. There were four trial types, as described below. Note that each proportion listed below depicts the number of chips that a puppet gave to the child compared with the total number of chips with which that puppet began. (A proportion of 3/4, for

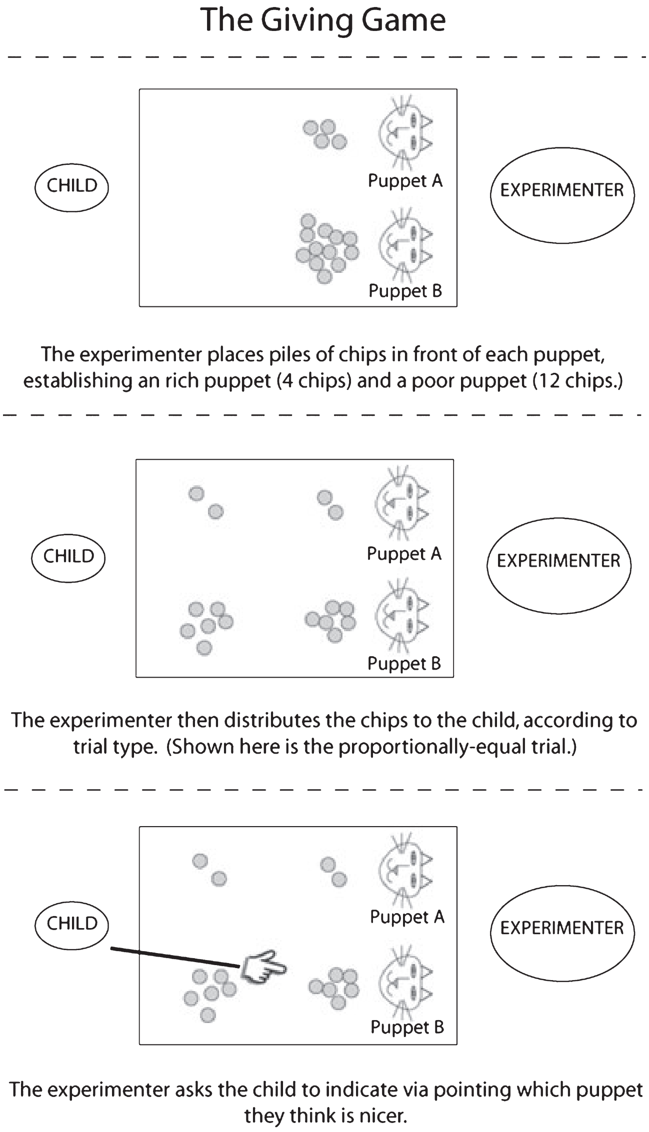

Figure 1 *A depiction of the 'Giving Game' as presented to child participants. In the first frame, the experimenter introduces the child to the two animal puppets who each have a different number of animal chips. In the second frame, the puppets give a pre-determined proportion of their chips to the child. In the third frame, the child points to indicate his or her choice of which of the two puppets is nicer.*

[1] We asked an additional two questions after the first 'who's nicer' question. After the niceness question, children were asked who they would like to give a sticker to, indicating their willingness to reciprocate with one of the two puppets. Third, the child was asked which of the two puppets he or she would go to for more chips. Our results indicated that children's answers to these questions tended to be the same as their answers to the first 'who's nicer' question. However, because this question was always asked before the others, we cannot be sure whether subsequent questioning was biased by the child's answer to the first question. For this reason, we decided to omit these later questions from our final analysis, and to focus only on children's responses to the 'who's nicer' question.

example, would mean that the puppet began with four chips and gave three of them to the child.) A full session thus included the following trials.

