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Structural explanations lead young children and adults to rectify resource inequalities

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ABSTRACT

Decisions about how to divide resources have profound social and practical consequences. Do explanations regarding the source of existing inequalities influence how children and adults allocate new resources? When 3- to 6-year-old children (N = 201) learned that inequalities were caused by structural forces (stable external constraints affecting access to resources) as opposed to internal forces (effort), they rectified inequalities, overriding previously documented tendencies to perpetuate inequality or divide resources equally. Adults (N = 201) were more likely than children to rectify inequality spontaneously; this was further strengthened by a structural explanation but reversed by an effort-based explanation. Allocation behaviors were mirrored in judgments of which allocation choices by others were appropriate. These findings reveal how explanations powerfully guide social reasoning and action from childhood through adulthood.

Introduction

At all stages of development, humans face decisions about how to allocate limited resources, distributing time, effort, money, attention, and more among various activities and recipients. These

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decisions have important implications for individuals, but also for society as a whole—indeed, social policies typically regulate the allocation of resources. To illustrate, imagine a situation in which students at one school perform very well on standardized tests, whereas students at a second school perform poorly. An "observer" learns about this and is given an opportunity to distribute educational resources between the two schools (e.g., books, science lab supplies). A growing body of research on the developmental origins of resource allocation shows that in such situations young children rarely distribute resources equitably (i.e., their allocations do not compensate for the existing disadvantage) and instead perpetuate or exacerbate inequalities (e.g., Rizzo & Killen, 2016). The current study tested whether children fail to rectify inequalities because they typically lack a way to explain the inequality that would justify compensating for existing inequalities. We propose that truly *structural explanations* (as defined below) are particularly promising in this respect and test whether providing these explanations to 3- to 6-year-old children promotes resource allocations that successfully rectify inequalities. For example, in the scenario above, the differences in school performance on standardized tests could be explained by invoking stable structural factors (such as funding differences between the schools) or by invoking internal factors (such as differences in student effort), among other possibilities. We hypothesized that whereas effort-based explanations will lead children to ignore or perpetuate existing inequalities, structural explanations will promote decisions that rectify existing inequalities.

Documenting whether and how explanations for inequality shape resource allocation is valuable not only because such decisions have important real-world implications but also because they provide a window into children's cognitive and social development (Heck et al., 2022; Paulus & Essler, 2020), including their ability to balance competing concerns for equality, equity, and/or merit-based reward (Killen & Smetana, 2015)—which in turn plays a key role in human cooperation (Blake & Rand, 2010; Fehr & Fischbacher, 2004; Rizzo et al., 2018). Below, we review prior work on children's understanding of resource inequalities and on the development of structural thinking before motivating our predictions and study.

Children's understanding of resource inequalities

Studies on the development of resource allocation typically ask children to allocate stickers, school supplies, or other goods between two parties. A key finding from this literature is a reliable and early-emerging preference for equal allocation, documented even in human infants (Baumard et al., 2012; Chernyak et al., 2016; Cooley & Killen, 2015; Geraci & Surian, 2011; McAuliffe et al., 2017; Olson & Spelke, 2008; Rizzo et al., 2018; Schmidt et al., 2016; Shaw & Olson, 2012; Sigelman & Waitzman, 1991; Sloane et al., 2012; Smith et al., 2013; Sommerville et al., 2013; Stowe et al., 2022; Warneken et al., 2011; Ziv & Sommerville, 2017). Moreover, children's preference for equal allocations extends to situations in which such allocations fail to rectify existing inequalities. For instance, Rizzo and Killen (2016) presented 3- to 8-year-old children with a preexisting inequality to examine how new resources were divided and how children evaluated equitable (rectifying), inequitable (perpetuating), and equal (50/50) allocations. They found that 3- and 4-year-olds divided resources equally but evaluated equitable allocations favorably, that 5- and 6-year-olds rectified inequalities but did not differentiate between equal and equitable allocations in their normative evaluations, and that 7- and 8-year-olds showed a preference for rectification on both measures. This work suggests that a tendency to correct an initial inequality, and to judge that it is appropriate to do so, does not emerge reliably until 7 or 8 years of age.

Young children may favor equal allocations given the strong appeal of equality as a governing norm. However, when young children do deviate from equal allocations, they often perpetuate inequalities, allocating resources to those who already have more rather than rectifying them (Essler et al., 2020; Olson et al., 2011; Paulus, 2014; see Paulus & Essler, 2020, for review). Such allocations may be guided by system justification (Olson et al., 2011), the tendency to assume that descriptive regularities support normative inferences, such that those who already have more *ought* to have more (Roberts et al., 2018; see also Paulus & Essler, 2020). Failures to reliably select and endorse equitable allocations have also been explained by an immature understanding of relevant norms of social responsibility toward those in need (Hook & Cook, 1979), difficulty in coordinating

multiple fairness concerns (Baumard et al., 2012), and the challenge of reasoning in context-sensitive ways (Sigelman & Waitzman, 1991).

Despite these obstacles, prior research shows that young children's preference for equal allocations is not entirely insensitive to the details of the allocation scenario. For example, in one study (Li et al., 2014) where 4- and 5-year-olds needed to allocate a single resource to one of two individuals and thus did not have the option of allocating equally, they tended to give more to the individual who initially had less. Characteristics of resource recipients, including shared group membership, can also influence resource allocation; children are more likely to rectify inequalities when they belong to the same (vs. a different) racial category as a disadvantaged group (5- and 6-year-olds; Elenbaas et al., 2016), and they adjust their giving in line with their race-based expectations about wealth (4- and 6-year-olds; Mandalaywala et al., 2021). Slightly older children (7-year-olds) favor their friends in resource allocations (Engelmann et al., 2021), and 6- to 9-year-olds perceive unequal resource allocations as more fair when they view their own families as having high socioeconomic status (Peretz-Lange et al., 2022).

Explanations of inequality appear to influence whether and how older children perpetuate versus correct existing inequalities. In studies with 10- and 11-year-olds, Elenbaas and Killen (2017) introduced a resource inequality with respect to the schools or hospitals that served two different racial groups and asked children to explain the source of this inequality. Children who explained the inequality by appealing to differing financial resources across groups, or to the differential treatment of those groups, judged the inequality to be less "okay" than children who explained the inequality by appealing to the different needs of each group. Children who gave the former explanations also judged that additional resource allocations that perpetuated the inequality were less "okay."

Merit-based explanations of inequalities have also been shown to encourage younger children (3- to 5-year-olds) to reward hard workers (manifested both in children's own allocation decisions and in evaluations of others' allocations; Baumard et al., 2012; Kanngiesser and Warneken, 2012; Rizzo et al., 2016; Schmidt et al., 2016). Compared with merit-based explanations, explanations appealing to an allocator's group preferences can lead 3- to 8-year-old children to make more allocations that rectify inequalities (although 3- to 5-year-olds still favor equal allocations in their evaluations; Rizzo et al., 2020). Thus, actions and attitudes toward inequalities appear to be sensitive to how inequalities are explained, especially in older children (see also Amemiya et al., 2023, for a review). The current study builds on this prior work by asking whether accounting for the stable origins of an existing inequality through a structural explanation can lead even preschoolers to rectify the inequality in their own resource allocations and to negatively evaluate the allocation decisions of others who fail to do so.

