

Developmental Psychology

Do Children Expect Boys and Girls to Be Rewarded Differently for Doing the Same Work?

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From a young age, children think resources ought to be distributed equally but expect resources to be shared preferentially with ingroup members. These desires for both impartiality and partiality take root in early childhood and likely become further entangled with age due to exposure to existing forms of group-based inequalities. Here, we ask whether children expect fairness or favoritism from an authority figure in the context of a real-world form of group-based inequality—the gender gap in pay. We tested 4- to 11-year-olds' ($N = 157$) and adults' ($N = 101$) expectations of how girls and boys would be rewarded by a teacher for performing a classroom task. Children were asked whether they expected a boy or girl to receive the larger reward (three versus two of five cookies) after completing a job. We found that 4- and 5-year-old children expected their own gender to be rewarded more favorably, an expectation that aligns with past work showing an own-gender bias in resource allocation. By contrast, and with the exception of 8- and 9-year-old boys, children in the 6- to 11-year-old range expected gender parity in pay, as did adults, a finding that contrasts with own-gender biases and with the real-world gender gap in pay. Our results shed new light on children's evolving expectations of how rewards will be distributed in a context in which fairness and favoritism are in tension. Moreover, they provide a foray into children's expectations about gender pay parity, an important and persistent issue in the society in which these children are developing.

Introduction

From infancy, humans hold rich expectations about their social world. They expect dominant individuals to win conflicts (Thomsen et al., 2011), caregivers to respond to crying infants (Johnson et al., 2010), and intentional agents to efficiently complete goals (Liu & Spelke, 2017). These rich expectations are also revealed when it comes to fairness (e.g., Geraci & Surian, 2011) and loyalty (Jin & Baillargeon, 2017). However, fairness—which we operationalize here as equality (McAuliffe et al., 2017)—and loyalty can exist in strong tension with one another: *should I share equally or favor my ingroup?* This tension is revealed in children's decision-making: children growing up in Western societies show increasing concerns for fairness (Blake & McAuliffe, 2011; Shaw & Olson, 2012; reviewed in McAuliffe et al., 2017), yet continue to show loyalty to their group members (e.g., Misch et al., 2018), and both of these behaviors can be perceived as acceptable and even desirable, depending on context.

The tension between fairness and favoritism in childhood is seen across different contexts, including children's own allocation decisions, their evaluations of others' allocation decisions, and their intervention decisions. First, with respect to allocation decisions, children's resource distributions often reflect an ingroup bias. Children preferentially distribute resources to speakers of their native language (Kinzler et al., 2012), to their gender and racial ingroup members (Renno & Shutts, 2015), and to members of their own school (Fehr et al., 2008). Children show this bias in their allocation behavior even towards others who share the same minimal group membership (Dunham, 2018; Gummerum et al., 2009; Richter et al., 2016; Sparks et al., 2017). Yet, with respect to their evaluations, children tend to evaluate fair distributions as better than distributions that favor ingroup members. For instance, 3 and a half- to 6-year-olds evaluated equal distributors as better than a partial distributor, even if these distributors deviated from a group loyalty norm of enacting ingroup favoritism (Cooley & Killen, 2015). Similarly, 6-year-olds evaluate equal distributors as nicer than ingroup-favoring distributors

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(DeJesus et al., 2014). With respect to their interventions, some work suggests that children enforce fairness as third parties in a way that favors their ingroup. For instance, 6- and 8-year-olds are more likely to intervene to prevent unfairness when an outgroup perpetrated the unfair allocation than when an ingroup member perpetrated the unfair allocation (Jordan et al., 2014). 6-year-olds in this same study were more likely to intervene against unfairness directed toward an ingroup member. Consistent with this latter finding, a more recent study showed that 1-year-old infants expected third-party punishment to occur on behalf of an ingroup victim, but not an outgroup victim (Ting et al., 2019). Other work, however, suggests that children enforce fairness as third parties impartially. For instance, 6- to 9-year-olds in Peru and the USA intervene against unfairness regardless of whether a same- or other-gender character benefits from unfairness (Corbit et al., 2021). And, 9- to 13-year-olds protest against unequal resource distributions even when the distributions are proposed by their gender ingroup members (Hitti et al., 2014).

Thus, children's allocation decisions, their evaluations of others' allocation decisions, and their interventions paint a complex picture of their evolving intuitions about fairness, favoritism, and their interaction. To further complicate this picture, children's actual behavior is not always in alignment with their understanding of how they know they *should* behave, a phenomenon that has been labeled the knowledge-behavior gap (Blake et al., 2014). For example, children know that they ought to share equally years before they actually do so (Smith et al., 2013). Focusing on children's *expectations* can be particularly valuable in revealing how they simultaneously weigh fairness and loyalty, integrating across these factors and incorporating beliefs about how they think the world is. Additionally, children's expectations are presumably relatively impervious to the extraneous factors that likely influence their actual behavior. For instance, while children's own allocation behaviors are likely influenced by myriad factors, including self-interest, reputational concerns, and concerns about potential punishment, their expectations of others' behavior should be relatively less influenced by these factors. In this way, tracking children's changing expectations across development can provide insight into children's maturing theories about how fairness and loyalty interact, independent of whether their own behavior and evaluations conform to these expectations.

A growing body of work suggests that infants expect resources to be divided equally (Schmidt & Sommerville, 2011; Sloane et al., 2012; Ziv & Sommerville, 2017), yet recognize that when resources are limited, ingroup members will be favored (Bian et al., 2018; Mahajan & Wynn, 2012). While less work has examined expectations in older children, a study by Renno and Shutts (2015) showed that 6- to 8-year-olds expect gender and racial ingroup members to help them more often than outgroup members. In a study by DeJesus and colleagues (2014), 6- to 9-year-olds expected distributors to favor their minimal ingroup members, as opposed to favoring their outgroup members *or* distributing resources equally. These data suggest that al-

though children evaluate fair distributors as nicer, they still expect ingroup-favoring decisions to occur.

One context in which these expectations have potential real-world consequences is in children's emerging understanding of the gender gap in pay. In 2010, American women with full-time employment made, on average, \$0.72 for every dollar that American men made (Goldin, 2014). While there are multiple factors that may contribute to this wage gap (e.g., negotiation style, expected tenure), the gap at least partly exists due to biased payment allocation decisions (Goldin, 2014). Work with adults has found support for a "salary estimation effect," with men estimating higher salaries for male targets than female targets across a range of occupations (Crawley, 2014; Furnham & Wilson, 2011). In Furnham and Wilson (2011), this salary estimation effect was observed *within* a range of occupations, with participants estimating higher salaries for male targets than their female counterparts for doing the same work. Additionally, recent work suggests that Americans tend to expect a gender gap within households, although they do not generally endorse this inequality (Midgette & D'Andrea, 2021). One account for effects like these is that they are due to an automatic association between men and wealth (Williams et al., 2010). Notably, the existing gender bias in wages and adults' expectations of it are at odds with adults' egalitarian preferences, which are consistently demonstrated in laboratory settings (e.g., Dawes et al., 2007).