(a) *Baseline* trials (3/4 vs 1/12, and 1/4 vs 9/12), in which one puppet gives the child an amount that is both proportionally and absolutely larger than that given by the other puppet.
(b) *Proportionally equal* trials (2/4 vs 6/12), in which the proportion given remained the same but the absolute amount differed between the two puppets.
(c) *Absolutely equal* trials (3/4 vs 3/12), in which the absolute amount given remained the same but the proportion differed between the two puppets.
(d) *Conflict* trials (3/4 vs 6/12), in which one puppet gave an amount that was absolutely larger, whereas the other puppet gave an amount that was proportionally larger.

Each session included 10 trials. Importantly, each trial was performed by a distinct pair of puppets, for a total of 10 pairs of puppets. The children had no basis to carry over their judgments from trial to trial. The trials were deliberately designed so that there would be a new and unique pair of characters, each given new names (Fred and Marvin on one trial, say, and Susan and Karen on another), and distinct types of animals (frogs on one trial, monkeys on another, and so forth) on each trial. The use of these characters was counterbalanced, so that it was not the case that, for example, Susan and Karen the cats were always performing a baseline trial. Each child began with the two baseline trials (one 3/4 vs 1/12 trial, and one 1/4 vs 9/12) at the beginning of the experiment, to ease them into the game by beginning with the easiest possible comparison. Children then received the other three kinds of trials (2/4 vs 6/12, 3/4 vs 3/12 and 3/4 vs 6/12) in a counterbalanced order. The block was repeated, yielding 10 trials total per child (*baseline 1*, *baseline 2*, *proportionally equal*, *absolutely equal* and *conflict* in each of two blocks).

After testing, the participants were given a single final trial to determine whether they had any baseline preferences for rich or poor puppets. In this final *wealth preference* trial, two novel sock puppets (which differed in size and shape from the animal puppets previously seen in the study) were introduced, one who had 12 chips and the other who had 4 chips. The children were simply asked who they thought was nicer, with no intervening giving session. When the experiment was over, the experimenter took the child's pile of animal chips, congratulated them for having enough to get a toy from the animal store, and guided the child to a large box to select a toy.

Adult-participant testing procedure

The adult participants were tested on a version of the test analogous to the one presented to the children. Adult participants were told that they were participating in order to provide a comparison group for a study of generosity with children. All instructions were the same, but whereas the children had stuffed animals to act out the 'Giving Game', adults were told that Mr A and Mr B (C, D, and E, F and so forth) were giving them chips. Placards with A and B (or C and D, E and F, depending on the trial) were placed where the puppets were placed during the children's task. The experimenter then physically distributed the chips as in the children's task, and the design and all questions remained identical to those of the children's task, with each of the 16 adults getting an identical counterbalanced condition to each of the 16 children in each age group. Adults received the wealth preference trial after the main design, and the actual sock puppets from the children's setup were used. The only significant difference between the adult's and the children's setup was the inclusion for adults of a Likert scale to indicate how difficult they found the judgment of who was nicer (Mr A or Mr B).

Results

Preliminary analyses of the responses revealed no significant differences on the two types of baseline trials (1/12 vs 3/4 and 9/12 vs 1/4) in any of the age groups (100% choosing correctly in baseline type 1 and 100% choosing correctly in baseline type 2 for adults, 97% and 88% for 5-year-olds, 63% and 66% for 4-year-olds; chi-square goodness-of-fit tests of the difference between the two distributions yields all p-values >.05); for the sake of simplicity we will collapse across these two types of baseline trials for the remainder of this discussion. In addition, Mann–Whitney tests of performance in each trial type revealed no effects of gender on niceness judgments (all p-values >.05); thus all further analyses will collapse across this factor.

