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The moral, or the story? Changing children's distributive justice preferences through social communication



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ABSTRACT

Can social communication alter children's preexisting inclinations toward equality-based or merit-based forms of resource distribution? Six- to eight-year-old children's ($N = 248$) fairness preferences were evaluated with third-party distribution tasks before and after an intervention. Study 1 indicated that stories about beavers dividing wood had no impact on children's fairness preferences, while Study 2 indicated that brief, direct testimony was highly influential. Study 3 matched storybooks and testimony in content, with each discussing a situation resembling the distribution task, and both formats exerted a significant impact on children's fairness preferences that persisted across several weeks. There were some indications that interventions preaching the superiority of equality-based fairness were particularly effective, but there were no differences between reason-based and emotion-based interventions. Overall, storybooks and testimony can powerfully and enduringly change children's existing distributive justice preferences, as long as the moral lessons that are conveyed are easily transferable to children's real-world contexts.

1. Introduction

The witch in *Sondheim's Into the Woods* warns: "Careful the things you say; children will listen." This aptly reflects the popular belief that children readily absorb anything they hear, whether they are told directly or through media (e.g., television, movies, or books) – particularly when learning moral values. Certainly, children are often credulous, believing what adults tell them even if it conflicts with their firsthand experience (see [Jaswal & Kondrad, 2016](#)). However, children's sponge-like deference is primarily bound to situations of ambiguity for which they have no prior knowledge. Children are considerably more discerning and prone to reject adults' claims when they already hold a countervailing belief or when they have other reasons not to trust an informant (see [Harris, 2012](#); [Koenig & Sabbagh, 2013](#); [Mills, 2013](#); [Sobel & Kushnir, 2013](#)). An open question is therefore raised: how receptive are children to social communication that aims to influence their preexisting moral commitments? In the present research, we investigated whether storybooks and direct testimony – two common sources of information about moral norms – could lead children to value one form of fairness (e.g., equality) above another (e.g., merit), as measured by third-party resource distributions.

Decades of research have indicated that socialization efforts by parents, teachers, and other adults can exert a meaningful impact on children's morally-relevant actions and patterns of moral reasoning (see [Grusec et al., 2014](#); [Hoffman, 1977](#); [Rushton, 1976](#)). While a large number of these studies have been correlational in nature (e.g., [Augustine & Stifter, 2015](#); [Davidov & Grusec, 2006](#); [Kochanska, 1997](#); [Walker & Taylor, 1991](#)), thus precluding strong inferences about the causal effects of socialization, there have also been many experimental studies indicating that modeling and other forms of social input can directly influence children's prosocial behaviors (e.g., [Blake et al., 2016](#); [Bryan & Walbek, 1970](#); [Eisenberg-Berg & Geisheker, 1979](#); [Grusec et al., 1978](#); [Williamson et al., 2013](#)). However, these previous experiments have generally focused on shaping children's tendencies to act in ways that are widely considered to be morally good (e.g., inducing children to be helpful or generous), and thus they do not speak to whether social communication can impact children's preexisting moral commitments. To the extent that prior research has instead aimed to shift children's basic stances on what is morally right or wrong, it has done so indirectly: by targeting non-moral beliefs that are known to bear on moral beliefs. For instance, researchers have previously shifted children's moral beliefs about unfamiliar actions by persuading children that these

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novel actions have the property of being disgusting, angering, or harmful (Rottman et al., 2017), or by leading children to reassess the scope of the proscription against causing harm (Li et al., 2019), but they have not (for example) shaped children's beliefs about whether harm is immoral. To our knowledge, researchers have not previously measured the efficacy of attempting to directly influence children's beliefs about moral principles themselves.

In addition to the theoretical implications of investigating whether and how beliefs about fairness can be altered by social communication, the present research is motivated by applied considerations. The contrast between equality-based fairness and merit-based fairness has been prevalent throughout history and prominently fuels contemporary political debates and ideologies in the United States (Dworkin, 2000). Given that children's distributive justice preferences are likely to eventually translate into preferences for how resources should be distributed at a societal level (Starmans et al., 2017), it is critical to understand the extent to which children adopt a reliable stance on how to justly allocate resources, and to explore whether certain social influences can disrupt this stance.

1.1. The development of distributive justice

Since Piaget's (1932) seminal work on moral development, psychologists have demonstrated that children possess at least two distinct ideas of how resources should be properly apportioned: according to equality (with everybody getting the same amount) or according to merit (with more deserving recipients earning more rewards). Most early research on the development of fairness beliefs was focused on the influences of cognitive maturation and logical or mathematical reasoning, positing that children pass through stable cognitive stages that lead to predictable changes in fairness concepts (see Damon, 1977; Hook & Cook, 1979). This body of literature yielded evidence that equality-based fairness is robust during early and middle childhood and is then replaced by merit-based fairness, which seemed to naturally emerge during late childhood or early adolescence (Almås et al., 2010; Damon, 1975; Piaget, 1932).

Although the general progression from favoring equality at younger ages to favoring merit at older ages is robust and highly replicable, further research has revealed that this developmental trajectory is neither deterministic nor stage-like. Although young children tend to divide resources equally in a range of situations, contextual factors influence older children's tendencies for dividing resources in accordance with merit or equality, such that they can flexibly switch between preferring different modes of distribution in different situations (Huntsman, 1984; Rizzo et al., 2016; Sigelman & Waitzman, 1991). There is also evidence of cultural malleability, such that age-matched children demonstrate divergent preferences for equality or merit in accordance with growing up either in an egalitarian community or in a meritocratic community (Nisan, 1984; Schäfer et al., 2015). This divergence of children's distributive justice tendencies in different societies lends support to theories that children's moral preferences are shaped at least in part by learning from discourse transmitted by moral authorities within a given cultural milieu (e.g., Shweder et al., 1987; Snarey, 1985).

Additionally, even though preferences for merit become more pronounced during middle and late childhood, a competence for understanding merit is intact much earlier than previously realized (see Blake et al., 2014). In looking time paradigms, infants are sensitive both to principles of equality (Geraci & Surian, 2011; Ziv & Sommerville, 2017) and to principles of merit (Sloane et al., 2012). Furthermore, children as young as three or four have been found to apply principles of merit when distributing resources between themselves and a third party (Kanngiesser & Warneken, 2012) or between two third parties (Baumard et al., 2012; Nelson & Dweck, 1977). However, when preschool-aged children are given the option to distribute resources evenly, they typically revert to dividing equally rather than

meritoriously, even if it means that one resource must be withheld or discarded (e.g., Baumard et al., 2012). Overall, this research indicates that the moral principles of equality and merit are simultaneously available even to very young children, although preferences for merit are substantially more fragile at an early age.

Together, the context-dependence of distributive justice and the early emergence of both equality-based and merit-based resource distribution suggest that favoring one form of fairness over another cannot be wholly explained by cognitive maturation. Despite extensive cognitive developmental research on children's third-party resource distribution tendencies, research is lacking on the forms of social influence that can shape these preferences and contribute to individual differences within a population. Could storybooks or testimony bring about shifts in preexisting fairness preferences, leading children to revise their tendencies either to provide people with equal amounts of resources or to provide more industrious people with more resources? The present research investigates whether patterns of resource distribution are amenable to being changed through such forms of social communication.

In addition to determining whether storybooks or testimony can produce any alteration in children's baseline fairness preferences, this research examined whether social communication is more effective for instilling preferences for either equality or merit. Given that equality is likely an initial default stance (e.g., Olson & Spelke, 2008; Sigelman & Waitzman, 1991; Smith & Warneken, 2016), it is plausible that children will more easily fall back upon this earlier and simpler idea after an intervention, especially given that merit preferences may be unstable after their initial acquisition. Alternatively, it is also reasonable to expect that interventions leading children to favor merit will be more powerful, given that children typically progress from preferring equality to preferring merit rather than the opposite (Hook & Cook, 1979), and social communication may provide the requisite scaffolding needed for children to reach this more complex stance on how to fairly divide resources (Turner & Berkowitz, 2005; Vygotsky, 1978). Arbitrating between these competing hypotheses can nuance the interpretation of any influence that social communication exerts on children's adoption of new fairness preferences, as differential effects of equality-based and merit-based interventions will indicate potential constraints on flexibility.

1.2. Learning moral lessons from storybooks and other forms of social communication

Throughout history, narratives have been designed to shape moral beliefs. This is evidenced in religious texts such as the Bible and the Ramayana, as well as in secular stories such as Aesop's fables. Anecdotally, stories have had tremendous effects in ameliorating prejudice and discrimination, as when enslaved African-Americans were treated with greater moral concern after the wide circulation of *Uncle Tom's Cabin* (Bloom, 2010). Accounts such as these have led several researchers to identify narrative as a primary cultural instrument for shaping and perhaps revising moral intuitions (Bloom, 2010; Haidt & Joseph, 2007; Tappan & Brown, 1989). Indeed, research has shown that stories can lead to powerful changes in adults' moral attitudes (Green & Brock, 2000; Mazzocco et al., 2010). The hypothesis that storybooks should be a viable form of social communication for influencing children's beliefs about distributive justice is also suggested by research indicating that illustrated storybooks are frequently effective vehicles of belief change in childhood (e.g., Kelemen et al., 2014; for reviews, see Hopkins & Weisberg, 2017; Strouse et al., 2018).