An open question is whether children hold expectations of this gender gap in pay and, if so, at what age they begin to expect men to be paid more than women for doing the same job. Previous work suggests that children hold an expectation of a gender gap *between* jobs. Liben and colleagues studied 6- to 11-year-olds' status ratings of female- and male-stereotyped occupations and found that children tend to rate culturally masculine jobs (e.g., auto mechanic) as higher in status. For older children, this gendered status association generalized to novel jobs. However, to our knowledge, no work has examined whether children expect a gender gap *within* jobs. Moreover, and related to children's emerging distributive fairness concepts, no work has examined whether children hold an expectation of a gender gap in pay when females and males have completed the same work. Examining children's expectations of how females and males will be compensated by an authority figure for equal work can help address these open questions by assessing children's expectations in a scenario that parallels real-world compensation scenarios in which pay is often decided by a boss.

Based on children's developing understanding of both fairness and loyalty, we lay out three different possibilities for how they might expect payment decisions to map onto gender. First, in line with ingroup loyalty concerns (e.g., Renno & Shutts, 2015), children may expect own-gender bias in allocation decisions. Thus, girls will expect females to be favored and boys will expect males to be favored. Second, in line with emerging fairness concerns, children may expect resources to be distributed equally, regardless of gender. Third, if children pick up on the existing gender gap in pay, this may be reflected in their expectations of

gender-biased payment. Thus, both boys and girls will expect males to be favored. With respect to this third possibility, if increased exposure to the gender gap gives rise to this expectation, we might expect that older children will show expectations relatively more in line with the existing gender gap than younger children.

Previous studies bring data to bear on the third possibility raised here: that children will expect a gender gap in pay. First, a study by Rizzo and colleagues (2020) examined children's responses to inequalities with individual origins (based on differences in work effort) or structural origins (based on preference for own-gender recipients; e.g., a female allocator favoring female recipients). Children across their age range of 3 to 8 years corrected gender-based inequalities. However, their expectations of others' allocations revealed a different pattern: both older and younger children expected an authority to perpetuate merit-based inequalities whereas older (6- to 8-year-olds) but not younger (3- to 5-year-olds) children additionally expected the perpetuation of gender-based inequalities. These data suggest that gender may not be viewed by children as a legitimate source of inequality. Yet, these findings do not speak directly to the question of children's expectations of a gender gap in pay because they examined inequalities based on the allocator's favoritism of their own gender (rather than a general expectation that males will be favored) and did not examine these patterns in a work context, where the gender gap has been demonstrated in adults.

Second, and more directly relevant to the gender gap in pay, is a study by Arnold and McAuliffe (2021) in which children had the opportunity to negotiate for a bonus number of stickers with either a male or female experimenter. They found that, in line with work with adults, 8- and 9-year-old girls asked for fewer stickers when negotiating with a male experimenter than a female experimenter and they did not see this gap in boys' negotiation or in younger girls' negotiation (4- to 7-year-olds). These data lend credence to the idea that the gender gap takes root early in development. However, because it was run from a first-person perspective—the child's own perspective—it remains unclear whether children hold a *general* expectation that males will be favored relative to females in payment decisions.

In the present study, we examine 4- to 11-year-old children's and adults' expectations of how an authority figure—a teacher whose gender we do not specify—will allocate five resources between a female and male who have completed the same task. We focus here on whether children hold *general* expectations that, given equivalent work, males will be more highly compensated than females. Exploring this general expectation requires avoiding scenarios involving gender-stereotypical occupations or domestic roles, which might produce differences in predicted compensation based on theories or specific experiences of gender congruence or "fit" with these different roles. This is especially important given that—as noted above—children are known to associate higher status with masculine jobs in the context of both real and novel occupations (Liben

et al., 2001) To further distance ourselves from specific stereotype content regarding normative adult roles, we focus on children's expectations about how other children would be compensated (rather than how adults would be compensated). To this end, our study examines whether 4- to 11-year-olds expect a teacher to reward a boy and girl character differently for completing the same classroom job. Note that we did not specify the teacher's gender and later asked children whether they thought the teacher was female or male. We then conducted exploratory analyses examining whether children expect teachers to favor children who share the teacher's gender. The classroom jobs used are common tasks (Fig. 1) with which both girls and boys in our study should have been familiar. Finally, to explore how children's expectations compared with those of adults, we include data from an online version of our study conducted with adult participants.

Because children within our age range show strong egalitarian preferences (Benenson et al., 2007; Blake & McAuliffe, 2011; Blake & Rand, 2009; McAuliffe et al., 2013), we asked children to report expected allocations for a resource that could *not* be divided equally between the two characters (five cookies, one plate of two and one plate of three). Our study thus addressed the following question: if a resource allocation decision by an authority figure must be biased, in which direction do children expect it to be biased with regards to gender? Exploring the direction of bias will bring data to bear on the three predictions outlined above: specifically, will children expect (1) own-gender bias, reflected by preferentially expecting the own-gender character to receive the favorable allocation; (2) no bias, reflected by at-chance choices; or (3) a gender gap in pay, reflected in preferentially expecting male characters to receive the favorable allocation.