In the baseline trials, participants' answers were coded as correct (picking the puppet who gave more both proportionally and absolutely), or incorrect. Because we have two trials per subject, a chi-square goodness-of-fit test was used to determine whether the distribution of these responses differed from chance. The participants were characterized as either consistent correct responders, inconsistent (choosing the correct answer on only half of the trials), or consistent incorrect responders, and this distribution was compared with an underlying normal distribution (where one-quarter of the participants would be correct responders, half would be inconsistent, and one-quarter would be incorrect responders). In these *baseline* trials, all age groups tended to answer that the puppet that gave more absolutely and proportionally was nicer, with their performance increasing with age. The adults' performance differed from chance in these baseline trials (ceiling performance; $\chi^2(2, n = 32) = 96$, $p < .0001$), as did the 5-year-olds' performance ($\chi^2(2, n = 32) = 60.69$, $p < .001$) and the 4-year-olds' (χ^2(2,

n = 32) = 11.19, p = .004). The number of cases in each category (consistent correct responders, inconsistent responders, consistent incorrect responders) for each age group was as follows – adults: 32, 0, 0; 5-year-olds: 27, 5, 0; 4-year-olds: 16, 9, 7.

For the experimental, non-baseline trials, participants were binned according to their pattern of response across the repeated trials they saw (whether they consistently picked the poor puppet, responded inconsistently, or consistently picked the rich puppet), and this distribution was compared with a chance distribution using a chi-square goodness-of-fit test as well. For the *absolutely equal* trials (3/4 vs 3/12), both adults (χ^2(2, n = 16) = 48, p < .0001) and 5-year-olds at a trend level (χ^2(2, n = 16) = 5.5, p = .06) said that the puppet that gave more proportionally was nicer. The 4-year-olds, in contrast, were reliably *inconsistent*, and switched who they thought was nicer from the first instance of this trial to the second instance (χ^2(2, n = 16) = 6.38, p = .04). The number of cases in each category (picking the poor puppet consistently, inconsistent responses, picking the rich puppet consistently) for each age group was as follows – adults: 16, 0, 0; 5-year-olds: 8, 6, 2; 4-year-olds: 1, 13, 2. We compared the performance on this trial type as a function of age, and found a significant developmental trend: the 4-year-olds were different from the 5-year-olds (χ^2(2, n = 16) = 14.29, p < .001), who were different from the adults (χ^2(2, n = 16) = 16, p = .003, Bonferroni-corrected alpha values for multiple comparisons).

For the *proportionally equal* trials (2/4 vs 6/12), adults said that the poorer puppet (the one who started with less, and ended with less) was nicer than the rich puppet (χ^2(2, n = 16) = 18.30, p < .0001). Both 5-year-olds (χ^2(2, n = 16) = 17.38, p < .001) and 4-year-olds (χ^2(2, n = 16) = 10.38, p = .005) indicated that the rich puppet, which had given more absolutely, was nicer. The number of cases in each category (picking the poor puppet consistently, inconsistent responses, picking the rich puppet consistently) for each age group was as follows – adults: 11, 1, 4; 5-year-olds: 0, 5, 11; 4-year-olds: 0, 7, 9. For the *conflict* trials (3/4 vs 6/12), the adults again said that the puppet that gave more proportionally was nicer (χ^2(2, n = 16) = 48, p < .0001). Both 4- and 5-year-olds gave the opposite answer, indicating that the puppet that gave more absolutely was nicer (χ^2(2, n = 16) = 21.38, p < .0001; χ^2(2, n = 16) = 27.38, p < .0001). The number of cases in each category (picking the poor puppet consistently, inconsistent responses, picking the rich puppet consistently) for each age group was as follows – adults: 16, 0, 0; 5-year-olds: 2, 1, 13; 4-year-olds: 1, 3, 12. These data are summarized in Figure 2.