The development of structural thinking

Following the philosophy of social sciences (Haslanger, 2011, 2015), we define structural explanations as explanations citing *stable* external factors that affect properties of social groups and individuals in virtue of their position within a larger social structure. For example, a structural explanation of why children in one school outperform children in another school on standardized tests might cite stable differences in the funding that the school districts receive, chronic disparities in the educational resources available to students in classrooms, and/or reliable differences in support outside of school (access to highly educated parents, tutors, etc.).

It is useful to think of structural explanations in contrast to traditional approaches to attribution. In the analysis of variance (ANOVA) or "cube model" (Kelley, 1973; Försterling, 1989), a behavior is attributed to covarying factors (person, situation, or stimulus). However, the model assumes that the data (behaviors) come from an "unconfounded" factorial design, where person and external factors (situation and stimulus) are free to vary independently. Structural thinking is instead sensitive to *confounds* between people and situations. Within a social structure, social groups often occupy fairly stable positions with chronic lack of access to certain opportunities. Taking such confounds into account when explaining group members' attributes, behaviors, and achievements is the hallmark of structural explanation, differentiating it conceptually from a broader class of situational explanations.

Children's ability to generate and understand structural explanations begins to emerge by 3 years of age and becomes more robust through age 6 (Vasil et al., 2024; Vasilyeva, Gopnik, et al., 2018; Vasilyeva & Lombrozo, 2020; Yang et al., 2022). However, because structural explanation has not tra-

ditionally been identified as a separate class of explanation, it has only recently attracted attention in the developmental literature. Instead, the psychological literature on social reasoning has largely focused on contrasting the broader classes of internalist (e.g., essentialist) and externalist (e.g., situational) explanations without differentiating externalist explanations that are structural from those that are not.

Internalist explanations of inequality attribute the inequality to something about the category or person per se in isolation from (social) context. This could include inherent or essential features that give rise to observable characteristics (e.g., Cimpian & Markman 2011; Cimpian & Salomon, 2014; Gelman, 2003; Prentice and Miller, 2007; Rizzo et al., 2022) or other "internal" features such as preferences, personality traits, interests, capacities, emotional states, and motivations (e.g., Peretz-Lange & Muentener, 2019; Seiver et al., 2013). For example, an internalist explanation of differential test performance could cite differences in innate ability or in willingness to work hard. By contrast, externalist explanations cite situational factors such as luck and happenstance, interventions of third parties, and social context. To illustrate, in a study by Hussak and Cimpian (2015), some externalist explanations of inequality cited distant historical facts about one group; the group "won a war, or they found gold, or something else happened that made them get a lot of money" (p. 743).

While structural explanation can be categorized as a subtype of externalist explanation, it is also special in a number of ways that make it worthy of targeted investigation. Structural explanations not only attribute an inequality to an external source, they also highlight the stable, chronic nature of the external constraints. Reference to *external factors* differentiates structural explanations from internalist explanations; reference to *stable constraints* differentiates structural explanations from externalist explanations that are not structural. In a separate line of work, we demonstrate that structural and merely externalist explanations generate very different behavioral responses in 3- to 9-year-old children in contexts that do not involve salient inequalities (Vasil et al., 2024). Here we focus on how structural explanations attributing inequalities to stable external factors affect children's reasoning about resource allocation.

Structural thinking about inequalities: Primary predictions

There are at least two mechanisms by which structural explanations could affect how children and adults understand and act in the face of inequalities. First, by virtue of citing external factors, structural explanations could mitigate the negative consequences of internalist explanations. In adults, internalist explanations are associated with greater acceptance of social stratification, "just world" beliefs, stronger endorsement of punitive programs that perpetuate inequalities, and lower endorsement of government programs aimed at alleviating inequalities (Adams et al., 2008; Jost et al., 2004; Kluegel, 1990). Children show similar effects; attributing a resource inequality to internal causes invites children as young as 4 years to endorse social stratification (Hussak & Cimpian, 2018) and to allocate new resources in a way that perpetuates rather than compensates for that inequality (Rizzo & Killen, 2016). Therefore, we might expect that attributing inequalities to external causes rather than internal causes will mitigate the tendencies listed above, as suggested by work with adults and older children (Adams et al., 2008; Elenbaas, 2019; Elenbaas & Killen, 2017).

The second mechanism by which structural explanations could influence resource allocation judgments is specific to structural explanations as we define them. Specifically, by citing *stable* external factors, structural explanations can highlight how inequalities emerge from larger, often problematic systematic regularities (Haslanger, 2015; Ritchie, 2019). Such inequalities are unlikely to correct themselves. By contrast, regarding an inequality as an unlucky coincidence resulting from chance processes is unlikely to provoke the same demand for intervention; such inequalities may well "wash out" in the long run and could just as easily have favored a different group. To probe this intuition, imagine witnessing one volunteer at an animal shelter giving few treats to cats while overindulging dogs. If you believe that preferences are random and that other volunteers are just as likely to favor cats, then you will conclude that the treat distribution will eventually even out by itself. By contrast, if you learn that one species is systematically mistreated, you might be compelled to intervene (e.g., to give more treats to cats). We expect structural explanations to highlight chronic systemic issues and in so doing invite action that rectifies inequality.

It is important to note that the distinction between externalist explanations that are and are not structural can be a matter of degree, with canonical structural explanations, as we define them, appealing to relatively stable factors. But there exists another variety of explanations appealing to elements of social structure (e.g., gender or racial categories) that need not imply stability in the forces generating inequality. We expect such explanations to have less pronounced effects than structural attributions appealing to more stable factors. One example comes from Rizzo et al. (2020), who attributed an inequality to an individual's group preference (e.g., an individual agent favors girls in dividing prizes between a boy and a girl; this condition was labeled "structural" in the article). In the absence of further evidence of within- and across-individual stability, a case of group favoritism can come across as a one-off accident rather than a stable and pervasive societal bias. (Consistent with this interpretation, 3- to 5-year-olds in Rizzo et al., 2020 expected the agent to divide resources *equally* on future occasions.) Such an attribution produced modest shifts away from perpetuating group-based inequalities in 3- to 8-year-old children, although equal allocation remained the dominant strategy. Critically, our structural manipulation appeals to more stable factors such as poverty; if we succeed in conveying stability, we would expect more dramatic effects of our structural manipulation than those found in Rizzo et al. (2020).

The above considerations yield the two primary predictions of our study: that providing a structural explanation for an existing inequality to preschoolers, versus an internalist explanation or no explanation, will (1) promote subsequent resource allocation decisions that rectify the inequality and (2) prompt more positive normative evaluations of whether it is "okay" for others to rectify an inequality and more negative evaluations of whether it is "okay" to perpetuate the inequality. Given prior evidence that tendencies to rectify inequality emerge only during late childhood (e.g., Rizzo & Killen, 2016), we were particularly interested in whether the youngest participants in our sample would be sensitive to structural explanations and shift toward inequality rectification as a modal response. In addition, based on predominant patterns in prior work, we expected children to favor equal allocations when no explanation for an existing inequality was provided, but to favor allocations that perpetuate the inequality when it was attributed to internalist factors such as differences in effort (Rizzo et al., 2016; Rizzo & Killen, 2018).