Method

Participants

Participants were $N = 157$ children recruited from public spaces (e.g., local museum, university fair). Participants were divided into four predetermined age categories: 4&5 ($M = 60.27$ months (m), $SD = 6.52$, range = 49-71 m; $N = 40$, 19 females (F)), 6&7 ($M = 83.76$ m, $SD = 6.47$, range = 72-95 m; $N = 41$, 20 F), 8&9 ($M = 107$ m, $SD = 5.74$, range = 96-116 m; $N = 40$; 20 F), and 10&11 ($M = 129.06$ m, $SD = 6.25$, range = 120-143 m; $N = 36$, 17 F). Note that we initially tested 4- to 9-year-olds and later had an opportunity to add our 10&11-year-old age group. See Supplementary Online Materials (SOM; Table S1) for the sample breakdown by age group and gender. In one case, we were missing a child's age in months, so we estimated their age to be their age in years plus six months. Six children were tested but excluded from the final sample because they refused to allow the resources to be divided unequally between the two characters on two or more trials (5) or because of experimenter error (1). An additional six children were excluded a-priori because they were pilot participants (1), out of our age range (2), familiar to the experimenter (2), or could not speak English (1). At the time of data collection, we were not col-

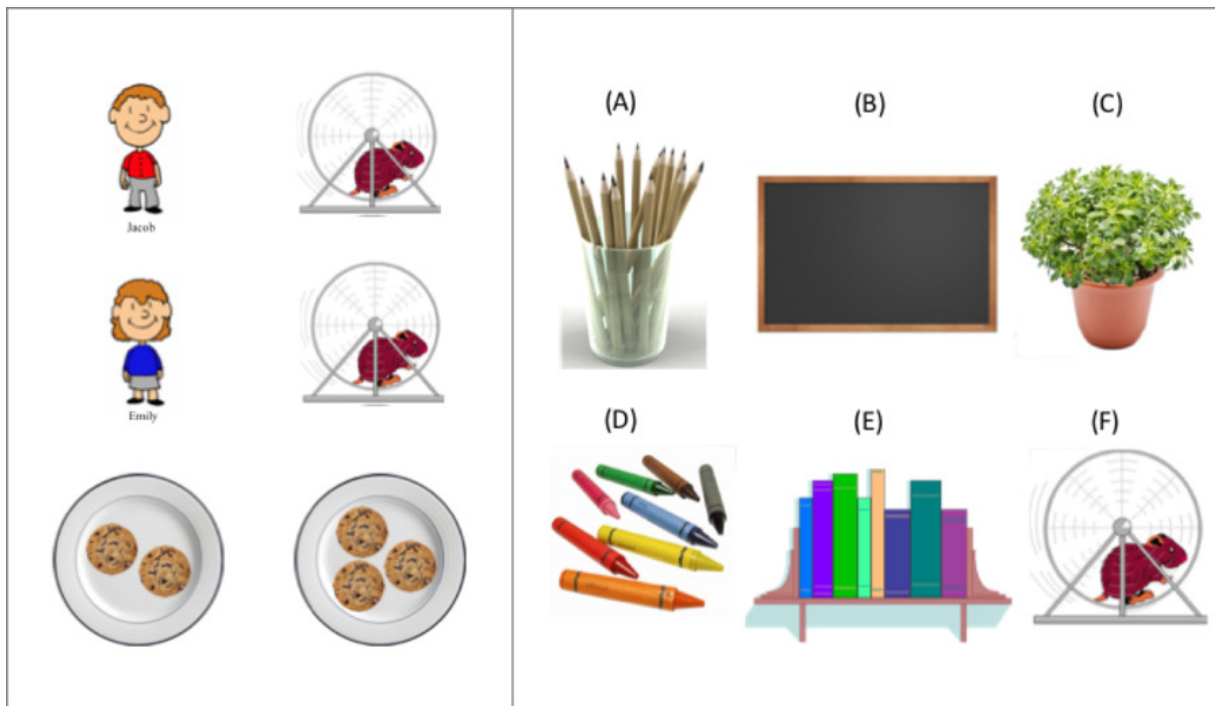


Figure 1. Left panel shows stimuli used in the reward expectation task. Participants were introduced to two characters, a boy and a girl, who helped their teacher with a classroom task. They were then asked how the teacher distributed an unequal number of cookies between the two characters. Right panel shows the different jobs that the characters performed for their teacher: they (A) sharpened pencils; (B) cleaned off a blackboard; (C) watered a classroom plant; (D) tidied up crayons; (E) put books on a shelf; or (F) fed the classroom hamster.

lecting demographic information when recruiting families in public spaces. Data collection with child participants was done in accordance with the Yale University IRB protocol #1305012100.

Design and Procedure

Participants were told six short stories about children in a classroom who did jobs for their teacher after school. To make the storytelling more engaging, the stories were explained with the use of a magnetic board and magnetic stimuli (Fig. 1). In each story, a girl and boy character performed a job in parallel (e.g., they each watered one of the classroom plants). Note that each story involved a different set of characters. Participants were then told that the characters' teacher wanted to reward them for their help. The teacher found five cookies, which meant that one character would receive three cookies while the other character would receive only two cookies. The allocations of cookies were presented on two separate plate magnets (Fig. 1). The experimenter then handed the magnetic characters to the participant and asked them to place the characters under the allocations of cookies that they thought each character received. Specifically, the experimenter said: "How do you think the teacher handed out the cookies?" As noted above, children who repeatedly refused to divide the cookies unequally were excluded. In four cases, we excluded one trial from a session because a child refused to divide the cookies unequally once (2), insisted on giving all five cookies to one of the two characters (1), or due to experimenter error (1).

In an effort to keep the teacher's gender ambiguous, the experimenter's script did not contain any gendered pronouns (gendered pronouns were used accidentally in approximately 6% of the sessions and, in these cases, pronouns used were "she" or "her"). Once the six test trials were complete, children were shown an image of a male and female teacher and asked which image more closely resembled the characters' teacher. The majority of participants (82%) thought that the teacher was a woman (121 of 148). This percentage reflects sessions in which the experimenter did not inadvertently use a gendered pronoun (note that this percentage is the same when we include all data; 128 of 157; exploratory analyses below that use participants' reporting of teacher gender include all data). The order in which the job and character stimuli were presented was randomized within-session. In our presentations, we counterbalanced (1) the order of presentation of girl and boy characters (note that they were on the board simultaneously, arranged vertically with one character on top of the other; see Fig. 1), (2) the side on which the larger and smaller cookie allocations were presented, and (3) the order in which the female and male teachers were presented at the end of the task (i.e., half the participants saw the female teacher first, half saw the male teacher first). Note that, as with the presentation of the characters, the teachers were on the board simultaneously, arranged with one character on top of the other. Based on participants' decisions across the six trials, we coded for two patterns that would be consistent with an attempt to equalize the rewards across trials: (1) an *alternating* pattern, in which the boy and girl

received more on alternating trials or (2) a *trial splitting* pattern in which participants allocated more to one gender on the first three trials and more to the other gender on the second three trials. Note that we included this second pattern here for the sake of completeness because it is a means of equalizing across trials. However, because children were not given information about the total number of trials, it is difficult to imagine how they could intentionally make choices in line with this latter pattern.