To measure how difficult the participants found these decisions, we tabulated the responses of adults on a 5-point Likert scale taken directly after answering this question, and averaged their responses to each of the two instances of each trial type. Overall, they rated the *baseline* trials as having a difficulty of 1.42, *absolutely equal* trials as 1.34, *conflict* trials as 2.17, and *proportionally equal* trials as 3.86 out of 5. A 2 (gender) × 4 (trial type) repeated-measures ANOVA of the adult's difficulty ratings showed a main effect of trial type on their difficulty ratings (F(3, 42) = 33.74, p < .001), with no interaction with gender (F(3, 42) = .984, p = .41). Tukey's HSD post-hoc tests, corrected for multiple samples, indicated no difference between *baseline* and *absolutely equal* trials, a significantly higher rating of difficulty for the *conflict* trials compared with *baseline* and *absolutely equal* trials (p < .05), and a significantly higher rating of difficulty for the *proportionally equal* trials compared with all other trial types (p < .01) (see Figure 3).

Because we did not have a difficulty rating from the children, one of the authors coded videotapes of the sessions to determine how long each response took as an ad hoc measure of difficulty. A second coder, blind to the hypotheses of the study, reviewed a subset (25%) of the videos, and the timing indicated a .94 correlation with the primary coder. Thus, the data from the original coder

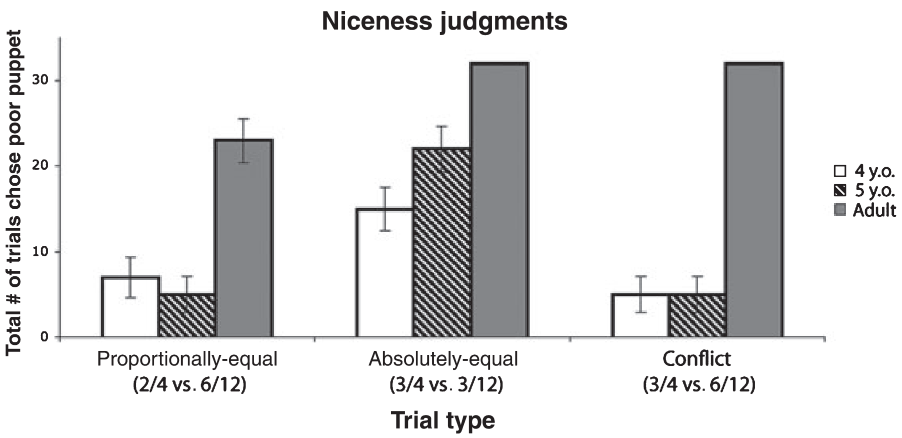

Figure 2 *Total number of trials (out of 32) for which each age group chose the poor puppet, as a function of trial type, in response to the question 'Who do you think is nicer?' The dashed line indicates chance level (16/32).*