Beyond these two central predictions, we had two auxiliary predictions. Unlike explanations that appeal to chance or to idiosyncratic factors that happened to arise, both essentialist and structural explanations appeal to stable features of the world, whether the stability is internal to the target of explanation (e.g., its "essence") or to the external world (a structural constraint). Therefore, such explanations support generalization to new cases (see Gelman, 2003; Lombrozo & Gwynne, 2014; Rhodes et al., 2012; Rhodes et al., 2018; Vasilyeva & Coley, 2013; Vasilyeva & Lombrozo, 2020); a group that is inherently hard-working on one occasion is likely to be so on another occasion, and a group that faces a stable structural constraint on one occasion is likely to face constraints on similar occasions (i.e., provided that the same structural barriers remain in place). This motivates the hypothesis that both internalist and structural explanations will lead preschoolers to generalize inequalities from one domain to another. For example, learning that one group of children outperforms another on standardized tests because children in the former group have more resources might support the inference that they will also win more music competitions and have more field trips. This is an important prediction because it identifies a way in which structural explanations are more akin to typical internalist explanations rather than non-structural externalist explanations. This is the third prediction (3) that we tested in our study.

Our final prediction was more exploratory: Might a structural explanation for an inequality affect children's social preferences for the disadvantaged versus advantaged groups? The literature on children's preference for rich versus poor groups is mixed. Some findings suggest that children expect rich people to share more because they have more (Ahl & Dunham, 2019; Ahl et al., 2019) and that children have positive perceptions of the rich (Baldus & Tribe, 1978; Li et al., 2014; Roussos & Dunham, 2016; Sigelman, 2013). Other studies find the opposite or mixed preferences in both children and adults (Elenbaas & Killen, 2019; Horwitz & Dovidio, 2017, Sigelman, 2012). Internalist explanations appear to increase favoritism of the rich by promoting a view of the poor as socially and physically unattractive (Ahl & Dunham, 2019; Ahl et al., 2019). Structural explanations thereby might increase the appeal of a resource-poor group of people by making internalist explanations of their poverty less plausible

and/or eliciting sympathy and fairness concerns by underscoring the systemic (rather than transient and accidental) nature of the disadvantage, thereby shifting responsibility from the "underperforming" group (Weiner, 1994). For example, Peretz-Lange and Muentener (2021) reported that explaining losing a game by appeal to extrinsic causes mitigates 5- and 6-year-old children's friendship preference for the winning group (but see Peretz-Lange et al., 2021, for qualifications regarding the effect's robustness). Similarly, Dunlea and Heiphetz (2022) provided evidence that attributing incarceration to societal reasons rather than internal reasons can promote positive attitudes toward incarcerated people among 6- to 8-year-olds. Therefore, we tested the prediction (4) that a structural explanation for an inequality will shift preferences regarding the resource-poor group of people away from their baseline levels in a more positive direction, that is, toward seeking social contact with resource-poor groups.

In sum, we know that young children tend not to allocate resources equitably (i.e., compensating for inequalities) and that explaining inequalities by merit differences can exacerbate tendencies to perpetuate them. There is also evidence that in older children and adults structural explanations are associated with policies aimed at rectifying inequalities and that even young children show early signs of structural thinking. However, it is currently unknown whether providing young children with a structural explanation for an inequality (one featuring *stable* structural constraints[1] as opposed to potentially transient factors) can have a causal impact on (as opposed to just a correlation with) how they (1) allocate new resources themselves or (2) judge allocations proposed by others. It is also unknown whether such explanations affect (3) expectations about the generalizability of inequality to a new resource and (4) social preferences toward disadvantaged group members. These are the questions our study set out to answer.

The current study

Our study focused on 3- to 6-year-olds, an age range during which sensitivity to equity concerns is actively developing (Rizzo & Killen, 2016) and structural thinking is beginning to emerge (Vasilyeva, Gopnik, et al., 2018). We also included adult participants to trace the developmental trajectory beyond childhood.

All participants were presented with an existing inequality: One group of children baked 5 pies, and another group of children baked 1 pie. They were then offered one of the following: no explanation for the inequality, an explanation that appealed to an internal factor (differential effort), or an explanation that appealed to structural constraints (differential access to ingredients). The internalist explanation cited effort, a factor that is recognized by young children as relevant to performance (Dweck & Leggett, 1988; Muradoglu & Cimpian, 2020; Nicholls & Miller, 1984) and that is conceptually and empirically linked to considerations of merit and reward in resource allocation contexts (Rizzo et al., 2016; Rizzo & Killen, 2018). The structural explanation emphasized the causal role of a stable external factor—school poverty—in producing the inequality, not only discouraging an exclusively internalist explanation but also undermining other non-structural externalist explanations such as those appealing to mere luck.

To test the predictions identified above, we asked participants to divide new resources (extra pies) between the two groups, evaluate different allocation strategies (rectifying vs. perpetuating the inequality), generalize the inequality to a new resource (kites), and indicate their social preferences (which of the two groups they would rather be friends with).

We also asked participants to explain the original inequality. In the internalist and structural conditions, this served as a manipulation check. However, in the no-explanation condition, this measure allowed us to index baseline explanatory tendencies in the absence of a provided explanation. Prior literature has documented a tendency to produce internalist explanations for individuals' behavior and for social inequalities, often beyond what is justified by the evidence (as reflected by the terms "fundamental attribution error" and "correspondence bias"), at least in Western societies (Gilbert &

[1] We use the expression "stable structural constraints" in a nonrestrictive sense to emphasize that stability is a key characteristic of stable constraints rather than to contrast them with a hypothetical theoretical class of "nonstable structural constraints." We thank an anonymous reviewer for encouraging us to clarify this point.

Malone, 1995; Jones, 1976; Kluegel, 1990). Children in our age range have also been shown to struggle with externalist explanations in some paradigms (Cimpian & Markman, 2011; Cimpian & Steinberg, 2014; Rhodes & Gelman, 2009; Taylor, 1996; Taylor et al., 2009). However, other evidence shows that children can successfully consider the influence of external constraints on behavior such as norms (Chernyak & Kushnir, 2014; Kalish, 2012; Smetana, 1981; Turiel, 1983) and that even 3-year-olds can generate structural explanations given suitable evidence (Vasilyeva, Gopnik, et al., 2018). In some contexts, young children (4-year-olds) are more open to considering situational explanations of individual behaviors compared with adults and older children (6-year-olds; Seiver et al., 2013). Therefore, we expected that children in the no-explanation condition would frequently provide internalist explanations, but we were also interested in assessing the extent to which they might spontaneously produce explanations citing externalist and possibly structural influences.