Adult version of the study

We conducted an online version of our task using Qualtrics survey software with adult participants ($N = 101$; Age $M = 39.14$ years, $SD = 11.16$, range = 20-70; $N = 38$ women). Recruitment and compensation were done via Amazon Mechanical Turk, using CloudResearch (formerly TurkPrime). Our target sample was $N = 100$ and we compensated 100 people, but one person completed the survey after the Human Intelligence Task (HIT) had closed. However, due to the anonymized nature of the data, we were unable to identify who was not compensated and thus we included all 101 participants in this sample. Adult data collection was conducted in accordance with Boston College IRB protocol #16.209.

The adult version of our task was based closely on the child version, but because it was done unmoderated online, adults read through the script themselves as opposed to interacting with an experimenter. Additionally, because of constraints involved in creating surveys using Qualtrics, instead of fully randomizing the presentation of characters and jobs, we randomly created sets of stimuli (e.g., Madison and Ryan were always paired with the ‘water the plants’ job). We had six girl characters, six boy characters, and six jobs, so this pairing resulted in six stimuli sets.

With these stimuli sets, we created two complete versions of the task, one of which had the stimuli sets in one configuration (e.g., Madison presented first, Ryan presented second) and the other of which had the counterbalanced configuration (e.g., Ryan presented first, Madison presented second). The presentation (left, right) of the plates of cookies was counterbalanced within and between these versions of the task, as was the order in which the female versus male teacher was presented. We used the “pick, group, and rank” question type in Qualtrics which allowed participants to drag the images of the cookies to the characters they thought received them. During the dragging portion of the task, presentation of choices was matched to the counterbalanced presentation of the stimuli.

Coding and analysis

The experimenter live-coded child participants’ decisions about whether they thought the girl or boy character received the larger number of cookies. Where we had a complete video recording for a session, a research assistant re-coded decisions from videos (96% of sessions). Reliability between live and video coding was very good (Cohen’s $Kappa = 0.98$).

All statistical analyses were conducted with R statistical software (version 3.6.3, R Foundation for Statistical Computing, 2020). Our study was designed to examine expectations of teacher allocations by gender and age. Although the study was not pre-registered, we consider this to be our main planned analysis which we addressed using two complementary approaches.

First, we examined whether participants’ own-gender choices (hereafter *participant-own-gender* choices; i.e., trials on which participants expected the character whose gender matched their own to receive three of five cookies from the teacher) differed significantly from a hypothetical mean of three. To this end, we created a sum of participant-own-gender choices, a measure that could range from 0 to 6. We then analyzed this measure using one-sample t-tests within each age and gender category.

Second, we conducted analyses examining which factors were the best predictors of children’s own-gender choices. Here, our main dependent measure was children’s expectation that their own gender would receive preferential treatment (i.e., receive the three of five cookies) on a given trial (participant-own-gender gets three cookies = 1; other gender gets three cookies = 0). Data were analyzed using Generalized Linear Mixed Models (GLMMs) with a binary response term using the package lme4 (Bates, Maechler, Bolker, & Bates, 2014). In all models, participant identities were fit as random intercepts to control for repeated measures. Our models included participant gender (male or female) and age as a four-level categorical variable (with our 4&5-year-olds age group as the baseline). We used age as a category for ease of graphical interpretation (Fig. 2) and because we recruited participants into pre-determined age groups. However, please see Table S2 for output from models with age fit as a scaled continuous predictor which are generally in line with analyses using age as a categorical predictor. Before examining predictors of interest, we first ran a comparison between a null model, which included only participant identity, and a full model which included all terms of interest as well as the interaction between age and gender. We found that our full model was a better fit to the data than our null model (LRT, $\chi^2_{7} = 18.19$, $p = 0.0112$).

In addition to examining first order effects of gender and age, we also examined the two-way interactions between age and gender. We established that particular terms were important predictors by dropping them from our models and testing whether their inclusion improved model fit using likelihood ratio tests (LRTs; terms dropped using command ‘drop1’). Figures were created using raw data, and binomial confidence intervals were calculated using the Agresti-Coull method (Agresti & Coull, 1998).

In an exploratory analysis, we additionally explored children’s choices from the perspective of the teacher’s gender (*teacher-own-gender* choices), as determined by participants’ answers to our final question about whether they thought the teacher was female or male. We did this to examine whether participants expected the teacher to show favoritism toward their own gender (e.g., a male participant expecting that a female teacher would be partial toward female characters) as opposed to showing favoritism based on

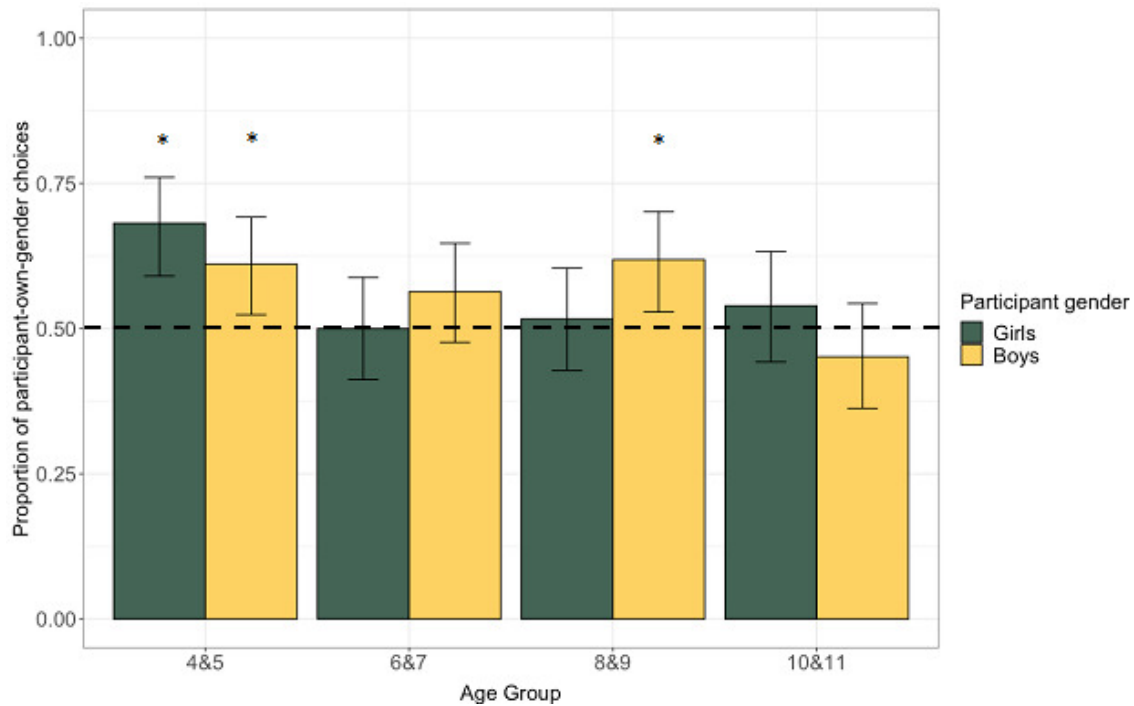


Figure 2. Expectations of participant-own-gender favoritism by age group and participant gender. Children were asked how they thought a teacher had allocated five cookies between a female and male character. Participant-own-gender choices refer to cases where participants expected teachers to allocate three of five cookies to the character that shared the participant's gender. Error bars indicate binomial confidence intervals. Asterisks indicate significance in one-sample t-test.

the participant's gender (e.g., a male participant expecting that a female teacher would be partial toward male characters).