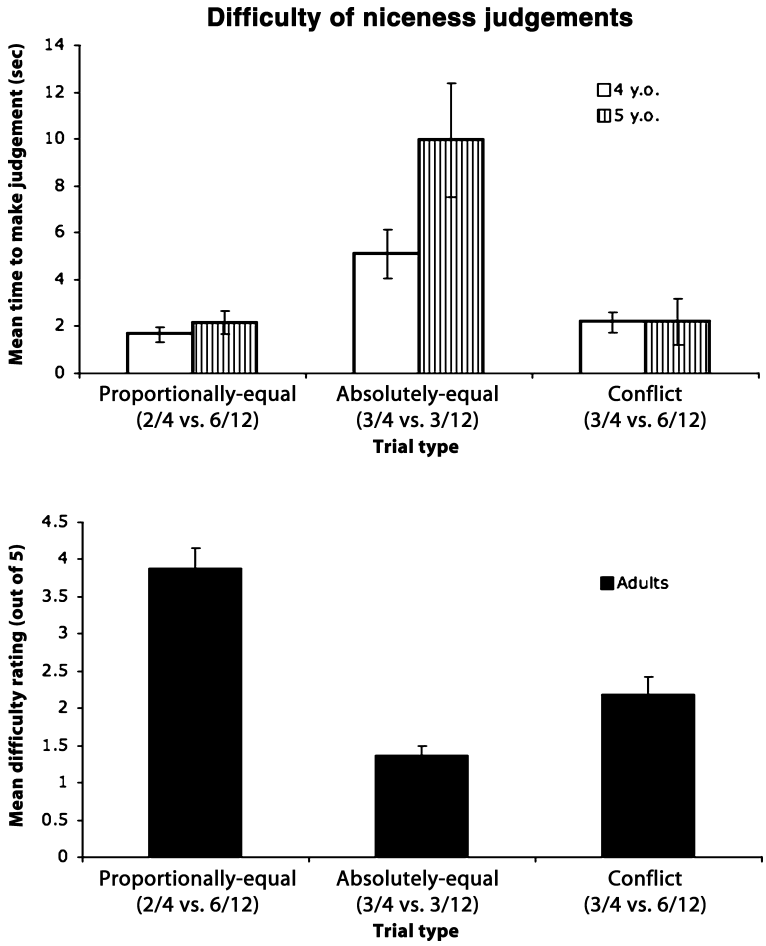

Figure 3 *Overall difficulty, by trial type, for the social judgments of which puppet was nicer. Difficulty was gauged by the adults' explicit ratings on a Likert scale (range of 1 to 5), and by how long (in seconds) the children took to answer the question of which puppet was nicer.*

were used in all data analyses. The children's responses to each of the two instances of each trial type were averaged. A 2 (gender) × 4 (trial type) repeated-measures ANOVA of the data from the 5-year-olds showed a main effect of trial type ($F(3, 42) = 9.3$, $p < .001$), and no interaction with gender ($F(3, 42) = .52$, $p = .67$). A similar pattern emerged with the 4-year-olds, with an overall difference in responses between trial types ($F(3, 42) = 10.04$, $p < .001$), and no interaction with gender ($F(3, 42) = 1.32$, $p = .28$). Tukey's HSD post-hoc tests, corrected for multiple samples, performed on both the 4- and 5-year-olds' data revealed a significant difference between the *absolutely equal* trials and all other trial types ($p < .01$ for both 4- and 5-year-olds) (see Figure 3).

All groups were also given a single *wealth preference* trial after the experiment was completed in order to evaluate whether they perceived a rich puppet or a poor puppet as nicer even in the absence of giving. Adults had no preference for either the rich or the poor puppet, with 8/16 adults choosing the poor puppet as nicer. However, 75% (12/16) of both the 4- and 5-year-olds exhibited a baseline preference for the rich puppet. A chi-square test of independence was performed to examine the effect of puppet wealth on niceness judgments. Both of the younger age groups indicated that the richer puppet was nicer at rates higher than chance ($\chi^2(1, n = 16) = 4$, $p < .05$).

General discussion

To explore the development of proportional reasoning and equity conceptions, 4-year-olds, 5-year-olds and adults were shown a series of trials in which puppets gave them different amounts of animal money, and were asked which puppet was nicer. Our first main finding is that, at all ages, participants were willing and able to use this one small piece of information to determine how nice each puppet was, and in most trial types this was a relatively quick and easy decision. Even 4-year-olds, whose record as social evaluators is spotty, were able to indicate clearly who they thought was nicer on 3 of 4 trial types (reliably giving answers at above-chance levels on *baseline*, *proportionally equal* and *conflict* trials). This finding is consistent with previous research showing that very young children are able to use the limited information of a single behavioural exemplar to make social evaluations (Alvarez *et al*., 2001; Boseovski & Lee, 2006), and is in contrast with some research that shows that children cannot distinguish the global niceness of a generous actor from that of a baseline actor who displays no generous behaviours (Heller & Berndt, 1981).