Method

Participants

A total of 201 children (mean age = 4.94 years, *SD* = 0.58, majority [95%] 4 or 5 years, range = 3–6; 95 girls and 106 boys) were recruited in museums and preschools located in the San Francisco Bay Area of California in the western United States. An additional 201 adults (mean age = 35 years, *SD* = 9, range = 21–66; 70 identified as women, 128 as men, 1 as non-binary, 2 did not specify) completed the study online. Data collection took place during the period December 2017 to March 2019. Additional demographic and recruitment information and a power analysis for sample size selection are available in the online supplementary material (Section I.1).

The study was approved by the University of California, Berkeley committee for protection of human subjects and by the Princeton University institutional review board.

Design, materials and procedure

Participants were presented with an illustrated story about 10 children in each of two schools: the Blue school and the Green school. For child participants, an experimenter read the story out loud, showing illustrations on a computer screen. Adults completed the study online, reading the story and entering responses at their own pace. The order in which the two schools were mentioned and the corresponding left–right placement of the Blue and Green school images on the screen were counterbalanced.

The story introduced an inequality: The children at the Blue school made 5 pies, whereas the children at the Green school made 1 pie.[2] In discussing the methods and results, we refer to this original distribution of pies as the "starting inequality," and we refer to the school that baked more pies as "pie-rich" and to the other school as "pie-poor." The full version of the study materials and data files are available through the Open Science Framework (https://osf.io/6kgps/?view_only=54f0516f78ef4129b14562c0d29eb95f).

Each participant was assigned to one of three conditions differing in the explanation of the starting inequality: an effort-based explanation, a structural explanation, or no explanation (baseline). In the *effort* condition, the children at the Blue school worked harder to make pies than the children at the Green school (they had more [fewer] pies "because they worked harder [didn't work hard]"), but the two schools bought the same amounts of baking ingredients, and the children at both schools were described as being equally good at baking. In the *structural* condition, one of the schools was rich

[2] We chose to use pies because they represent an intuitively valuable concrete resource (similar to resources that have been used in prior studies; e.g., cakes in Huntsman, 1984, and cookies in Baumard et al., 2012) and because this resource is familiar to children and supports both internalist and structural explanations (pies are something children can make themselves, investing more or less effort, and making pies requires ingredients, which can plausibly be limited due to stable structural constraints). Prior research shows that children in our age range allocate luxury and necessary resources similarly (at least when rewarding agents differing in merit; Rizzo, et al., 2016; but see Essler et al., 2020); we did not provide any information regarding the luxury-versus-necessity status of the resource.

and bought more baking ingredients for its children than the poor school (“because their school is rich [poor] and bought more [less] ingredients”), but the children in both schools worked equally hard and were equally good at baking. In the *no-explanation baseline* condition, no information about the amounts of ingredients, effort, or baking talent was provided.

Illustrations showed the number of boxes with ingredients for pies that each school purchased. In both the effort and structural conditions, participants were asked to count the boxes each school purchased; all children were able to count these correctly.

The main vignette about baking pies was preceded by a “cupcake prelude” that described how the students in the two schools baked cupcakes in the school kitchens using the ingredients that the schools purchased. The primary purpose of the prelude was to convey the stability of the resource disparity in the structural condition (the children in one school always had more ingredients—more bags with ingredients for cupcakes and more boxes with ingredients for pies). This emphasis on stability is crucial to inducing a genuinely structural construal as opposed to presenting the disparity as a one-time accidental influence of transient external factors (see Vasil et al., 2024). To match the procedure across experimental conditions, the cupcake prelude was included in all conditions, and in the effort condition the children in one school always worked harder, both when they baked cupcakes (in the prelude) and when they baked pies (in the main vignette), suggesting the stability of effort. The cupcake prelude in the baseline condition did not mention effort or amount of ingredients. We did not provide information about the number of cupcakes the two schools baked in any condition.

After the cupcake prelude and the story about pies, participants in all conditions completed the following key measures presented in a fixed order: generation of an explanation of the inequality, resource allocation decision, resource allocation evaluation, social preference measure, and generalization of inequality to a novel resource.

Explanations of inequality

After the introductory story, all participants were asked “Why did the children in the Blue school bake more pies?” and “Why did the children in the Green school bake fewer pies?” For participants in the effort and structural conditions, this served as a comprehension check; effort-based explanations were counted as “correct” for the effort condition, and structural explanations were counted as “correct” for the structural condition.[3] Although most children responded right away, some children received experimenter encouragement to share any explanation that came to mind (e.g., “What do you think?”, “Does anything come to mind?”, up to three times). Adults were not offered additional encouragement. Participants received feedback restating the correct explanation (in the effort and structural conditions) or merely acknowledging their response (in the baseline condition).

Resource allocation

Participants were told that a local bakery donated 6 new pies to the schools and that they needed to decide how many of the new pies each school should receive. Participants were presented with five possible ways to divide the pies, ranging from dividing the pies 5:1 in favor of one school to dividing them 1:5 in favor of the other school. Each option was stated verbally (e.g., “five pies to the Blue school and one pie to the Green school”) and was accompanied by a visual diagram (shown in Fig. 1; for children, the allocation options were printed on strips of paper; for adults, they appeared on the screen). The options were presented in one of two orders, starting with giving more pies to the school appearing on the left, which was determined by the counterbalancing condition.

Allocation evaluation

After performing their own allocation, participants were asked to evaluate whether two proposed allocations were “okay” or “not okay.” The allocations were introduced as having been proposed by another child (or person for adults) and were presented in random order. One allocation perpetuated

[3] All adults and most children provided correct explanations for their condition on the first attempt; only 7 children could not repeat the provided explanation (4 in the effort condition and 3 in the structural condition; Fisher's exact test, $p = .165$). We did not exclude participants based on responses to this question because the criterion could not be applied in the baseline condition. However, excluding these 7 participants does not change the observed patterns; if anything, it tends to strengthen them.

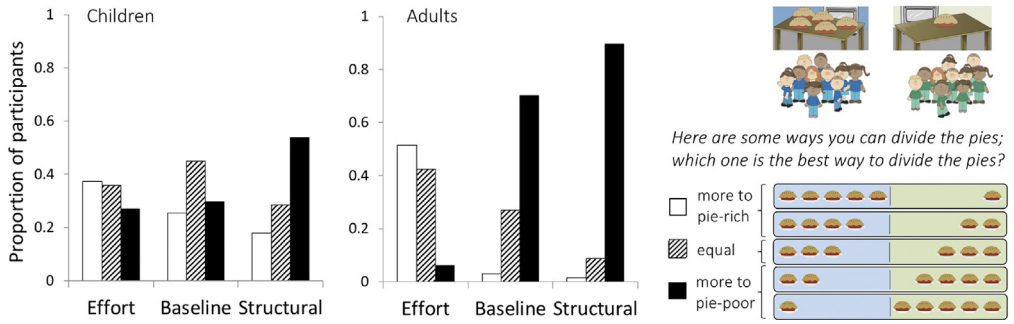

Fig. 1. Distribution of resource allocation decisions as a function of explanation and age group.

the starting inequality: "We should give more pies to the Blue school and fewer pies to the Green school." The second, proposed by "another kid [person]," compensated for the starting inequality: "We should give more pies to the Green school and fewer pies to the Blue school." Participants evaluated each allocation proposal using a two-step smiley face scale ranging from 1 (*really not okay*) to 4 (*really okay*): they first chose whether it was "okay" or "not okay" (a smiley or sad face) and then indicated whether it was "really [not] okay" (a large smiley [sad] face) or "a little bit [not] okay" (a small smiley [sad face]).