In supplementary analyses, we examined (1) children's behavior on the first trial only using generalized linear models with a binary response term (see SOM; Fig. S1 and Table S3) as well as (2) the distribution of children's own-gender choices (see SOM; Fig. S2 and Table S4).

Results

Expectations of participant-own-gender favoritism by the teacher

The youngest participants in our sample—children in the 4&5-year-old age group—expected own-gender characters to receive partial treatment from the teacher. By contrast, 6- to 11-year-olds, with the exception of 8&9-year-old boys, expected impartiality (Fig. 2). In other words, 4- and 5-year-old girls and boys expected the teacher to give the plate of three cookies to their gender-matched character more than the other-gender character (girls, Mean (M) = 4.05 trials, Standard Deviation (SD) = 1.31; boys, M = 3.67, SD = 1.11). Indeed, expectations of participant-own-gender favoritism differed from chance (Fig. 2; one-sample t-test compared to a hypothetical mean of 3; girls, $t(18) = 3.5$, $p = 0.0026$, $d = 0.8$; boys, $t(20) = 2.75$, $p = 0.0123$, $d = 0.6$). With the exception of boys in the 8&9-year-old group, boys and girls across the other age groups expected no favoritism in the teacher's allocation decisions ($ps > 0.18$, $ds < 0.3$). However, boys in the 8&9-year-old group expected the teacher

to preferentially reward male characters ($t(19) = 2.8$, $p = 0.0116$, $d = 0.63$), an expectation that aligns with that of their 4- and 5-year-old counterparts.

Consistent with these patterns, our GLMM predicting participant-own-gender choices (participant-own-gender gets three cookies = 1; other gender gets 3 cookies = 0) showed a main effect of age (LRT, $\chi^2_1 = 11.71$, $p = 0.008$; see Table 1 for full and reduced model output) but no effects of participant gender (LRT, $\chi^2_1 = 0.02$, $p = 0.89$) or of the interaction between age group and participant gender (LRT, $\chi^2_1 = 6.45$, $p = 0.09$). An examination of the effect of age (Table 1) shows that all age categories differed from the 4&5-year-old baseline in the full model (and all but one in the reduced model), suggesting that, in general, 6- to 11-year-olds were generally less likely to expect their own gender to be favored than were our younger participants.

When we examined the patterns of children's expectations of the teacher's allocations, we found that, in some cases, children appeared to be expecting equality across the six trials: about a fifth of our participants (19.7%) chose the female and male characters in line with either the alternating ($N = 29$) or trial-splitting pattern ($N = 2$). These proportions did not differ across age groups ($\chi^2_3 = 3.80$, $p = 0.28$).

Expectations of teacher-own-gender favoritism

In an exploratory analysis, we examined whether children expected teachers to be partial toward characters that shared the teacher's gender (rather than characters that shared the participant's gender). For instance, do children

Table 1. Estimate and standard error (s.e.) of fixed effects in Generalized Linear Mixed Models predicting children's participant-own-gender choices (= 1). Table shows output from the full model, which included all predictors of interest, as well as the reduced model, which excluded the interaction between age group and participant gender because it did not improve model fit. Baselines: Age = 4&5; Gender = female. Table also shows goodness-of-fit statistics.

	Expectation: Full	Expectation: Reduced
Intercept	0.76 (0.20)***	0.58 (0.15)***
Age group: 6&7	-0.76 (0.27)**	-0.46 (0.19)*
Age group: 8&9	-0.69 (0.27)*	-0.32 (0.19)
Age group: 10&11	-0.60 (0.28)*	-0.62 (0.19)**
Gender: Male	-0.31 (0.27)	0.02 (0.13)
Age group x Gender: 6&7 x Male	0.56 (0.37)	
Age group x Gender: 8&9 x Male	0.73 (0.38)	
Age group x Gender: 10&11 x Male	-0.04 (0.39)	
AIC	1286.27	1286.72
BIC	1329.86	1315.78
Log Likelihood	-634.13	-637.36
Number of trials	938	938
Number of Participants	157	157
Variance: Participant (Intercept)	0.00	0.00

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

who thought the teacher was female expect her to favor female characters regardless of the child's own gender? Recognizing that the majority of children in this study thought the teacher was female (82%, $N = 70$ girls; $N = 58$ boys) rather than male (18%, $N = 6$ girls, $N = 23$ boys), leading to an imbalance in our data, we coded teacher-own-gender choices depending on whether the child reported that the teacher was male or female when asked at the end of the task. For instance, if a child reported that they thought the teacher was female, any trials on which the child expected the teacher to favor the female character would be coded as 1 whereas trials on which the child expected the teacher to favor the male character would be coded as 0. Note that these analyses include the small number of sessions in which the experimenter inadvertently used a gendered pronoun.

We ran a GLMM with teacher-own-gender choices as the response term and participant age group, participant gender, teacher gender, and the 3-way interaction between these terms as predictors. This model revealed that the interaction was not significant. We next ran a reduced model with age group, participant gender, teacher gender, and the 2-way interaction between participant gender and teacher gender. This term was a significant predictor of children's expectations of teacher-own-gender choices ($\chi^2_1 = 12.34$, $p < 0.001$; Table S3). Fig. 3 suggests that this interaction is due to girls' tendency to expect female (but not male) teachers to favor their own gender and for boys' tendency to expect male (but not female) teachers to favor their own gender.

This approach suggests that it was not the case that children generally expected teacher-own-gender favoritism. For instance, girls who thought the teacher was male did

not expect the teacher to favor male characters in their allocations. Rather, these data largely reflect the main pattern of results shown: namely, young children expected participant-own-gender favoritism and this expectation was attenuated over age.