Because we provided the term 'nicer' to the participants, we cannot know the depth of these social evaluations. We did not include a transfer task that could establish whether these evaluations apply to future behaviour of the actors, or to different behaviours (e.g. Boseovski & Lee, 2006; Heller & Berndt, 1981; Rholes & Ruble, 1984). For example, would children expect that a 'nicer' puppet would be nicer to everyone? Do children think that the 'nicer' puppet is fair and generous only in the context of giving, or are they making more global interpretations that this puppet will now be athletic and smart? In the future, it would be interesting to take this paradigm and manipulate the behavioural frequency of giving by each puppet, and abandon rotating the puppets each trial. Another alternative extension of this paradigm would be to see if the children would be more willing to play with one puppet over the other, or more likely to say that one puppet is funnier or smarter than the other, given only this single instance of generous giving. In this manner, the paradigm could be used more readily to connect to research on how the frequency and distinctiveness of behaviours lead to different types of evaluations.

Another methodological limitation is that the use of a forced-choice measure resulted in participants' inability to say that both puppets were equally nice. If half of the participants choose Puppet A as nicer, and half Puppet B, it could be because of two distinct underlying thought patterns. On the one hand, the participants could be in a transitory state, in which one puppet seemed decidedly nicer to half the children, and the other puppet decidedly nicer to the other half of children. On the other hand, the participants could be in a steady state, in which they all thought that the two puppets were equally nice. We believe that the difficulty ratings and latency data do go some way towards addressing this question; if participants were decidedly choosing one puppet over the other, the time to choose would be similar to that in above-chance trials. Instead, a pattern emerged in which the at-chance trials took the longest amount of time, an indication that this was a difficult decision and that the two puppets were equally good candidates for being 'nicer'. This interpretation of the difficulty and latency data must be tempered somewhat, given that difficulty for adults and children was assessed using different measures, and future studies using this paradigm would benefit from incorporating a child-friendly difficulty scale or measuring the time it took adults to make their choice.

Our second main finding is that there exist different criteria at each age in terms of what constitutes equitable behaviour. Adults favoured the character who distributed a greater proportion of their resources, irrespective of absolute amount. When the puppets gave the same proportion, as in the case of one puppet giving 2 of 4 chips, and the other giving 6 of 12, they judged the one that gave 2 of 4 as nicer, presumably because this puppet starts with, and is left with, less. These findings mirror those of Pruitt (1968), who found that adults in a pen-and-paper task were more likely to reciprocate towards those who had been proportionally generous, and discounted larger amounts when they came from a large pool of money. Damon (1977) calls this 'benevolence' reasoning, one of the highest stages of distributive justice reasoning. Benevolence reasoning comes into play when we perceive that someone has a prior condition that limits their abilities or available resources. It should be noted, though, that the adults who judged the poorer puppet in this proportionally equivalent situation as nicer did not do so blithely: it was rated as the most difficult of all the trials.

In contrast to the adults, 4- and 5-year-olds judged the puppet that gave a greater absolute amount as nicer, both when it gave the same proportion as the other puppet and when it gave a smaller proportion than the other puppet. When the two puppets gave the same amount, 4-year-olds were split as to whether the rich or poor puppet is nicer, but 5-year-olds, similar to the adults, favoured the one that gave the greater proportion. Both 4- and 5-year-olds appear to find this a relatively difficult choice, taking about three times longer on average to make this judgment.

In addition, we found that children had a baseline belief that rich puppets are nicer than poor puppets. This finding meshes nicely with work by Olson and colleagues (Olson, Banaji, Dweck & Spelke, 2006), who found a similar bias to favour an already-fortunate and wealthy character. One might wonder if children were using only *wealth* to determine niceness throughout the experiment, and did not understand the question correctly. We know that this is not the case, however, because there were several trial types in which their test responses indicate that they found the poor puppet to be nicer. For example, if these children were simply using a wealth-as-niceness philosophy, they would have favoured the rich puppet in the baseline trial of 3/4 vs 1/12, but they did not. It remains an open question as to why the children prefer the rich puppet over the poor puppet. One theory is that, given that children had no other information to go on, they looked at the piles of chips in front of the puppets and used the only cue of 'more' as translated to 'better'. This reasoning would have been especially salient since this trial took place after the experiment, during which time they were focused on getting many chips.