Recently, several researchers have begun to investigate the effectiveness of storybooks in producing changes in children's resource allocations. In one study, 6- to 9-year-old children became more generous in a first-person altruism task (the Dictator Game) after being read a storybook about a child who exerted self-control (Steinbeis & Over, 2017). In another study, 4- to 6-year-old children became more

generous in the Dictator Game when they were read a story about a child who learned to share, although not when they were read an otherwise identical story about an anthropomorphic raccoon who learned to share (Larsen et al., 2018). Both studies therefore demonstrated that storybook interventions can affect children's altruistic giving (also see Yao & Enright, 2020, for similar findings). However, these studies have not attempted to change children's abstract fairness preferences; rather than targeting belief revision, participants were led to act in accordance with their preexisting beliefs that generosity was good. Influencing beliefs about fair resource distribution requires an approach that targets specific fairness principles, ideally when children do not stand to benefit themselves.

Despite some successes in teaching children moral lessons through stories, as described above, many written narratives and television shows have been ineffective, often as a result of poor comprehension of the intended message or a failure to transfer the information to a different context (Mares & Acosta, 2008, 2010; Narvaez et al., 1999). For example, upon watching a television episode about a three-legged dog (intended to teach tolerance for people with disabilities), most kindergarten teachers took the story at face value and did not appropriately generalize the message to humans – and in some cases, they became *more* intolerant of those with disabilities, thus internalizing exactly what the story aimed to overcome (Mares & Acosta, 2008). Additionally, a recent set of attempts to teach children honesty through popular storybooks such as *Pinocchio* found that only one of four books was effective (Lee et al., 2014), and it is unclear whether this single success resulted from the message contained in the storybook itself or from the experimenter's prompting of children to act like the protagonist.

Overall, the conflicting literature on the efficacy of moral learning from storybooks suggests that children may derive greater benefits from more direct and straightforward forms of verbal communication (henceforth, simplified to “testimony”). Unlike stories, which are largely intended to entertain, the primary purpose of testimony is to convey information. A number of studies have found that children's moral beliefs and prosocial behaviors can be influenced by various forms of adult testimony (Li et al., 2019; McAuliffe, Raihani, & Dunham, 2017; Rosenhan et al., 1968; Rottman et al., 2017; Rushton, 1975; Sagotsky et al., 1981; also see Eisenberg et al., 2006; Harris, 2012). However, none of this research has investigated how testimony can alter commitments to preexisting moral principles. Additionally, given that children are typically less credulous in contexts that do not require them to defer to adults in order to acquire information, and in contexts where they already have stable commitments (Harris, 2012; Schillaci & Kelemen, 2014; Sobel & Kushnir, 2013), it is an open question whether testimony can motivate moral belief change. Therefore, in addition to examining the impact of storybooks on fairness preferences (Studies 1 and 3), we investigated whether a brief direct statement (Study 2) or more extended testimony (Study 3) would affect children's fairness preferences.

1.3. Emotional and reasoned appeals

Both storybooks and testimony vary greatly in the nature of their appeals, ranging from being highly emotional to being highly reasoned. This distinction between emotional and reasoned appeals has been frequently emphasized in the literatures on persuasion (Petty & Cacioppo, 1986) and moral psychology (Haidt, 2001; May, 2018). A dominant perspective amongst moral developmentalists is that children acquire moral beliefs through personal reasoning (see Dahl & Killen, 2018), suggesting that social communication will be effective only insofar as it provides children with the ability to reason differently about an issue. However, recent research has revealed that additional factors beyond reason also contribute to the development of moral preferences (see Hamlin, 2015; Rottman, 2019), and thus other kinds of appeals may be effective. In particular, emotional appeals have been proposed

as a primary catalyst for moral belief change (e.g., Clifford, 2019). Studies with adults suggest that providing reasons is often an ineffective strategy for altering moral beliefs (Stanley et al., 2018), while stories produce moral attitude changes most readily when readers are emotionally transported into a narrative world (Mazzocco et al., 2010). Thus, in Studies 1 and 2, we tested whether emotional appeals or reasoned (principle-based) appeals are more effective in leading to belief change in the domain of distributive justice.

1.4. Overview of the present research

Our research investigated whether storybooks and testimony are effective tools for influencing children to revise their existing preferences for either equality-based or merit-based forms of resource distribution. First, to estimate the stability of children's fairness preferences, we conducted a baseline study to test children's tendencies to change their patterns of resource distribution after an irrelevant intervention. Then, in our primary studies, we examined children's tendencies to change their patterns of resource distribution after being exposed to an intervention that was designed to convince them of the superiority of their disfavored form of fairness.

In each of the three primary studies, participants were assigned to one of four conditions. In Studies 1 and 2, these resulted from a 2 (Fairness Type: Merit vs. Equality) X 2 (Appeal: Emotional vs. Reasoned) design. In Study 3, these resulted from a 2 (Fairness Type: Merit vs. Equality) X 2 (Intervention: Storybook vs. Testimony) design. We tested participants both before and after an intervention to determine whether social communication could alter the fairness preferences children already possessed. To measure fairness preferences, a third-person distribution task was used. This not only allowed us to investigate the socialization of moral principles, but also eliminated the potential that selfishness could influence the results. When children stand to gain or lose from their distributions of resources, they tend to be strategically self-interested (Fehr et al., 2008; Larsen et al., 2018; Shaw et al., 2014; Sheskin et al., 2014; Smith et al., 2013; Steinbeis & Over, 2017) and do not always behave in accordance with their principles (Blake et al., 2014). These considerations are not relevant to impartial third-person allocations, which may more directly reflect abstract beliefs about justice.

We tested six- and seven-year-old children in Studies 1 and 2 because, during this period of development, children tend to begin gravitating away from heavily weighting equality-based forms of distribution and move toward merit-based forms of distribution (e.g., Damon, 1975; Hook & Cook, 1979; Leventhal et al., 1973). Additionally, findings that children are overly literal in their interpretation of moral stories have been primarily constrained to preschool-aged participants (see Narvaez, 2002), and older children have enhanced abilities to extract abstract lessons from storybooks (Emmons et al., 2018). Due to a preponderance of equality distributors in the pre-test phase in Studies 1 and 2, Study 3 broadened the age range to include eight-year-olds. In each study, we report all measures, conditions, and data exclusions, either in the main text or in the Supplementary Materials. All stopping rules for data collection were determined in advance.

2. Baseline study

Because the stability of children's fairness preferences is largely unknown, we conducted a control study to obtain a point estimate of “chance” responding. This study involved an irrelevant intervention, which allowed us to estimate the baseline rate at which children can be expected either to remain steadfast in their patterns of resource distribution between a pre-test and a post-test, or to randomly oscillate between different kinds of resource distributions (i.e., equality-based fairness or merit-based fairness) across two similar distribution tasks.

2.1. Method

2.1.1. Participants

Participants were 32 six- to eight-year-olds (14 female; $M_{\text{age}} = 7.41$; $SD_{\text{age}} = 0.93$) who were recruited from a small city in the northeastern United States via a participant database and tested in a college laboratory ($N = 12$), or who were recruited and tested in a nearby school ($N = 20$). Participants were primarily White and of middle- to high-SES. Three additional participants were tested but were replaced due to failures to pass a comprehension check. Because no participants gave a greater number of resources to the less productive child during either pre-test or post-test (i.e., they all divided prizes based on either merit or equality), all other participants were retained for analyses.

2.1.2. Materials and procedure

2.1.2.1. Pre-test and post-test. As a measure of initial fairness preferences, participants were presented with an initial distribution task (pre-test) before the experimental intervention. A second distribution task (post-test) was then administered after the intervention. The crucial dependent measure was whether participants changed their tendencies to distribute resources based on equality (by giving four prizes to each child) or based on merit (by giving more prizes to the child who completed more of a task) between the pre-test and the post-test.

The distribution task, adapted from [Leventhal et al. \(1973\)](#), took the form of a timed “work task”. Participants first completed a version of this task themselves, and they were told that time had run out after they had completed exactly 50% of the task (such that the performance of all participants was exactly the same). Because this procedure was repeated in the pre-test and the post-test, two separate work tasks were used. These were functionally similar but differed in superficial properties. One involved adhering colored discs to a strip of colored paper, and the other involved stamping rubber stamps below corresponding animal pictures. The order of these two tasks was counterbalanced across subjects, as were the resources being distributed (either smiley-face stickers or temporary tattoos).