Adults' responses

Like most 6- to 11-year-olds, adults expected teachers to distribute the cookies impartially with respect to character gender (Fig. 4). Neither men nor women expected favoritism in the teacher's allocation decisions: expectations of participant-own-gender favoritism did not differ from chance (one-sample t-test compared to a hypothetical mean of 3; women, $t(37) = -0.96$, $p = 0.34$, $d = 0.16$; men $t(62) = -1.1$, $p = 0.28$, $d = 0.14$) and our GLMM showed no effect of participant gender (LRT, $\chi^2_1 = 0.02$, $p = 0.88$; Table S5) on participant-own-gender choices.

When we explored adults' expectations of teacher-own-gender favoritism (Fig. 5) using a GLMM, we found a significant two-way interaction between participant gender and teacher gender (according to the participant) on teacher-own-gender favoritism (LRT, $\chi^2_1 = 5.01$, $p = 0.03$; Table S5). This result was likely driven by the few women ($N = 5$) who reported that they thought the teacher was male. The majority of participants reported that the teacher was female (89%; $N = 33$ women and $N = 57$ men) while a minority reported that the teacher was male (11%; $N = 5$ women and $N = 6$ men). Women who thought the teacher was male expected teachers to favor male characters. Other participants showed no expectation of teacher-own-gender favoritism.

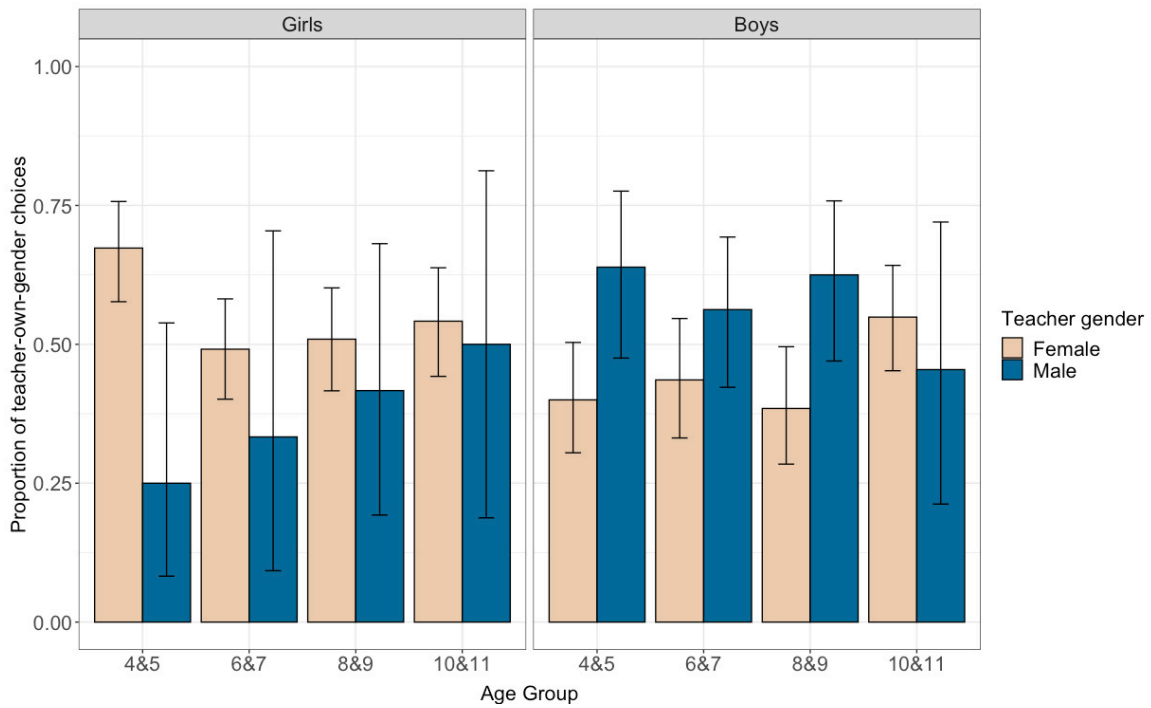


Figure 3. Expectations of teacher-own-gender favoritism by age group, participant gender (facets), and teacher gender as reported by the participant. For instance, if a child reported that they thought the teacher was female, any trials on which the child expected the teacher to give three of five cookies to the female character would be coded as 1.

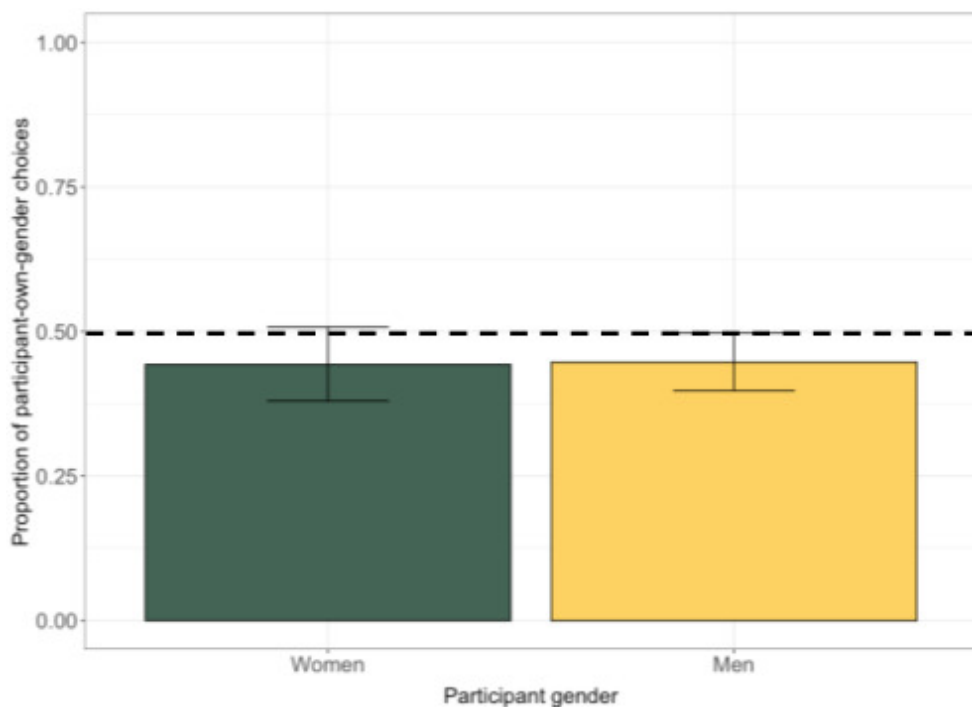


Figure 4. Proportion of own-gender choices by adult participants.