Social preference

We next assessed social preferences toward members of resource-rich versus resource-poor groups. Participants were asked "Who would you rather be friends with?" and were given three response options: "kids from the Blue school" (indicating a social preference for the pie-rich group), "kids from the Green school" (indicating a social preference for the pie-poor group), or "both the same."

Generalization of inequality to a new resource

Participants were told that the children at the two schools also made kites and were asked to predict the distribution of kites across the two schools by selecting one of three options: that the "kids in the Blue school made more" (the starting inequality persisted), the "kids in the Green school made more" (the inequality reversed), or "both the same" (the inequality disappeared).

The study also included several additional supporting or exploratory measures, which we report in full in the supplementary material. These included (a) additional demographic information, such as political beliefs (for adults only), which yielded weak and inconsistent effects; (b) a series of comprehension, attention, and memory checks, as well as open-ended justifications for a subset of questions, which suggested that our task was attended to and appropriately understood by both children and adults; (c) an exploratory measure of inequality generalization to a school introduced as having a shared color (Blue or Green), which yielded mixed results; (d) an open-ended question in the structural condition asking participants to explain the origin of the structural inequality, which was included to see whether an internalist origin for a structural inequality was frequently assumed (in fact this was very rare).

Results

Resource allocation decisions: Do structural explanations of inequality promote resource allocations that rectify inequality?

Preliminary inspection of the data revealed that three allocation options (1:5, 3:3, and 5:1) accounted for the majority of responses, especially among children (only 7.5%–11.9% of children in

each condition chose 2:4 or 4:2). Thus, we recoded all responses into an ordered factor variable with three levels representing increasing numbers of resources allocated to the pie-poor group: "more to pie-rich" (4 or 5 pies to the pie-rich school), "equal" (3 pies to each school), or "more to pie-poor" (4 or 5 pies to the pie-poor school). The distribution of responses is shown in Fig. 1.

An ordinal logistic regression predicting resource allocation choices from the explanation condition (effort-based explanation, structural explanation, or no-explanation baseline) and age group (children or adults)[4] revealed a significant interaction between the predictors (likelihood ratio [*LR*] = 41.11, $p < .001$). To examine the lower-level effects of explanation across and within each age group, we queried the same regression model, changing the reference group for each of the categorical predictors.

For children, the effort-based explanation did not significantly affect allocations (odds ratio [*OR*] = 0.68,[5] $t = 1.17$, $p = .241$), although the modal response shifted from equal allocation in the baseline condition toward giving more to the pie-rich school in the effort condition (see Fig. 1). The structural condition, by contrast, reliably shifted children's allocations toward rectification[6]; children who received a structural explanation gave more pies to the pie-poor school than children who received no explanation (baseline) (54% vs. 30%; $OR = 2.36$, $t = 2.59$, $p = .009$) and children who heard an effort-based explanation (27%; $OR = 3.46$, $t = 3.65$, $p < .001$).

For adults, relative to the baseline, the number of pies allocated to the pie-poor group significantly dropped after hearing an effort-based explanation ($OR = 0.05$, $t = -7.97$, $p < .001$) and significantly increased after hearing a structural explanation ($OR = 3.56$, $t = 2.66$, $p = .007$) (structural vs. effort: $OR = 66.98$, $t = 8.81$, $p < .001$).

Comparing the effects of explanation across age groups, the effect of the effort-based explanation (vs. baseline) was significantly stronger in adults than in children ($OR = 12.86$, $t = 5.25$, $p < .001$). However, there was no significant difference between age groups in the magnitude of the effect of structural explanation (vs. baseline) ($OR = 0.66$, $t = 0.70$, $p = .481$).

Overall, adults rectified inequality more than children at baseline ($OR = 5.59$, $t = 4.90$, $p < .001$) and in the structural condition ($OR = 8.41$, $t = 4.56$, $p < .001$), but children rectified more than adults in the effort-based explanation condition ($OR = 2.30$, $t = 2.52$, $p = .016$).

Having found the predicted effect of structural explanations in promoting resource allocation decisions that rectify existing inequalities in both children and adults, we next examined whether this effect was driven by the older children in our sample. An ordinal logistic regression predicting children's resource allocation choices from the explanation condition (effort-based explanation, structural explanation, or no-explanation baseline) and age in months revealed that the effect of explanation did not depend on children's age (interaction $LR = 1.95$, $p = .378$). To verify this further, we examined the effect of explanation in the youngest half of our developmental sample (3- and 4-year-olds, age below the median of 4.903 years,[7] range = 3.27–4.90; $n = 98$). An ordinal logistic regression predicting 3- and 4-year-olds' resource allocations from the explanation condition showed that structural explanation promoted inequality-rectifying resource allocations compared with the baseline condition ($OR = 3.23$, $t = 2.47$, $p = .013$) and the effort-based explanation condition ($OR = 6.71$, $t = 3.66$, $p < .001$); the latter two did not differ ($OR = 0.48$, $t = -1.58$, $p = .114$). When the starting inequality was explained by effort or when no explanation was provided, only a minority of 3- and 4-year-olds gave more pies to the pie-

[4] An additional analysis showed that the presentation order for resource allocation options (starting with 5 pies to the pie-poor vs. pie-rich school) did not significantly affect allocation responses ($t = 0.20$, $p = .843$) and did not interact with other factors ($LR = 6.92$, $p = .226$); thus, the order factor was dropped from the analysis.

[5] Here and below, we report the odds ratios, that is, exponentiated odds ratio coefficients from ordinal logistic regressions. These can be interpreted as the relative difference between the odds of transitioning to the next level of the ordinal outcome variable, comparing levels of the predictor variable.

[6] The effect's significance indicates that there was an overall shift toward giving more pies to the pie-poor school. The distribution of responses in Fig. 1 shows that this was driven by an increase in rectifying allocations rather than by a shift from "more to pie-rich" allocations to "equal" allocations. Our interpretation of significant effects here and below is based on the inspection of response distributions.

[7] Excluding children exactly at the median age from this analysis makes it harder to detect a significant effect of explanation on the younger group and thus works against the claim that structural explanation can promote inequality rectification in young children.

poor school (20% and 26% of children, respectively). However, when the inequality was explained by structural factors, 64% of 3- and 4-year-olds chose to rectify it by giving more pies to the pie-poor school. In the baseline condition, as expected, this young subsample predominantly selected the equal allocation (46%); in the effort condition, the majority of children (53%) allocated more pies to the pie-rich school.