After participants gained personal experience with the work task, they were told about two other children (matched for gender and age), who had participated earlier but who needed to leave suddenly and were not able to receive any prizes. It was revealed that one of these children had completed 25% of the task in the time allotted, while the other had completed 75% of the task. This discrepancy was presented visually and through counting the number of discs or stamps that had been applied to the other children's strips of paper. The ratio was 15:5 for the discs task and 12:4 for the stamps task. At this point, participants were told that their help was needed in determining the right number of prizes to allocate to each child, and they were provided with eight resources to distribute into envelopes. A novel second experimenter administered the second task after the intervention had taken place and after playing a brief distractor game of “I Spy” with the participant in order to make this second portion of the testing session appear “totally different” from the first portion (which children were told was the case). After participants finished distributing resources on each occasion, they were asked to explain their reasoning for their particular division of stickers or tattoos.

2.1.2.2. Intervention. The baseline intervention consisted of a 357-word storybook, which was factual rather than moralistic, and which did not mention fairness, resources, or anything else related to equality or merit. Seven illustrations of beavers (also used in the Study 1 storybooks), which did not depict any form of resource distribution or indications of equality or merit, were used to create an educational storybook that provided a range of true facts about beavers (e.g., “Beavers have see-through eyelids that let them see things underwater” and “Beavers have long teeth that never stop growing”).

Following the second distribution task, participants were asked to

recount one thing that they learned about beavers from the storybook. This allowed us to ensure attentiveness and comprehension of the book (and to analyze only data from participants who demonstrated basic comprehension).

2.2. Results

Across both the pre-test and the post-test, 100% of participants either divided stickers based on merit (i.e., they gave more stickers to the child who was shown to be more productive in the work task) or divided stickers equally; none gave more stickers to the child who was less productive. Children tended to be equality-distributors (62.5%) rather than merit-distributors (37.5%) at pre-test, but a binomial test indicated that this trend was non-significant, $p = .215$. A logistic regression indicated that changes in patterns of resource distribution between pre-test and post-test did not significantly differ across children who initially divided by equality or by merit, $b = 1.04$, $p = .234$.

Critically, this study provided an estimate of the baseline rate of change in patterns of resource distribution between the pre-test and the post-test, in the absence of exposures to a relevant intervention. Overall, 7 of the 32 participants (21.88%) changed their pattern of distribution between the pre-test and the post-test.

2.3. Discussion

This Baseline Study found that more than three-quarters of participants retained the same pattern of resource distribution after an irrelevant intervention, demonstrating that children tend to have stable fairness preferences by middle childhood. This study additionally suggested a benchmark for determining the effectiveness of our interventions in Studies 1–3. Because participants in this study were largely, but not wholly, consistent in their patterns of resource distribution across the pre-test and post-test, it is evident that neither 0% (floor) nor 50% (pure chance) would be appropriate points of comparison. Instead, we can reasonably expect that approximately 21.88% of children will tend to alter their distribution patterns randomly, regardless of whether they are exposed to a relevant intervention. We therefore use this percentage as a point estimate for chance-level responding, to which we compare rates of change in the studies described below.

3. Study 1

Study 1 examined whether moralistic storybooks can shift children's fairness preferences. The stories used in the intervention were modeled after existing popular storybooks, and as such they featured animals as the main characters – as this is a pervasive component of children's storybooks ([McCrinkle & Odendaal, 1994](#)).

3.1. Method

3.1.1. Participants

Participants were 70 six- and seven-year-old children (34 female; $M_{\text{age}} = 7.13$; $SD_{\text{age}} = 0.49$) from a large city in the northeastern United States who were recruited via a large participant database and tested in a university laboratory ($N = 11$) or who were recruited and tested in local elementary schools and summer camps ($N = 59$). Participants were primarily White and of middle- to high-SES. One additional child was tested but not included in the dataset due to an experimenter error. As all participants either divided stickers based on merit or based on equality in both the pre-test and the post-test, no other participants were excluded from analyses.

Participants were randomly assigned to hear either an Emotional appeal or a Reasoned appeal. Given that the study design involved attempting to shift children's initial preferences for equality or merit through a storybook intervention, participants were not randomly assigned to the Equality or Merit interventions, but were rather assigned

to a particular Fairness Type based on the preferences that they demonstrated in their pre-test distributions (as in Bandura & McDonald, 1963). This ensured that each participant was presented with an argument that ran contrary to his or her initial mode of allocation (i.e., equality-distributors at pre-test were assigned to hear a storybook that advocated for merit, while merit-distributors at pre-test were assigned to hear a storybook that advocated for equality). Given this targeted intervention approach, over-sampling was necessary in order to have sufficient sample sizes in each condition. A stopping rule, decided prior to data collection, dictated that testing would cease after at least 16 children had been assigned to each cell within the 2 (Fairness Type) X 2 (Appeal) design. In order to achieve this minimum sample size in the condition preaching Equality through Emotional appeals, six extra participants needed to be tested (an additional six participants divided by equality at pre-test and were therefore assigned to the condition advocating Merit through Emotional appeals). Here, as well as in Studies 2 and 3, the same pattern of findings is found when excluding these additional children and reanalyzing the data with a reduced sample of 64 participants (see Supplementary Materials).

3.1.2. Materials and procedure

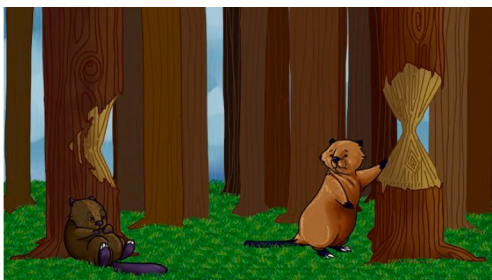
3.1.2.1. Pre-test and post-test. Participants were presented with the same pre-test and post-test as in the Baseline Study, such that they were again asked to distribute resources between one child who had completed 25% of the work task and another child who had completed 75% of this task. As was the case in the Baseline Study, the experimenters did not specify a reason for this discrepancy in the children's performance, making it unclear whether differences in ability or differences in effort were at play. This ambiguity was intentional, as it allowed the Equality intervention to impact fairness preferences by highlighting that individuals differ in their abilities to accomplish tasks, and claiming that we shouldn't fault hard-working individuals for reduced outputs that are no fault of their own. Similarly, this allowed the Merit interventions to impact fairness preferences by highlighting that individuals differ in their tendencies to be diligent, and claiming that we shouldn't reward lackadaisical individuals for their relatively

poor outputs. A second experimenter administered the post-test to reduce potential demand effects.

3.1.2.2. Intervention. The illustrated storybooks, which were custom written by the first author to maximize control of the relevant variables, were each 357 words in length (exactly matching the length of the storybooks from the Baseline Study). These stories depicted a society of beavers who needed to decide how to distribute the wood they cut down each day. In each case, the beavers initially distributed wood in a way that matched the participant's pattern of distribution. The beavers subsequently realized that it was better to instead divide their wood in accordance with a different principle – either equality or merit, whichever opposed the participant's distribution – and they unanimously decided to enact this change. Storybooks that appealed to emotions presented a tale focused on a protagonist, Benny (or Betty, for girls), who felt conflicted about the status quo of the distribution norms in the beaver society and convinced the other beavers to split up their wood equally instead of splitting it up according to merit, or vice versa, in order to overcome the existing societal injustice. Storybooks that appealed to reason were also presented in illustrated books about beavers distributing wood, but rather than presenting an affectively charged chronicle with a main character, these books objectively described the beavers' behavior and presented principled arguments for dividing wood according to either equality or merit. (See Fig. 1 for excerpts; the full set of materials is available at <https://osf.io/sf6xa>.) After the book was read aloud, participants were asked to retell the story to the first experimenter in order to ensure full comprehension, and any inaccuracies were corrected as needed. This was relatively infrequent, as most participants demonstrated an understanding of the stories without the need for any corrections or reminders.

3.1.2.3. Exploratory questions. After the primary measures were administered, participants were asked to rate, on a scale from 1 (really bad) to 4 (really good), the degree to which it is good for all beavers to split up their wood equally so every beaver gets the same amount. They were also separately asked to rate, on the same scale, the

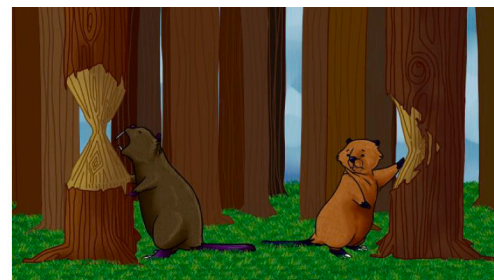
MERIT INTERVENTION



Emotional: “Benny watched how the beavers who didn't work very hard still got the same amount of wood as the hard-working beavers, and because some beavers got more wood than they worked for, they all had the same sized dams. It made Benny so upset that he couldn't sleep night after night.”

Reasoned: “The reason beavers should keep their own wood is that harder-working beavers should not be forced to give up some of the wood they cut down, and it wouldn't be right for beavers that don't work very hard to get extra wood that they didn't cut down themselves.”