Discussion

Our results suggest that 4- and 5-year-olds tested in the USA expect teachers to show favoritism toward members of their own gender group when distributing unequal pay for equal work. However, by the age of 6 years, this expecta-

tion is attenuated. With the exception of 8- and 9-year-old boys, older children expect teachers to be impartial with respect to gender when distributing rewards for work. Adults, too, expect impartiality from teachers. These results suggest that, across development and into adulthood, people

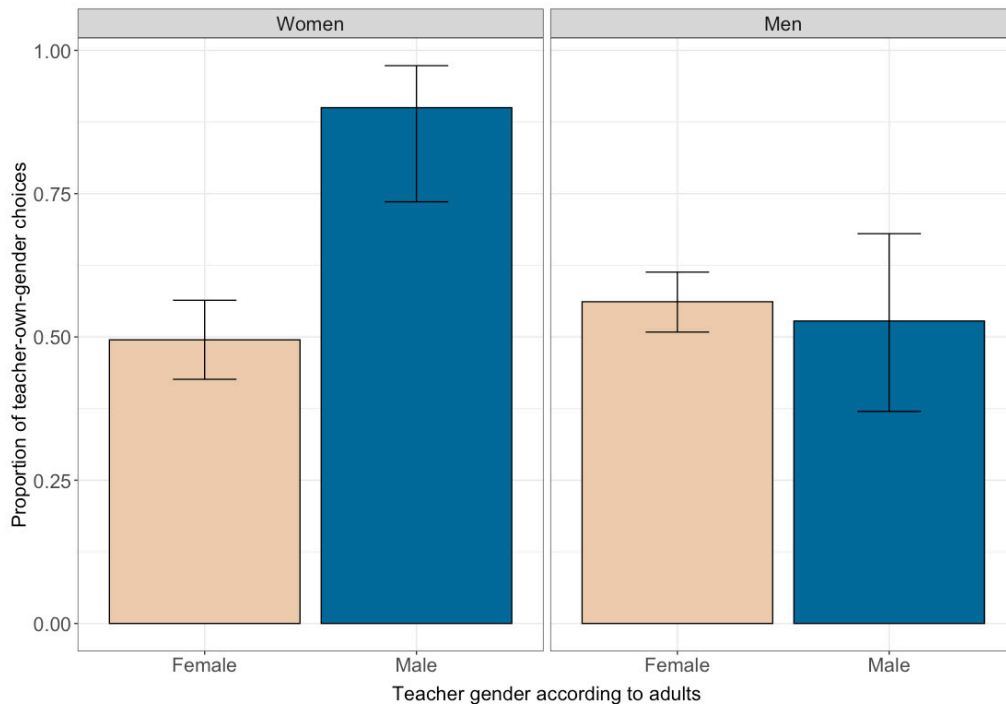


Figure 5. Expectations of teacher-own-gender favoritism by participant gender (facets) and teacher gender as reported by the participant.

in the USA show a growing expectation of gender parity in pay.

Our study was positioned to distinguish between three possibilities. First, that expectations of teachers' allocation behavior would align with their own-gender preferences. Second, that expectations would align with a preference for equality. Third, that expectations would align with the real-world phenomenon of the gender gap in pay. Our data certainly do not strongly support the third possibility: neither girls, boys, women, nor men in our study expected teachers to preferentially reward males over females for completing the same task. However, our findings are consistent, to varying degrees, with the first and second possibilities. In line with the first possibility, 4- and 5-year-olds' expectations of teachers' allocations showed an own-gender bias: both girls and boys in this age group expected the teacher to favor participant-own-gender characters. In line with the second possibility, our models showed that, relative to our youngest participants (4- and 5-year-olds), children in the older age groups (6- to 11-year olds) were generally less likely to expect own-gender bias. The absence of expectations of participant-own-gender favoritism was seen in 6- to 11-year-olds and adults, with the exception of 8- and 9-year-old boys who expected teachers to favor males. While certainly notable, this expectation of participant-own-gender favoritism was not present in our oldest male participants or adult men, suggesting that their expectations eventually fall into alignment with those of their female counterparts.

When we examined children's expectations of teacher-own-gender favoritism, we found no evidence that children generally expected teachers to favor characters that were members of the same gender group as the teacher (i.e., par-

ticipants who reported that the teacher was male did not expect male characters to be favored by the teacher). However, because our design did not provide information about teacher gender during the course of our main measures, it is also possible that children did not form expectations about teacher gender at all until we asked them about it explicitly at the conclusion of the task. This raises the possibility that calling attention to teacher gender during the main task could have shifted results, something worthy of future study.

When looking at adults' expectations of teacher-own-gender favoritism we saw this same pattern of results that we saw in children. However, there was one notable exception: female participants who reported that they thought the teacher was male expected teachers to preferentially reward male characters. Although this potentially reflects an interesting gender difference, we are reluctant to interpret this finding too richly both because these analyses were exploratory and not part of our original research questions and because of the small number of female participants (5 of 38 women) who reported that they thought the teacher was male.

Our finding that 4- and 5-year-old children in our study expected participant-own-gender favoritism while older children and adults generally did not points to a potential age effect on expectations of bias. Perhaps younger children expect teachers to allocate rewards in a way that maps onto children's *own* preference for members of their gender group. Does the expectation of teacher favoritism change with age because children's own-gender preferences change with age? An alternative possibility is that children's own-gender preference remains stable, but they override this preference with an expectation of equality

when thinking about what a teacher would do. This alternative is consistent with other work suggesting that children generally approve of equal distributions by gender (Conry-Murry, 2015). To distinguish between these possibilities, it is important to understand whether and to what extent children's own-gender preferences change with age.

Previous work suggests that children in this age range show a consistently strong own-gender preference (Dunham et al., 2016), and we have no reason to believe that children in our sample would be different. However, it is nevertheless possible that children in our sample showed an unusual decrease in own-gender preference and thus an accompanying decrease in expectations of own-gender favoritism. To rule out this alternative, we ran a simple explicit preference test with children in this age range in an effort to replicate the established own-gender preference effects. In this preference test, we elicited children's preference for the male versus female characters used in the expectation task ($N = 144$; see SOM for details of methods and results). Consistent with previous work, participants showed a strong own-gender preference which remains robust across our 4- to 11-year-old age range (Fig. S3; Table S7). Thus, we do not think the reason we see an attenuation in expectations of own-gender favoritism is due to changing own-gender preferences. Why, then, are children expecting gender pay parity despite strong own-gender preferences? One possibility is that children learn over development that their preferences are not an accurate guide to the behavior of others. Another possibility, which is not mutually exclusive but rather complementary with this first possibility, is that children show increasing expectations of fairness, or impartiality, over development. It is on this possibility that we focus the rest of our discussion.