Allocation evaluation: Do structural explanations of inequality promote more positive evaluations of rectification, and more negative evaluations of perpetuation?

Allocation evaluations (1 = *really not okay* to 4 = *really okay*) were treated as an ordinal factor and were predicted from the explanation condition (effort, structural, or baseline), age group (children or adults), and the evaluated allocation strategy (perpetuate [give more pies to the pie-rich school] or rectify [give more pies to the pie-poor school]) in an ordinal regression, including all interaction terms and allowing for random participant intercepts. To explore a significant three-way interaction illustrated in Fig. 2 ($LR = 59.82$, $p < .001$), we analyzed children and adults separately.

Within each age group, we observed a significant interaction between allocation strategy and explanation condition (children: $LR = 10.71$, $p = .005$; adults: $LR = 188.63$, $p < .001$).[8] To examine the lower-level effects of allocation strategy across and within each explanation type, we queried the same regression models, changing the reference group for each of the categorical predictors.

Children in the baseline and effort conditions evaluated the two proposed allocation strategies similarly (effort condition: $OR = 1.08$, $z = 0.23$, $p = .816$; baseline: $OR = 1.38$, $z = 1.01$, $p = .314$; no significant interaction, $OR = 0.78$, $z = -0.56$, $p = .577$), and their ratings did not differ from the scale midpoint (nonparametric one-sample sign tests, all $ps \geq .222$). In the structural condition, by contrast, children rated rectification more favorably than perpetuation ($OR = 4.33$, $z = 4.45$, $p < .001$), and both ratings differed from the scale midpoint in different directions ($ps \leq .014$) (see Fig. 2). Children in the structural condition differentiated between the two allocation strategies significantly more than in the effort condition ($OR = 4.03$, $z = 3.06$, $p = .002$) or the baseline condition ($OR = 3.14$, $z = 2.49$, $p = .013$).

Adults in the effort condition rated the decision to rectify less favorably than the decision to perpetuate ($OR = 0.12$, $z = -6.03$, $p < .001$), but this pattern was reversed in the structural condition ($OR = 183.73$, $z = 10.40$, $p < .001$; interaction between condition [structural vs. effort] and allocation strategy, $OR = 1469.92$, $z = 11.57$, $p < .001$). The baseline condition showed a similar pattern of differentiation ($OR = 11.53$, $z = 7.09$, $p < .001$) as in the structural condition, but it differed significantly from both other conditions. Most important, relative to the baseline condition, the structural condition intensified the divergence in evaluations of the two allocation options (interaction $OR = 15.93$, $z = 4.75$, $p < .001$), driving down ratings of giving more to the pie-rich group ($OR = 0.15$, $z = -4.43$, $p < .001$) and boosting positive evaluations of giving more to the pie-poor group ($OR = 2.46$, $z = 2.25$, $p = .025$) (see Fig. 2). By contrast, the effort condition reversed evaluations of the two strategies relative to baseline (interaction $OR = 92.27$, $z = -8.93$, $p < .001$). All ratings differed significantly from the scale midpoint ($ps < .001$).

As for allocation decisions, we also examined whether the effect of explanation on allocation evaluations was driven by the older children in our sample. An ordinal logistic regression predicting children's allocation evaluations from explanation condition (effort, structural, or baseline), allocation strategy (rectify or perpetuate), and age in months revealed that the effects did not depend on children's age (dropping the interactions with the age variable from the model did not affect the model fit, $LR = 1.76$, $p = .88$). As an additional confirmation that even the youngest children were sensitive to the explanation manipulation, we verified that the target interaction between explanation condition and allocation strategy held in the youngest half of our developmental sample (3- and 4-year-olds; $LR = 6.58$, $p = .037$). Only in the structural condition did 3- and 4-year-olds rate inequality rectification more favorably than inequality perpetuation ($OR_{str} = 4.03$, $z = 2.78$, $p = .005$; $OR_{bas} = 1.67$, $z = 1.21$, $p = .262$; $OR_{eff} = 0.71$, $z = -.74$, $p = .460$).

[8] To verify that the structural condition shifted evaluations relative to baseline, we reran these analyses; dropping the effort condition for both age groups, the interaction of condition and allocation strategy remained significant (children: $LR = 6.11$, $p = .013$; adults: $LR = 25.40$, $p < .001$).

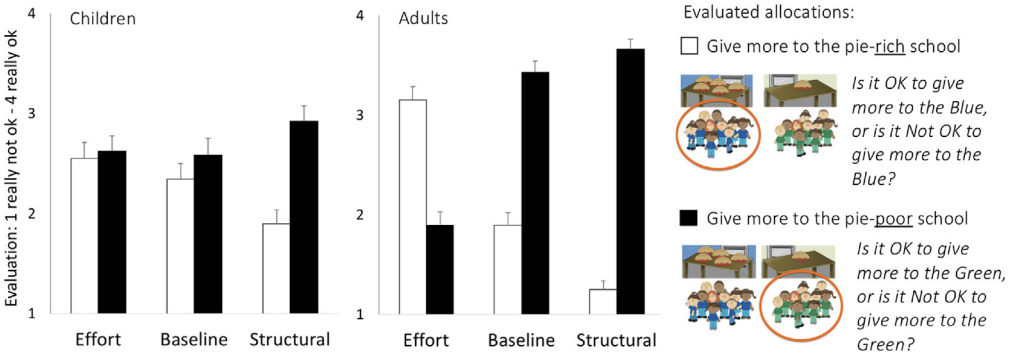

Fig. 2. Mean resource allocation evaluations on a scale of 1 (*really not okay*) to 4 (*really okay*) as a function of experimental condition and age group. Error bars represent 1 standard error of the mean (SEM). (Means and SEMs were calculated for illustration purposes; the analyses treat the rating scale as ordinal.)

Generalization of inequality to a new resource domain: Is an initial inequality that has been attributed to structural factors expected to generalize?

To assess whether participants expected an inequality in one resource domain (pies) to generalize to another resource domain (kites), we analyzed kite judgments as a function of condition. Ratings were treated as an ordinal factor, with higher levels corresponding to stronger generalization of the initial inequality to the new resource (1 = *the pie-poor group made more kites,* 2 = *both made the same,* 3 = t*he pie-rich group made more kites*). These ratings were predicted from explanation condition (effort-based, structural, or baseline), age group (children or adults), and their interaction in an ordinal regression. The interaction was not significant (LR = 2.13, p = .345) and was dropped from the model. On average, both the effort explanation (OR = 2.55, t = 3.39, p < .001) and the structural explanation (OR = 2.47, t = 3.32, p < .001) boosted generalization to a new resource relative to the baseline. The two explanation conditions did not differ ($OR_{\text{str vs. eff}}$ = 0.97, t = −0.11, p < .916). Adults generalized more than children (OR = 7.65, t = 8.10, p < .001) and more than chance in all conditions (one-sample sign test, ps < .001). Children generalized above chance in the effort and structural conditions (ps < .001), but not in the baseline condition (p = .121). The distribution of responses is shown in Fig. 3.

Social preference: Do structural explanations of inequality mitigate social (friendship) preferences favoring advantaged groups?