EQUALITY INTERVENTION



Emotional: “Benny watched how the beavers who had longer teeth had an easier time getting wood than the shorter toothed beavers, and because they didn't give any of their own wood away to the beavers with short teeth, they had much bigger dams. It made Benny so upset that he couldn't sleep night after night.”

Reasoned: “The reason beavers should split up their wood equally is that beavers with smaller teeth can't cut down as much wood as other beavers, and it wouldn't be right for them to end up with smaller dams just because they can't get as much wood as longer-toothed beavers.”

Fig. 1. Sample excerpts and illustrations from each of the storybooks that were used in Study 1.

degree to which it is good for beavers to keep exactly the amount of wood they work to cut down. Two additional post-test measures, both intended to reduce the distance of the transfer required from the storybook, were added after data collection began, and were administered to a subset of the children at the very end of the study session. These exploratory measures are described fully in the Supplementary Materials.

3.2. Results

3.2.1. Primary analyses

Participants were coded as having changed (1) or not changed (0) their type of fairness distributions between equality and merit from pre-test to post-test. Thus, regardless of whether participants altered the exact quantity or ratio of prizes they distributed, they were only considered to have changed their fairness preferences if their distribution pattern reflected a different normative principle. Overall, 16/70 (22.86%) of participants changed their distribution patterns after being read a storybook. This closely resembles the rate of change we found for the irrelevant intervention in our Baseline Study (21.88%), as confirmed by a one-sample binomial test using this percentage as a point

estimate, $p = .885$. Tendencies for changing distribution patterns did not differ from the Baseline Study in any experimental condition, as confirmed by one-sample binomial tests, $ps > .36$ (see Fig. 2).

A logistic regression was conducted to predict changes in resource distribution from Fairness Type (Merit Intervention vs. Equality Intervention), Appeal (Emotional Intervention vs. Reasoned Intervention), and the interaction between these variables. This analysis indicated that children were not differentially likely to change their style of resource distribution across the two Fairness Types, $b = -0.31$, $p = .695$, or across the two kinds of Appeal, $b = -0.72$, $p = .354$. Furthermore, there was no interaction between Fairness Type and Appeal, $b = 0.35$, $p = .764$. Adding Age in Months and Gender to the model also did not yield any significant predictors of changes in resource distribution, $ps > .39$.

3.2.2. Secondary analyses

A majority of participants (77.14%) gave responses that were consistent with the book when asked which kind of fairness they endorsed for the beavers. Specifically, participants who heard the Equality books believed that it was better for beavers to divide their wood equally, as rated on a 1–4 Likert scale ($M = 3.69$, $SD = 0.82$), than for beavers to

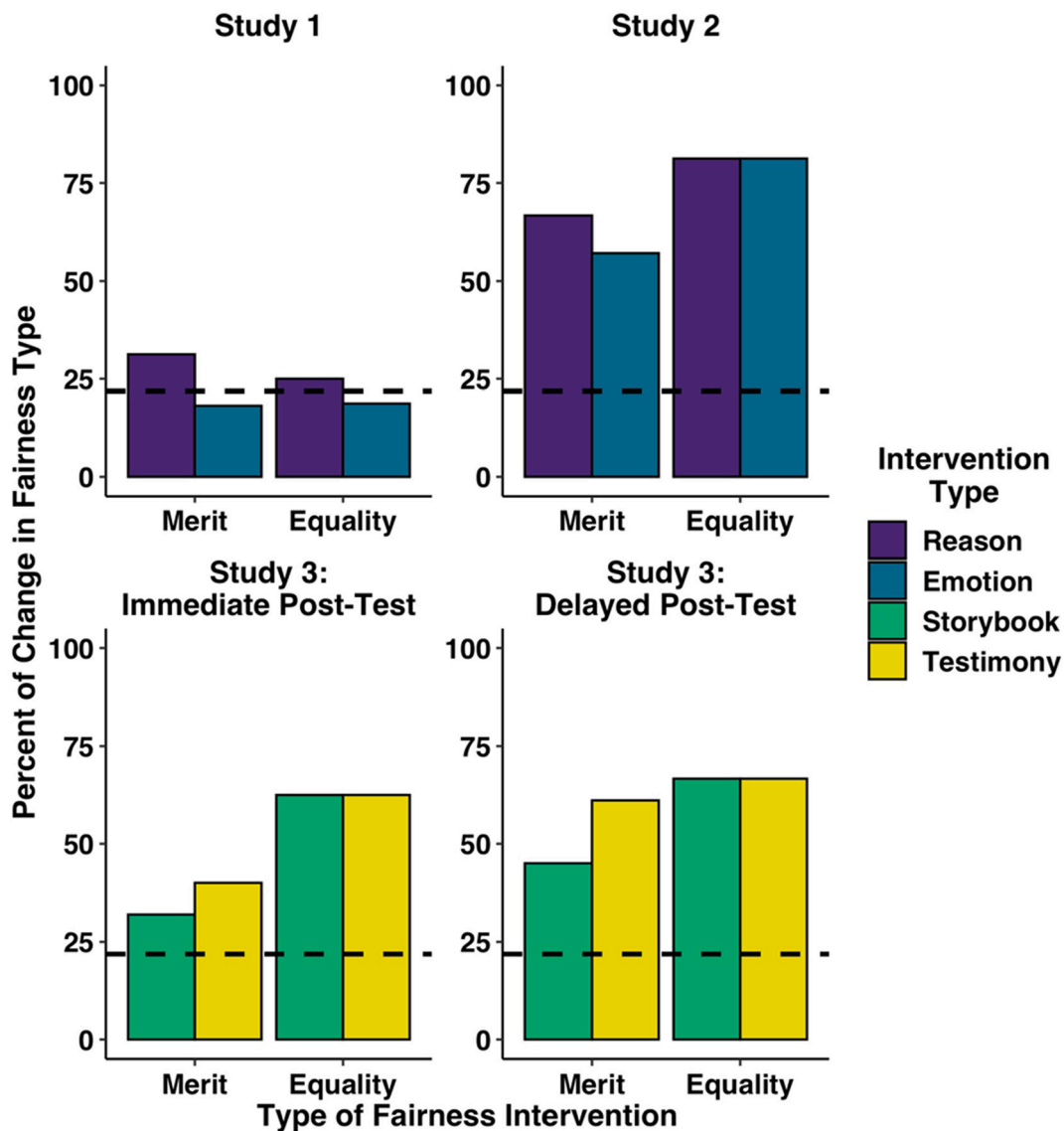


Fig. 2. The percentage of participants who changed their patterns of resource distribution from the first distribution task (pre-test) to the second distribution task (post-test) in each Study (with both timepoints displayed for Study 3), split by Fairness Type and Intervention Type. The dashed line indicates “chance” performance, as suggested by the point estimate we obtained in the Baseline Study.

Table 1
Coding for justifications, as applied across Studies 1–3.

Justification type	Representative examples
Consideration of outputs The children should be rewarded based on the quantity that they produced.	“This girl did more stamps and this girl did less stamps.” “They both did a really good job.”
Consideration of inputs The children should be rewarded based on how much effort or skill they devoted to the task.	“This girl was a little faster and neater.” “They look like they both tried really hard.”
Consideration of recipients' welfare The distribution would maximize happiness or minimize sadness/victimhood.	“The other would cry if they didn't get the same amount.” “So they don't have to fight over it.”
Consideration of moral principles The distribution should be based upon an abstract principle of justice or fairness.	“If we sorted it any other way it wouldn't be fair.” “It wouldn't be fair if one got less than the other one.”
Other/uncodable	“I don't remember.” “Because there's eight, and four plus four equals eight.”