In sum, then, the pattern of results we observe is consistent with the interpretation that (a) adults care only about proportion, (b) 4-year-olds care only about absolute amount, and (c) 5-year-olds care mostly about absolute amount, but when this is held constant, they can start to attend to proportion. A question of interest is whether younger children are *unable* to consider proportion, *unwilling* to consider proportion, or both? Given recent research observing that younger children reason proportionally in some cases (Boswami, 1998; McCrink & Wynn, 2007; Mix *et al*., 1999; Sophian, 2000), we believe that the youngest children in this study ignored proportion not because they are unable to reason about it, but because they consider only absolute amount as relevant to equity judgments. This may be because these children are stuck in a classic egocentric phase (Piaget, 1926) and this reflects their underlying mental state. However, it is possible that the techniques we used to engage the children in the study (they are the recipient, they are encouraged to get animal chips) could have led to a self-centred view of the situation. Thus, future work using this paradigm should take a page from traditional equity design and examine whether levels of self-interest during the study have an impact on how children perform.

It is important to note that, although we did not find full proportional reasoning in an equity scenario, the fact that 5-year-olds were sensitive to such factors at all is a break from what has commonly been found in previous research on equity and distributive justice. Five-year-olds in a typical equity scenario (one pie to share, many people with different claims who want it) normally perform as strict egalitarians: if 3 people worked, then each will each get 1/3 of the resources, no matter what (Lerner, 1974; Larsen & Kellogg, 1974). The use of this novel Giving Game allowed us to control for factors such as absolute amount and proportion on a variety of trials to see what would happen when these variables were available for use and *not in conflict with each other*. This unique design revealed that young children (5-year-olds) who are reasoning about resource distribution can take into account proportion as a basis for social evaluations, but the situation must be structured so that their first impulse (attention to absolute amount) yields no clear winner.

What is it, then, that transforms children into adults when reasoning about equity? It is possible that the amount of sharing experience a child has will dictate whether they are sensitive to initial starting amount and therefore proportion. Children at this age (3–5 years) are able to share, but this ability comes mainly after being a distributor themselves in an identical situation (Birch & Billman, 1986). This raises the possibility that children who are placed in the role of the giver in the Giving Game in an initial phase will have a deeper understanding of the cues available (and be willing to use proportion as a cue to fairness) when they themselves are the recipient in a later phase. Relatedly, the ability to abandon egocentric reasoning and take into account the perspective of the giver may be driving this developmental change. It is possible that some of the youngest children in our group are still lacking a fully formed theory of mind, and cannot take into account other people's mental states and reason as an 'other'. As a direction for future research, it would be interesting to examine whether there is a relationship between classic theory-of-mind tasks such as the false-belief task (e.g. Wellman *et al.*, 2001; Wimmer & Perner, 1983), and the degree to which participants in the Giving Game consider proportion to be a driving variable in making social judgments.

Finally, the adult responses also warrant further investigation. It is possible that the group of adults we tested – students at Yale University – gave answers that would be inconsistent with those of adults who have had different life experiences. There may be cross-cultural differences, and even within-culture factors such as wealth, religion and political orientation might shape this reasoning. Even for our participant pool, it is an open question as to precisely how the calculations of generosity are made. Consider the conditions in which one puppet gives 3/4 and the other gives 6/12. Adults favour the former as nicer, but is this because (a) the puppet starts off with less, (b) it gives a greater proportion, or (c) it has less after the giving? Further research could profit from teasing apart these alternatives in adult participants.

In sum, our study provides novel evidence for a developmental transition in which children move from using self-centred, absolute variables (how much did I get?) to other-centered, proportional variables (how much could they afford to give me?) while making social evaluations about two participants who distribute their resources. These data complement previous developmental work on equity reasoning, proportion comprehension and social evaluations, and provide insight into how we learn to navigate a daily life in which complex equity conceptions and subsequent social judgments are essential.

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