Social preference ratings were treated as an ordinal factor (1 = *prefer the pie-rich group,* 2 = *both the same,* 3 = *prefer the pie-poor group*) and were predicted from the explanation condition (effort-based, structural, or baseline), age group (children or adults), and their interaction in an ordinal regression. The interaction was significant (LR = 22.08, p < .001). As shown in Fig. 4, the most common choice across conditions was "both the same," indicating no friendship preference between groups (except for the adults in the effort condition; see below), but preferences varied with the explanation condition and age.

The structural explanation shifted children's social preferences relative to the baseline (OR = 2.15, t = 2.02, p = .043); this appeared to be driven by a reduction in the number of children who preferred to be friends with the kids from the pie-rich school (from 36% to 21%), an increase in the number of children expressing no preference (from 54% to 66%), and a slight increase in the number of children who preferred the kids from the pie-poor school (from 10% to 13%). The effort condition did not differ from either the structural condition (p = .617) or the baseline condition (p = .126).

For adults, the distribution of social preferences varied significantly across all three conditions. The structural explanation increased preferences for kids from the pie-poor school relative to the baseline condition (OR = 2.41, t = 2.37, p = .018) and the effort condition (OR = 10.67, t = 6.22, p < .001); the effort explanation, by contrast, increased preferences for kids from the pie-rich school above baseline

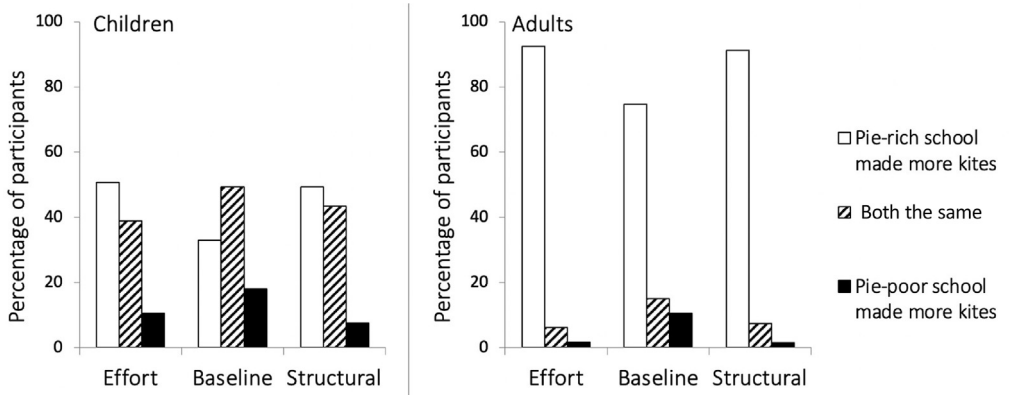

Fig. 3. Generalization of inequality to a new resource domain: Percentages of participants saying that the kids from the pie-rich school made more kites (reflecting a judgment that the inequality would persist), saying that both schools made the same number (indicating that the inequality would disappear), and saying that the kids from the pie-poor school made more kites (indicating that the inequality would be reversed).

(OR = 0.23, t = −4.12, p < .001). Examining the two-way interactions, the differences between the effort condition and the other two conditions were more pronounced for adults than for children (ps < .001), but interestingly, the effect of the structural explanation relative to the baseline did not differ for children and adults (OR = 1.12, t = 0.22, p = .829).

Explanations of inequality: When an explanation for an inequality is not provided, what kinds of explanations do children and adults generate?

Participants' responses to the question "Why did the kids at the Blue [Green] school bake more [fewer] pies?" were coded into five categories: effort-based (e.g., "they worked harder"), other internalist (primarily citing preferences, priorities, wants, and needs; e.g., "'cause they like pies more," "they wanted to," "because maybe they wanted more pies because maybe they are starving," "they eat a lot"), structural[9] (e.g., "because they had more ingredients and they had more money"), other externalist (e.g., "because the teacher said 'let's make five pies'," "oven broke"), or miscellaneous, including failures to respond and restatements (e.g., "they put them in the oven and the oven makes them hot"). Responses could receive multiple codes (e.g., "because they wanted more pies and they have much more money" was coded as both "other internalist" and "structural"). Two independent coders coded all responses with experimental condition concealed (mean intercoder agreement across codes, Cohen's kappa = .86, range = .67–.98, all ps < .001); disagreements were resolved through discussion. The two questions about the two schools produced nearly identical response patterns and were combined; the combined response inherited all the codes received by either of the two component responses. Fig. 5 shows the distribution of explanations generated in the baseline condition (the response distribution across all the experimental conditions is available in the supplementary material; see Table S1).

Overall, children's explanations revealed an asymmetry: they readily generated explanations citing internal factors, but they rarely considered structural or other external factors. In contrast, adults frequently explained the initial inequality by citing effort or other internal factors and/or structural or other external factors. We can summarize this pattern by combining effort-based and "other internal-

[9] To apply the same coding scheme across all experimental conditions, we classified any reference to differential access to ingredients and money as structural; however, not all such responses contained clear cues that participants treated the lack of ingredients as a genuinely stable structural factor. The relatively high levels of generalization of the starting inequality to a new property (kites), at least in the adult sample, suggest that participants did frequently construe lack of ingredients or money as a stable feature; nevertheless, the distinction between "structural" and "other externalist" explanation codes for the baseline participants should be interpreted with some caution. The overall response distribution is informative even with this caveat.

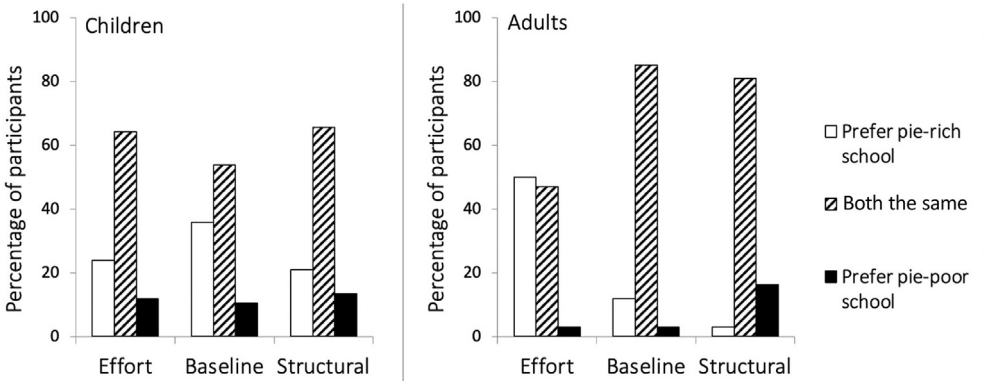

Fig. 4. Social preferences: Percentages of participants preferring to be friends with the kids from the pie-rich school, expressing no preference, and preferring to be friends with the kids from the pie-poor school.