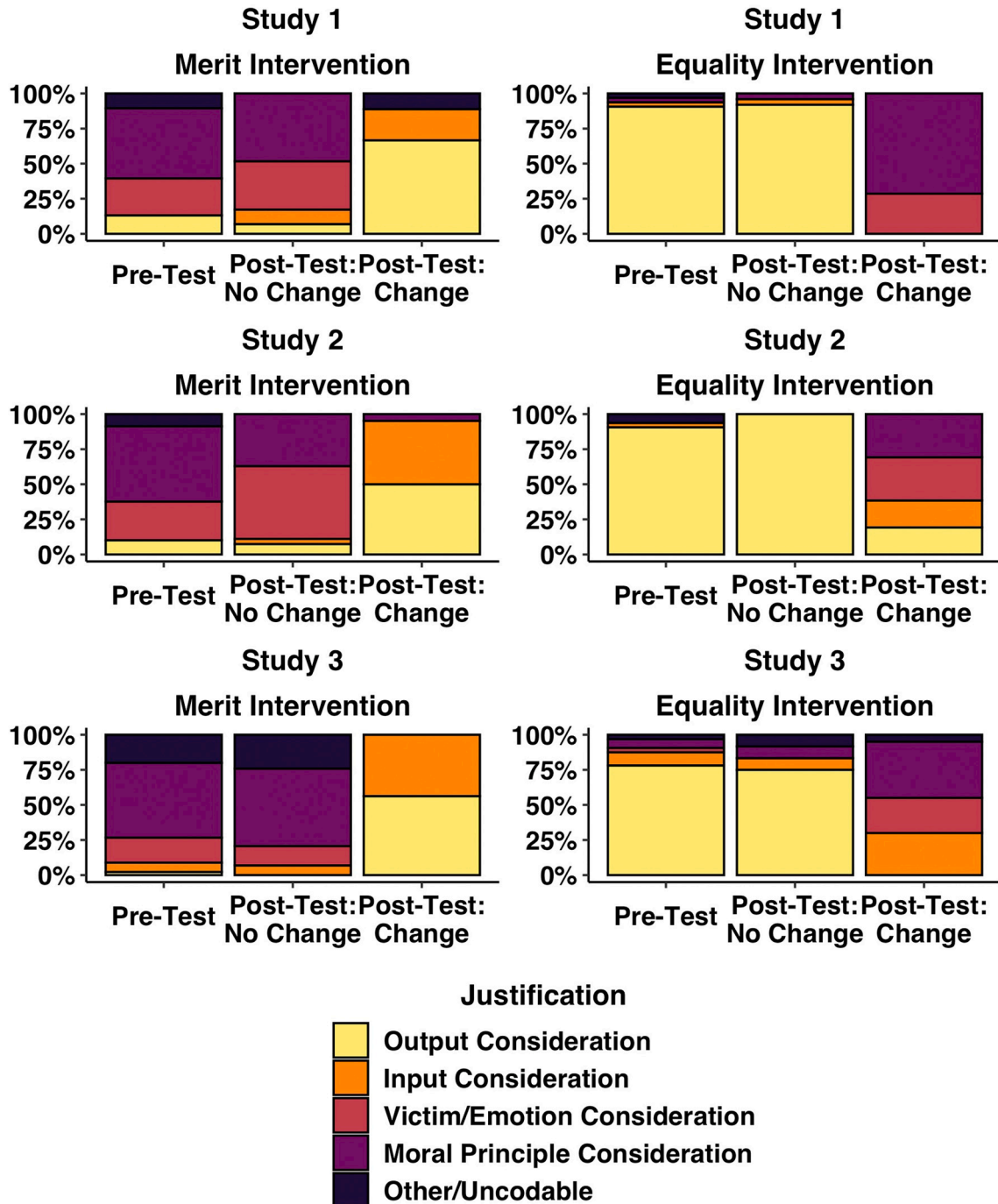


Fig. 3. Percentages of Justification Types produced across studies, split by Fairness Type and Distribution Task (Pre-Test vs. Post-Test) and Change.

keep the amount of wood they worked to cut down ($M = 1.66$, $SD = 0.83$), $t(31) = 8.06$, $p < .001$. Conversely, participants who heard the Merit books believed that it was better for beavers to keep the amount of wood they worked to cut down ($M = 3.42$, $SD = 0.86$) than for beavers to divide their wood equally ($M = 2.61$, $SD = 1.03$), $t(37) = 3.09$, $p = .004$. These analyses suggest that most of the participants successfully learned the moral of the story as it applied to beavers, despite their general failure to transfer the lesson of the storybook to the post-test resource distribution task.

3.2.3. Justifications of resource distribution

We analyzed participants' justifications for their resource distributions in order to determine whether children tended to change the content of their reasoning in accordance with changes in how they divided prizes between the two hypothetical child recipients. Each justification was assigned a single code based on which of five pre-defined categories seemed most representative (see Table 1). Participants' justifications tended to accord with their patterns of resource distribution; merit distributors typically focused on the amount of output that the hypothetical children produced in the work task, while equality distributors typically focused on moral principles (see Fig. 3 and Supplementary Materials for details). The small number of participants who changed their distribution patterns also tended to change the content of their justifications, unlike participants who did not change their distribution patterns.

3.3. Discussion

In this study, storybooks about beavers dividing wood were designed to alter children's inclinations toward favoring equality or merit. Although these stories resembled many popular children's books that are marketed explicitly for the purpose of moral education, more than three-quarters of participants remained steadfast in their preferences for equality-based or merit-based forms of distributive justice after being read a story that advocated for a different form of resource distribution. These low rates of change were produced both by storybooks that utilized a reasoned appeal and by storybooks that utilized an emotional appeal. Children's overall rate of change was nearly identical to the rate of change found in the Baseline Study, which employed irrelevant storybooks that merely provided facts about beavers' biological and behavioral characteristics. This indicates that the small number of participants who changed their pattern of resource distribution in accordance with the storybook's lesson was likely due to random chance.

A plausible explanation for our null findings is that the storybooks were ineffective due to children's failures to abstract the moral message being conveyed in the stories and their difficulties in analogically mapping the story's lesson onto the distribution task (Mares & Acosta, 2008; Narvaez, 2002; Walker & Lombrozo, 2017). This is bolstered by our finding that, even though participants' own distributions of resources to other children tended to be at odds with the message being conveyed in the storybooks, participants tended to believe that beavers

should divide wood in the way that the storybooks suggested. Participants also tended to succeed on other exploratory tasks, which involved scenarios that were more directly analogous to the content in the storybooks (e.g., involving distributions of nuts amongst squirrels or distributions of firewood amongst humans; see Supplementary Materials). Because the distance of transfer was reduced on these tasks, taken together, the pattern of findings suggests that participants' failures to apply the storybooks' lessons to the post-test resource distribution task was not due to a problem of comprehension but was rather due to a problem of transfer. Thus, despite findings that even very young children are capable of abstract transfer (Brown, 1990), it may take somewhat longer for children to attend to deep structural features of stories (Daehler & Chen, 1993). In general, storybooks have been shown to promote "near transfer" much more effectively than "far transfer" in children (Emmons et al., 2018; Ganea et al., 2014; Richert & Smith, 2011; Walker et al., 2015), and as such they may only facilitate moral decision-making when analogical processing is relatively simple.

Therefore, a major challenge is faced when using storybooks to actuate moral belief change. Because far transfer is often required when applying lessons from popular stories, as these stories cannot be easily tailored to a particular situation at hand, it is likely that moralistic storybooks are inherently difficult for children to generalize to their everyday lives. This is unlike the case of naturalistic speech, which can be readily tailored to direct children's attention to relevant features of a particular context. As such, testimony may represent an underappreciated alternative form of social communication that could more powerfully impact children's fairness preferences.

4. Study 2

To test the effectiveness of a more direct means of social transmission for impacting children's fairness preferences, Study 2 employed an intervention involving testimony.

4.1. Method

4.1.1. Participants

Participants were 101 six- and seven-year-old children (44 female; $M_{age} = 7.08$; $SD_{age} = 0.50$) from a large city in the northeastern United States who were recruited via a large participant database and tested in a university laboratory ($N = 34$) or who were recruited and tested in local elementary schools and summer camps ($N = 67$). Participants were primarily White and of middle- to high-SES. An additional 9 participants gave a greater number of stickers to the less productive child during either the pre-test or the post-test. These children were excluded from all analyses, as they could not be readily classified as Merit or Equality distributors.

As in Study 1, participants were randomly assigned to hear either an Emotional appeal or a Reasoned appeal, and they were assigned to the Equality or Merit conditions based on their pre-test distributions, thus ensuring that each child was presented with an argument that ran

Table 2
The full, verbatim testimony that was used in Study 2.

Merit intervention	Equality intervention
<p>Emotional: "Another way to divide up stickers is for the harder-working boy to get more stickers than the less hard-working boy. That's a much better way of dividing up stickers, because it would have made the boys much happier if they got exactly the amount they worked for. Dividing up stickers any other way makes these boys feel really upset."</p> <p>Reasoned: "Another way to divide up stickers is for the harder-working boy to get more stickers than the less hard-working boy. That's a much better way of dividing up stickers, because each boy should have as many stickers as he deserves based on what he did to earn them. Dividing up stickers any other way would not make any sense."</p>	<p>Emotional: "Another way to divide up stickers is for each boy to get an equal number of stickers. That's a much better way of dividing up stickers, because it would have made the boys much happier if each one got exactly the same amount as the other boy. Dividing up stickers any other way makes these boys feel really upset."</p> <p>Reasoned: "Another way to divide up stickers is for each boy to get an equal number of stickers. That's a much better way of dividing up stickers, because each boy should get the same amount of stickers whether or not he's able to quickly put down lots of discs. Dividing up stickers any other way would not make any sense."</p>

contrary to their initial mode of allocation. Despite being recruited from the same population as participants in Study 1, participants in Study 2 were more prone to equal distributions at pre-test than participants in Study 1, which meant that 37 additional children needed to be tested in the Merit conditions before 16 participants were obtained in each cell of the 2 (Fairness Type) X 2 (Appeal) design.

4.1.2. Materials and procedure

The pre-test and post-test were identical to those used in Study 1. All participants were presented with a pre-test distribution task to establish an initial measure of fairness preferences. The first experimenter then provided brief testimony preaching the opposing form of distributive justice, after which a novel second experimenter entered the room and administered a distractor task and then a post-test distribution task. Again, the crucial dependent measure was whether participants changed their preference to distribute the resources based on equality or merit.