Having ruled out the possibility that the observed pattern of attenuation in expectations of own-gender bias is undergirded by decreasing own-gender preferences, we are now in a better position to discuss the factors that could have contributed to the observed expectation of gender pay parity in most of our older children and in adults. First, by middle childhood, the majority of children in our sample may have had direct experience with authority figures, including teachers, behaving equitably towards boys and girls. Thus, our participants may have inferred based on their experience that, in this context, teachers would not exhibit gender bias in their reward allocations. While this is certainly a possibility, work from Rizzo et al. (2020) has shown that older (6- to 8-year-olds) but not younger (3- to 5-year-olds) children expected an authority figure (group leader) to perpetuate gender-based inequalities, so it is not unreasonable to think that children may hold the same expectations of teachers. Additionally, the Rizzo et al. (2020) findings suggest that experience indexed by age does not necessarily result in the attenuation of expectations of bias. Nevertheless, had we asked children about allocation decisions in a different context (e.g., men and women in different occupational roles), they may have shown different expectations. Second, the majority of our participants stated that they thought the teacher was female, despite the fact that we avoided the use of gendered pronouns. This as-

sumption may have played into their expectations of reward allocations: children in this age range may expect female allocators to show no gender bias in their allocations but may hold different expectations about male allocators. Our exploratory analysis speaks to this to some extent in showing that it was not the case that children seemed to hold a general expectation that teachers would preferentially reward characters that shared the teacher's gender. However, because only a small portion of our participants thought the teacher was male, these results speak only indirectly to this possibility. Future work could experimentally manipulate the gender of the allocator to test this possibility more directly. It is worth noting, in this vein, that in work with adults, both men and women showed a pro-male bias in their allocation decisions (Moss-Racusin et al., 2012).

From a methodological limitations perspective, we need to take seriously the possibility that children may not have been construing the classroom reward allocation scenario in the way that we intended. Namely, it is possible that children, although asked about their expectations of the teacher's behavior, were instead thinking about what they would or should do. If this were the case, children were treating our task more as a first-person allocation task than a third-party task tapping their expectations of an authority figure's (potential) gender bias. Future work in this area could consider employing a more complete design wherein children are asked about their own and a teacher's preferences for male versus female characters, are given the opportunity to allocate the rewards themselves (a first-person allocation task), and also report what they think the teacher did. Additionally, in line with DeJesus et al. (2014), future work could consider asking for both children's expectations of what happened as well as their *evaluations* of different allocations, as expectations and evaluations are not always in alignment. Although we very much hope future work addresses these open questions, particularly how—more specifically—children are construing the dependent measure in this task, we think it is reasonable to believe that children were able to reflect on and report on their expectations of teacher behavior given that they have reported on their expectations of authority figures in past studies (e.g., Rizzo et al., 2020).

The finding that our participants expected gender pay parity aligns with a large body of work on the development of distributive justice, which demonstrates that children in our age range tend to show strong egalitarian preferences and, indeed, are even willing to sacrifice their own rewards to promote equality (reviewed in McAuliffe et al., 2017). In the context of gender-based inequalities, our results are in alignment with findings from Corbit and colleagues (2021) which showed that children intervened at similar rates against inequalities that benefitted a male or female character, consistent with a general preference for equality. They are also similar to results from Rizzo and colleagues (2020), wherein children corrected gender-based inequalities. Additionally, work on children's emerging understanding of procedural justice suggests that children value impartiality (Shaw & Olson, 2014). Our

participants may have been applying existing principles of distributive and procedural justice to this situation.

One of our motivations for studying children's expectations in the context of gender-based favoritism in resource allocation was to begin to explore whether—and if so, when—children begin to expect a gender gap in pay. Given the prevalence of the gender gap in pay, as well as work suggesting that adults show a “salary estimation effect” consistent with the pay gap (Furnham & Wilson, 2011), it is reasonable to assume that, at some point in development, children become aware of the fact that men are often paid more than women for doing the same job. Lending credence to this idea is recent work showing that, in first-person negotiation scenarios, a gender gap emerges in late-childhood. By 8 years of age, girls but not boys ask for less from male than female allocators (Arnold & McAuliffe, 2021). While our findings did not end up providing direct insight into this question, our study has paved the way for future work in this area. For instance, this expectation may emerge only in specific contexts. Studying the origins of these expectations across different occupational contexts in childhood and beyond would be a fruitful way to pursue this question further.

It is worth noting that while adults' expectations were generally consistent with older children's (6- to 11-year-olds') expectations of gender pay parity, they were inconsistent with work on the “salary estimation effect” (Furnham & Wilson, 2011; Williams et al., 2010), which suggests that adults generally estimate that males will receive more compensation than females. One possible explanation for this difference is that men and women may hold one set of expectations about how children should be rewarded and another set of expectations about how adults should be rewarded. An additional possibility that relates as much to our child participants as it does to our adult participants is that, in presenting the male and female characters simultaneously, participants were prompted to think about distributional fairness and this concern overwrote an existing, but potentially weaker, belief that males tend to be paid more than women. To test this idea, future work could employ a design that does not directly contrast the male and female characters. Indeed, future work with children could benefit from the methods that have been developed for salary estimation to ask children in a more open-ended way how much they expect males and females to be compensated. This type of more continuous measure was recently used in a study on the development of a gender gap in negotiation (Arnold & McAuliffe, 2021). If work of this kind continues to show that children expect gender pay parity, it will be important to consider the extent to which the absence of an expectation of the gender gap in pay is due to extensive

messaging about the importance of equality in childhood and, by extension, to consider whether this kind of messaging can help adjust adults' expectations of gender pay inequality.

To return to our main research question, *Do children expect boys and girls to be rewarded differently for doing the same work?*, the answer appears to be a resounding ‘no.’ Or, at least, ‘not in this context.’ Instead, children tend to expect gender parity in pay from relatively early in development. While we view these results as somewhat encouraging—justice is supposed to be impartial, after all, and children seem to expect that—there is still much work to be done. While we have no evidence for an early-emerging expectation of a gender gap in pay, the gender pay gap undoubtedly exists, and understanding its origins and, by extension, whether it can be attenuated early on remains a priority for future work.

Contributions

Contributed to conception and design: KM, YD, SC
 Contributed to acquisition of data: KM, SC
 Contributed to analyses and interpretation of data: KM, MK, SC, YD
 Drafted and/or revised the article: KM, MK, SC, YD
 Approved the submitted version for publication: KM, MK, SC, YD

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Competing Interests

No competing interests to declare.

Data Accessibility Statement

Data and R code can be accessed at <https://osf.io/b8rzj/>.

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