4.1.2.1. Intervention. The first experimenter provided testimony consisting of short declarations (59 words) presented in conversational language, without illustrations or written words (see Table 2). These appealed to recipients' feelings in the Emotional conditions (e.g., "dividing up stickers [in the way you demonstrated] makes these girls feel really upset") and to abstract moral principles in the Reasoned conditions (e.g., "each girl should have as many stickers as she deserves based on what she did to earn them"). The first experimenter left the room immediately after providing the testimony, and did not reappear again during the study session, thereby reducing potential demand effects.

Just as often happens in real life when adults directly convey moral lessons to children, the testimony focused on the situation at hand. The content of the testimony involved language that was adapted directly from the storybooks in Study 1, but which referred to human children in the immediate context. In particular, the testimony distilled the main lessons from the Study 1 stimuli without adding any additional content; a detailed allegory about beavers dividing wood was replaced with stark statements indicating either that it is much better for harder workers to get more resources or that it is much better for resources to be divided equally.

4.2. Results

4.2.1. Primary analyses

Participants were coded as having changed (1) or not changed (0) their type of fairness distributions between equality and merit from pre-test to post-test. Collapsing across conditions, a one-sample binomial test (comparing to a baseline rate of 21.88% change) found that testimony reliably led to changes in children's distribution patterns from pre-test to post-test, $p < .001$, with 67.33% of participants changing their distribution patterns after testimony was presented. Children were well above Baseline levels in all four conditions, as confirmed by one-sample binomial tests, $ps < .001$ (see Fig. 2). These results indicate that children's fairness preferences are malleable and can be robustly influenced through very brief testimony.

A logistic regression was conducted to predict changes in resource distribution from Fairness Type (Merit Intervention vs. Equality Intervention), Appeal (Emotional Intervention vs. Reasoned Intervention), and the interaction between these variables. This analysis indicated that children were not differentially likely to change their style of resource distribution across the two Fairness Types, $b = 0.77$, $p = .309$, or across the two kinds of Appeal, $b = -0.41$, $p = .430$. Furthermore, there was no interaction between Fairness Type and Appeal, $b = 0.41$, $p = .697$. Adding Age in Months and Gender to the model also did not yield any significant predictors of changes in resource distribution, $ps > .36$. (However, Fairness Type does become a significant predictor when no other variables are included in the model,

$b = 1.02$, $p = .047$.)

4.2.2. Justifications of resource distribution

As in Study 1, when children's fairness preferences shifted, these shifts were frequently aligned with changes in the content of justifications (see Fig. 3 and Supplementary Materials). Additionally, children who shifted to favoring merit frequently invoked considerations of relative input, even though this form of justification was absent amongst children who divided by merit at pre-test, tentatively suggesting a change in reasoning that was produced by the testimony.

4.3. Discussion

In this study, direct testimony led children to shift their preferences for distributing resources according to principles of merit or equality, indicating that social communication can powerfully impel children to revise their existing moral beliefs. Participants were very quick to trust and adopt the first experimenter's claims even though these claims directly contradicted participants' preexisting fairness preferences. This tendency was quite strong, which is notable in light of previous research indicating that children do not passively internalize everything they hear, particularly when they hold countervailing beliefs (see Koenig & Sabbagh, 2013). The abundance of children who changed their preferred pattern of resource distribution in Study 2 is especially remarkable given that this intervention was much briefer than the storybook in Study 1 and did not require children to repeat back what they had heard. It is likely that the testimony was so effective because it was directly related to the distribution tasks, and because the lesson was not obscured by the irrelevant details of a narrative and thus allowed for more straightforward transfer. Overall, the results of Study 2 suggest that children have a hearty bias toward credulity when exposed to moral testimony.

While this study did not uncover a significant effect of Fairness Type in the primary analysis, there was a trend for participants to be more easily swayed by testimony endorsing equality (81.25% change from merit) than by testimony endorsing merit (60.87% change from equality). This provides a very tentative indication that some fairness beliefs — namely, those that represent an initial default stance — may be more easily swayed than others. Consistent with recent research showing an equivalence of reasoned and emotional appeals in producing moral change in adults (Lindauer et al., 2020), there were no significant differences between the two types of appeal, although there was a slight tendency for participants to be more readily influenced by reason (72.09% change) than by emotion (63.79% change).

Taken together, Studies 1 and 2 suggest a stark difference in the relative effectiveness of storybooks and testimony for changing children's fairness preferences. In Study 1, children did not revise their moral beliefs based on the lessons conveyed in the metaphorical stories, whereas in Study 2, direct testimony was highly effective in changing children's patterns of resource distribution. It is thus tempting to conclude that testimony, but not storybooks, can constitute an effective format for conveying moral values to children. However, there were several differences between the storybooks in Study 1 and the testimony in Study 2 that prevent drawing strong conclusions from their comparison. One significant dissimilarity is that the storybooks required a more abstract mapping to the post-test measure, as their moral lessons occurred in the context of a fictional society of beavers. As such, the ineffectiveness of the storybooks in Study 1 could have resulted from children's difficulty in detecting relevant similarities or in applying the lesson from a story about animals to a disparate real-world situation, rather than limitations of a storybook format per se (Daehler & Chen, 1993; Walker & Lombrozo, 2017).

5. Study 3

To investigate whether the disparate findings across Study 1 and

Study 2 were likely due to content or due to format, Study 3 carefully matched and directly compared storybooks and testimony. Because there were no clear differences in fairness preference changes between emotional and reasoned appeals in either of the previous studies, the Appeal manipulation was removed from Study 3.

The storybooks were rewritten to share a number of critical surface-level similarities with the target distribution task. First, they portrayed relatable, gender-matched children. Second, the plot centered around the division of prizes to two students in an art class, which is highly reminiscent of the target distribution task. Third, the discrepancy in performance between the two characters in the storybooks (who completed 25% of a task and 75% of a task, respectively) was exactly matched between the storybooks and the distribution tasks. Therefore, in comparison with the Study 1 storybooks, transfer was greatly facilitated in the Study 3 storybooks due to the heightened structure-mapping between the intervention and the dependent measure (Gentner, 1983).

The testimony was rewritten to match the storybooks in every way possible. In order to achieve a direct matching of content and source to the storybook, the testimony took the form of a video-recorded monologue by an art teacher describing how she divides prizes in her art class, and her description very closely followed the plot of the storybooks. Utilizing videotaped testimony reduced potential variability in the presentation of the testimony, and it also reduced the possibility of demand effects that are more likely in live contexts.

Finally, to ensure that we were truly measuring enduring moral learning, rather than transient situational effects, participants were given a second post-test after a substantial delay.

5.1. Method

5.1.1. Participants

Participants were 77 six-, seven-, and eight-year-old children (35 female; $M_{\text{age}} = 7.40$; $SD_{\text{age}} = 0.86$; 24–28 children of each age) who were recruited from a small city in the northeastern United States via a participant database and tested in a college laboratory. Participants were primarily White and of middle- to high-SES. Participants were randomly assigned to hear either a Storybook or videotaped Testimony. As in the previous studies, participants were assigned to the Equality or Merit conditions based on their pre-test distributions. An additional 22 participants were tested but were excluded from analyses because they gave more stickers to the lower-performing child ($n = 1$) or because they failed a comprehension check (Storybook conditions: $n = 9$; Testimony conditions: $n = 12$). Once again, a greater number of children needed to be tested in the Merit conditions before a minimum of 16 usable participants were obtained in each of the four conditions.

To address the extent to which the effects of the interventions would persist over time, participants were asked to return approximately 2 to 4 weeks after their initial study session. A total of 68 non-excluded participants (88.31% of the sample) were able to return at this second timepoint (mean delay = 21 days; range = 12–45 days).

5.1.2. Materials and procedure

The general procedure from the previous studies was retained in Study 3, with the exception of the details described below. Some additional, exploratory questions were also asked, and these are described in the Supplementary Materials.

5.1.2.1. Intervention. All storybooks and testimony were matched in length (508 words) and in content, such that the primary difference was whether their content was conveyed through illustrations and the perspective of a narrator (Storybooks) or through the videotaped first-person account of an art teacher (Testimony). Each format involved an art teacher giving prizes to children in her art class, either based on the students' performance on a coloring task or based on a desire for egalitarianism. In the Merit versions, the teacher came to

appreciate the value of dividing prizes based on merit after seeing one child work very hard while another goofed off. In the Equality versions, the teacher came to appreciate the value of dividing prizes evenly after one child didn't finish coloring due to having old, broken colored pencils, while another child finished coloring quickly due to owning brand-new colored pencils. In all cases, the art teacher began dividing prizes in accordance with the participant's pre-test performance and then realized that it was better to divide prizes in a different way (see Fig. 4 for excerpts; the full set of materials is available at <https://osf.io/sf6xa>). The storybooks were read directly to the children, with ostensive cues such as pointing to retain their attention throughout, as in Study 1. The video testimony was played on an iPad.

5.1.2.2. Comprehension questions. To ensure that any differences that might emerge between Storybooks and Testimony could not be due to differences in comprehension across the two formats, we excluded any participants who did not accurately report the primary details of the intervention (see Participants section above). Specifically, participants were asked what the art teacher thought was fair at the beginning of the story or video, and what she thought was fair at the end of the story or video (with forced choice response options for each question). As per a preregistered decision (see <https://osf.io/sf6xa/registrations>), participants were required to answer both questions correctly in order to be retained in the final sample.

5.1.2.3. Delayed post-test. A third distribution task was used during the second testing session. This delayed post-test task remained structurally matched to the pre-test and post-test tasks, but the superficial qualities of the task were changed, such that it involved matching tiles depicting various yoga poses. The target children were described as having matched either 3 of 12 tiles (25%) or 9 of 12 tiles (75%).

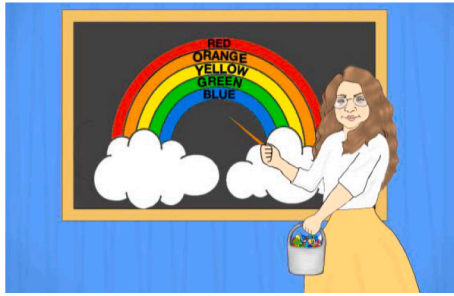
5.2. Results

5.2.1. Primary results

Participants were coded as having changed (1) or not changed (0) their type of fairness distributions between equality and merit from pre-test to post-test, and also from pre-test to delayed post-test. One-sample binomial tests comparing against baseline rates of change (21.88%) demonstrated that, collapsed across conditions, the interventions reliably led to changes in children's distribution patterns from pre-test to post-test, $p < .001$, with 46.75% change overall, and from pre-test to delayed post-test, $p < .001$, with 58.82% change (see Fig. 2).¹ This significant change was found for each of the interventions preaching equality, both at the initial post-test (Equality Storybook: 62.50% change; Equality Testimony: 62.50% change) and at the delayed post-test (Equality Storybook: 66.67% change; Equality Testimony: 66.67% change), $ps < .001$. For each of the interventions preaching merit, significant changes did not occur at the immediate post-test (Merit Storybook: 32.00% change; $p = .228$; Merit Testimony: 40.00% change; $p = .059$), although they did at the delayed post-test (Merit Storybook: 45.00% change; $p = .025$; Merit Testimony: 61.11% change; $p < .001$), suggesting that children might take longer to process or internalize lessons about dividing resources in accordance with merit.

A logistic regression, including only participants who returned for the delayed post-test, was conducted to predict whether children were differentially likely to change their style of resource distribution across the two Fairness Types (Merit Intervention vs. Equality Intervention), the two kinds of Intervention (Storybooks vs. Testimony), the Timepoint (Immediate vs. Delayed), and the interactions of these

¹ The 68 participants who returned for the second session had a 45.59% rate of change at the initial post-test, which is similar to that found in the overall sample.

STORYBOOK INTERVENTION

Equality: “Mrs. Jones asks her students to listen and makes an announcement. She tells them: ‘A good way to divide up the prizes is for everyone to get the same amount of prizes. No matter how many rainbows everyone colors, whether it’s six or two or anything else, everyone would get four prizes each. That’s a good way of dividing things up because it’s not fair for some people to get more prizes just because it’s easier for them to do a better job. Everyone will be much happier if they get the same number of prizes as everyone else.’”

Merit: “Mrs. Jones asks her students to listen and makes an announcement. She tells them: ‘A good way to divide up the prizes is for hard-working people to get more prizes than less hard-working people. The more coloring everyone finishes, the more prizes they’d get; for example, if they color six rainbows, they’d get six prizes! That’s a good way of dividing things up because it’s not fair for everyone to get the same number of prizes even though some people do more to deserve them. Everyone will be much happier if they get the prizes they worked for.’”

TESTIMONY INTERVENTION

Equality: “When I thought about that, I realized something... A good way to divide up the prizes is for everyone to get the same amount of prizes. No matter how many rainbows everyone colors, whether it’s six or two or anything else, everyone would get four prizes each. That’s a good way of dividing things up because it’s not fair for some people to get more prizes just because it’s easier for them to do a better job. Everyone will be much happier if they get the same number of prizes as everyone else.”

Merit: “When I thought about that, I realized something... A good way to divide up the prizes is for hard-working people to get more prizes than less hard-working people. The more coloring everyone finishes, the more prizes they’d get; for example, if they color six rainbows, they’d get six prizes! That’s a good way of dividing things up because it’s not fair for everyone to get the same number of prizes even though some people do more to deserve them. Everyone will be much happier if they get the prizes they worked for.”

Fig. 4. Excerpts from each of the interventions that were used in Study 3, including a sample illustration from the storybook and a still frame from the videotaped testimony.

variables. Changes in resource distribution differed across the two kinds of Fairness, $b = 1.50$, $p = .042$, with interventions encouraging equal distributions being more powerful than interventions encouraging merit-based distributions. Despite this difference becoming descriptively less pronounced at the delayed post-test, there were no significant effects of Timepoint, $b = 0.90$, $p = .190$, or of the interaction between Fairness Type and Timepoint, $b = -0.61$, $p = .551$. Changes in patterns of resource distribution did not differ across the two kinds of Intervention (Storybook vs. Testimony), $b = 0.88$, $p = .212$, and there were no significant two-way or three-way interactions involving this variable, $ps > .39$.

Adding Age in Months and Gender to the model led the effect of Fairness Type to become non-significant, $b = 1.19$, $p = .121$. The effect of Gender was also non-significant, $b = 0.22$, $p = .549$, but Age marginally predicted change, $b = 0.44$; $p = .073$. As there were no other significant effects in this model, we removed all predictors aside from Age. This led Age to become a significant predictor, $b = 0.57$, $p = .010$. Further exploration of the data demonstrated that 8-year-olds (62.50% change at immediate post-test; 78.95% change at delayed post-test) were much more susceptible to the interventions than either 6-year-olds (35.71% change at immediate post-test; 48.15% change at delayed post-test) or 7-year-olds (44.00% change at immediate post-test; 54.55% change at delayed post-test), suggesting that our broadened age range in this study allowed us to detect developmental changes that

were not present with only 6- and 7-year-olds in the previous studies.

5.2.2. Justifications of resource distribution

Once again, participants' justifications tended to align with their distribution patterns. Only participants who were influenced by the intervention tended to change the content of their justifications during the post-test (see Fig. 3 and Supplementary Materials for details).

5.3. Discussion

Study 3 indicated that closely-matched storybooks and testimony are similarly effective in their power to change children's preexisting fairness preferences. Specifically, this study found that approximately half of children revised their tendencies toward equality-based or merit-based distributions after an intervention involving a storybook that was read to participants or after an intervention involving prerecorded firsthand testimony. The changes that were produced in children's fairness preferences were higher than those found in the Baseline Study, particularly when equality was preached, demonstrating that both of the intervention formats were reliably effective. Furthermore, these changes persisted after a delay of several weeks, indicating that children's preference changes were not fleeting.

Although Studies 1 and 2 indicated that storybooks and testimony differ in their effectiveness when stories involve allegorical tales about

animals – as they often do – and when testimony is conveyed directly rather than via a video, Study 3 demonstrated that both formats of social communication can be highly effective in changing children's resource distribution tendencies. Despite frequent claims that stories are especially powerful as modes of social communication (e.g., Bloom, 2010; Haidt & Joseph, 2007), they were no more effective than closely matched testimony. This is perhaps especially striking given previous research indicating that early readers, such as the participants in this study, trust printed information more readily than orally conveyed information (e.g., Einav et al., 2013). However, children transfer oral testimony more robustly than written information, suggesting that this distinction is not straightforward (Eyden et al., 2014). Furthermore, previous research on this issue has not studied moral learning, nor has it directly compared illustrated text (as in the storybooks) with first-person testimony, nor has it used videotaped testimony rather than testimony directly conveyed by an experimenter, so future research will be needed to discern the extent to which printed words in the storybooks may have influenced children's fairness preferences in the present research.

Overall, these findings affirm that social communication can be effective in altering children's fairness preferences. This was especially true when convincing children that equality-based distributions are preferable to merit-based distributions, which provides a preliminary indication that appeals favoring equality may be more compelling than appeals favoring merit. Equality, as an initial default preference, may be easily re-invoked with encouragement, while merit is less foundational and thus may be more easily abandoned.

6. General discussion

The present research investigated whether adults' social communications can change children's minds about the best way to distribute resources to third parties. Findings indicated that children's fairness preferences are susceptible to the influences of storybooks and testimony preaching the benefits of either equality-based fairness or merit-based fairness, but only in certain circumstances. Study 1 indicated that typical storybooks (i.e., fictional stories featuring animals, thus requiring far transfer) were not effective in impacting fairness preferences. In contrast, Study 2 found that brief in-person testimony was extremely effective in changing fairness preferences, with the majority of children revising their preexisting preferences after this direct intervention. However, Study 3 clarified that these differences were not due to the format of the social communication itself, but were rather attributable to features related to the distance of transfer that are typically – but not essentially – aligned with these formats. Specifically, Study 3 found that storybooks and videotaped testimony that were closely matched to each other, as well as being closely matched to the target distribution task, were each effective in changing fairness preferences in approximately half of participants.

To our knowledge, this is the first demonstration that storybooks and testimony can alter children's moral commitments. Previous research has primarily focused on extending the scope or application of children's existing moral commitments. The extensive literature on moral socialization has shown how modeling and other forms of social input can bring children's behaviors in line with broadly accepted prosocial standards of sharing or cooperating (see Grusec et al., 2014). Other research has demonstrated that certain stories can expand children's compassion toward marginalized members of society (e.g., Cameron & Rutland, 2006; Mares & Acosta, 2010). A few studies have used testimony to impact children's beliefs about the consequences or properties of novel actions (e.g., Li et al., 2019; Rottman et al., 2017), but have not attempted to directly alter children's basic moral values. Thus, our present focus on changing children's fundamental preferences for how resources ought to be distributed is qualitatively distinct from the aims of prior research on moral learning.

In Study 3, children's preference changes did not fade during a

considerable delay. Instead, the experimental effects persisted or became stronger across the course of several weeks. This convincingly indicates that participants were not merely influenced by fleeting context effects during the experimental session. Rather, the interventions robustly shifted children's fundamental convictions about how to fairly distribute resources. However, additional studies are needed to confirm that these interventions impacted children's preferences for equality or merit in an unmediated fashion. It is possible, for example, that our interventions led children to attend to the frequency with which certain people have differential abilities or the frequency with which certain people tend to exert differential effort, which could have in turn led children to prefer equality or merit, respectively (see Nisan, 1984). The degree to which moral belief change is necessarily yoked to changes in “informational assumptions” (Turiel et al., 1991) or “ontological frames” (Beal, 2020) is a critical area for future exploration. Crucially, however, regardless of whether storybooks and testimony promote change directly (by impacting moral principles without intermediary changes) or indirectly (by first altering children's perceptions of relevant descriptive facts), the end result is an enduring alteration of moral commitments, which demonstrates a form of receptivity to storybooks and testimony that has not previously been documented in moral socialization research.

By demonstrating that children's fairness preferences are susceptible to storybooks and testimony, the present findings confirm that the developmental shift from favoring equality to favoring merit is not inevitably governed by cognitive maturation or autonomous construction from past experiences. Rather, children's ideas about the fairest type of resource distribution can be enculturated. Contrary to the Piagetian beliefs that inspired much of the early work on children's resource distribution tendencies (e.g., Damon, 1977; Hook & Cook, 1979), children are not limited to thinking about fairness in a specific way as a result of stage-based constraints. Both forms of reasoning can coexist in the minds of young children, and children can switch between distribution styles even after a brief intervention.

These results also tentatively indicate that it may be easier to change fairness preferences by encouraging children to revert to an earlier-emerging form of thinking than by encouraging them to adopt a typically later-developing disposition. In both Studies 2 and 3, equality-based interventions were slightly more effective than merit-based interventions, although this tendency was not statistically significant in Study 2 and should thus be interpreted with considerable caution. To the extent that this imbalance exists, however, it may be explained by the robust finding that equality is a potent “stable attractor” in the moral domain (Baumard et al., 2012; Chernyak & Sobel, 2016; McAuliffe, Blake, et al., 2017; Shaw & Olson, 2012), thus exerting a strong pull on fairness preferences that may hold greater sway than appeals to merit. Notably, however, the gap between equality interventions and merit interventions became less pronounced after a delay in Study 3. Although this effect was not significant, it provides a preliminary suggestion that children may merely be slower to adopt merit-based preferences. Similar increases in acquisition after a delay have been previously found in cases of moral learning (Rushton, 1975) and in other domains (e.g., Vlach & Sandhofer, 2012).

The comparison of Studies 1 and 2 indicates that there are extreme differences in the effectiveness of the kinds of storybooks and testimony that are typically used in everyday life. Because there were several key differences between the storybooks in Study 1 and the testimony in Study 2, we eliminated these discrepancies in Study 3. Notably, the Study 3 storybooks focused on humans rather than on animals. In Study 1, it is possible that children resisted learning or transferring lessons from stories that were about animals (see Strouse et al., 2018). However, although extreme anthropomorphism has been shown to be detrimental to young children's learning (Ganea et al., 2014), including in the domain of fairness (Larsen et al., 2018), this does not seem to apply to the more moderate forms of anthropomorphism that were used in the Study 1 storybooks (Geerds, 2016; Geerds et al., 2016). In addition,

the exploratory tasks in Study 1 indicated that the transfer from animals to humans per se was not the primary factor preventing the storybooks from being effective. Rather, transfer was likely hindered by the difficulty in structure-mapping more generally (Gentner, 1983), perhaps in connection with the Study 1 stories depicting worlds that were irrelevant to participants' lives (Richert & Smith, 2011; Walker et al., 2015; but see Hopkins & Weisberg, 2017). In Study 3, by creating storybooks with a plot that was more easily mapped onto the resource distribution task, children became much more likely to transfer the lessons that were preached by the stories.

The lengthy, videotaped testimony in Study 3 was less effective than the pithy, direct testimony used in Study 2. One explanation for this decrease in effectiveness is that testimony conveyed in person may more easily yield changes in fairness preferences. At least for young children, information that is conveyed through video is not as effectively transferred as information that is conveyed directly (see Barr, 2019). Alternatively, there may have been relatively stronger demand characteristics in Study 2. Even though the post-test distribution was performed in front of a different experimenter than the one who provided testimony, providing testimony in person could have evoked some affiliative motivations that increased children's deference (see Jaswal & Kondrad, 2016), while these social motivations were unlikely to surface for videotaped testimony. Finally, forms of testimony that are specifically tailored to a particular case at hand, as in Study 2, may be more effective than testimony that focuses on a similar but distinct situation.

Overall, despite a stark difference between storybooks and testimony when comparing the findings of Studies 1 and 2, the differences between these formats of social communication dissolved when they were carefully matched on multiple dimensions. Importantly, then, these findings confirm that children are capable of learning moral lessons from storybooks. Previous research has found that, with the right kinds of scaffolding (e.g., being provided with commentary or being prompted to explain events in a story), children can extract abstract moral lessons rather than focusing on superficial features (Mares & Acosta, 2010; Walker & Lombrozo, 2017). Here, we have found that this is also true when stories are specifically written to elicit preference changes in a clearly relevant situation. Thus, in circumstances where direct transfer is strongly facilitated, stories can serve as effective cultural vehicles for conveying moral information to children and for producing moral belief revision. However, stories are no more effective than the consistently reliable method of directly telling children a moral lesson.

7. Conclusion

Once children have adopted a particular moral belief, what can motivate them to change their minds? The present research has demonstrated that stories and testimony are powerful mechanisms for inciting belief revision in the domain of fairness, as long as the messages being conveyed are easily transferable to particular cases of resource distribution. Children's credulity in this context suggests that social communication may be a primary (albeit understudied) mechanism of moral development more generally, perhaps because the veracity of others' claims about basic moral values cannot be directly verified or disconfirmed through firsthand experience. Given the vast sociopolitical ramifications of believing that resources should be divided either equally or meritously, it is notable — and perhaps deeply concerning — that children's fairness preferences can be revised after a brief intervention.

This research also examined whether storybooks constitute a privileged format for changing children's minds. Across cultures, storybooks are ubiquitous devices for influencing children's beliefs and preferences about moral issues, which has led to much popular speculation about the subversive or positive effects that stories have on children (e.g., Kohl, 1996). Despite this folk belief that stories harbor a

special potency for molding children's values, and the massive success of commercially available storybooks that have been created for this aim, the present research suggests that storybooks do not exert a uniquely powerful influence on children's fairness preferences. Storybooks must be closely matched to the moral problem at hand in order to be effective in leading children to alter their fairness preferences — and even then, stories are no more effective than non-narrative testimony. While stories may be inimitably compelling as sources of immersive entertainment, it is apparently the moral lesson, rather than the story itself, which serves as the critical factor that can provoke lasting changes in children's preexisting tendencies to prefer a particular moral stance.

CRedit authorship contribution statement

Joshua Rottman: Conceptualization, Methodology, Investigation, Formal analysis, Writing - original draft, Writing - review & editing. **Valerie Zizik:** Methodology, Investigation, Writing - review & editing. **Kelly Minard:** Methodology, Investigation, Writing - review & editing. **Liane Young:** Conceptualization, Writing - review & editing. **Peter R. Blake:** Conceptualization, Writing - review & editing. **Deborah Kelemen:** Conceptualization, Methodology, Writing - review & editing.

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Appendix A. Supplementary materials

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