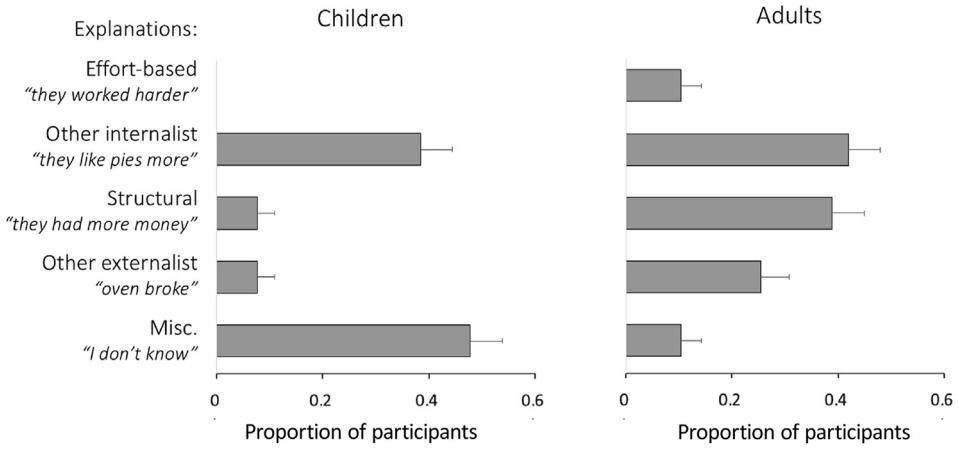

Fig. 5. Proportions of participants in the baseline condition generating each explanation type in response to "Why did the kids at the Blue school bake more pies?" and "Why did the kids at the Green school bake fewer pies?" Error bars represent 1 standard error of the mean.

ist" explanations into a "broadly internalist" category and combining structural and "other externalist" explanations into a "broadly externalist" category. Children offered 2.5 times as many broadly internalist explanations (25) as broadly externalist explanations (10), whereas adults offered slightly more (1.2 times more) broadly externalist explanations (43) than broadly internalist explanations (35).

Logistic regressions predicting each explanation type from age group revealed that adults were more likely than children to generate structural and "other externalist" explanations (7.61 times higher odds of generating structural explanations for adults than for children, Nagelkerke R^2 = .20, p < .001; 4.08 times higher odds of generating other externalist explanations, R^2 = .10, p = .005). The two age groups did not differ in their likelihood of producing "other internalist" explanations (p = .697). Children were 7.82 times more likely than adults to produce unclassifiable responses (R^2 = .23, p < .001). Effort-based explanations were never generated by children in the baseline condi-

tion and were not analyzed. The supplementary material also reports exploratory analyses of the relationships between the explanations baseline participants generated and their resource allocation decisions.

Discussion

This study examined how different explanations for an existing resource inequality influence decisions and judgments concerning whether the inequality should be perpetuated or corrected. A large body of research has shown that young children tend to allocate resources by dividing them equally and to perpetuate inequalities even when rectification is called for (e.g., Paulus, 2014; Rizzo & Killen, 2016, 2018; Sigelman & Waitzman, 1991). Whereas children who received no explanation or an internalist explanation mirrored this pattern, the structural explanation condition produced a strikingly different result: when 3- to 6-year-old children and adults received a structural explanation for an inequality, they were more likely to allocate new resources in a way that rectified the inequality. This effect held even for our youngest participants—a group with a particularly strong penchant for equal allocation (e.g., Rizzo & Killen, 2016) and on some occasions preferential treatment of rich others (Paulus & Essler, 2020).

Patterns of resource allocation were mirrored in normative evaluations concerning which allocations were "okay"; only when children learned that an inequality was produced by structural factors did they reliably endorse compensating for the inequality more often than perpetuating it. Likewise, receiving a structural explanation magnified adults' judgments, intensifying their approval of rectification as well as their disapproval of perpetuation. A no-explanation baseline condition (absent from most previous studies) allowed us to attribute these effects specifically to the structural explanation.

As predicted, the effects of our structural manipulation—attributing an inequality to *stable* structural factors—were stronger than previously documented effects of attributing an inequality to individuals' group preferences (e.g., an agent giving more prizes to a girl than to a boy; Rizzo et al., 2020). Indeed, when the inequality was attributed to such individual preferences, only 14% of 3- to 8-year-old children fully rectified it, whereas the majority (74%) divided resources equally. By comparison, 48% of children in our structural condition fully rectified the inequality, whereas only 28% divided resources equally. We agree with Rizzo et al.'s (2020) description of their pattern of results as indicating an "aversion to perpetuating" group-based inequalities rather than a desire to actively rectify them (p. 450); in contrast, we read the pattern observed in our study as a genuine shift toward valuing inequality rectification.[10] Considered jointly, the results from these two studies illustrate how behavioral responses to inequalities track gradation in the stability and systematicity of the inequalities' origins.

Our findings offer new evidence of structural thinking as a coherent causal explanatory construal with a unique cognitive profile. On the one hand, it contrasts sharply with internalist thinking in its potential to promote inequality rectification (and to generate expectations of mutability across different contexts; Vasilyeva et al., 2018; Vasilyeva & Lombrozo, 2020); on the other hand, structural explanations, just like internalist explanations, have strong inductive potential (Vasilyeva & Lombrozo, 2020). Consistent with prior work, we found that both structural and effort-based explanations led children and adults to expect existing inequalities (in ingredients for pie) to generalize to additional resources (materials for kites).

Explanations of inequality also affected social preferences. For adults, an effort-based explanation made friendship with the resource-rich group more attractive, and a structural explanation made friendship with the resource-poor group more attractive, in each case relative to baseline. For children, a structural explanation shifted preferences from baseline, modestly suppressing friendship choices

[10] Consistent with this, in Rizzo et al. (2020) 3- to 5-year-olds evaluated equal allocations more positively than either rectifying or perpetuating allocations, rating the latter two as relatively "not okay," whether in the group-based or individual-performance condition, where the inequality was attributed to recipients' hard work. In contrast, in our study the structural explanation significantly boosted children's positive evaluations of rectification and lowered evaluations of perpetuation relative to both effort-based and no-explanation baseline conditions.

that favored the resource-rich group, whereas an effort-based explanation had no effect on children's social preferences.

Overall, compared with adults, children were less responsive to an internalist, effort-based explanation of inequality across our key measures. For adults, an effort-based explanation shifted allocation decisions, evaluations, and social preferences in favor of the hard-working group; yet, none of these effects was observed for children. Children also never spontaneously cited effort to explain the inequality in this domain. These findings are surprising in light of prior evidence that young children consider the role of effort in explanations of performance (especially academic performance; Dweck & Leggett, 1988; Muradoglu & Cimpian, 2020; Nicholls & Miller, 1984) and display a growing understanding of merit-based reward (Baumard et al., 2012; Rizzo et al., 2016; Rizzo & Killen, 2018; Schmidt et al., 2016). We speculate that the relative paucity of references to effort in child- and adult-generated explanations was due to salient competing explanations available within the domain of our vignette; intuitively, whether, what, and how much people cook is saliently shaped by what they like to eat and how hungry they are (consistent with the high frequency of "other internalist" explanations spotlighting agents' preferences and needs; e.g., "they like pies more"; "they were really hungry"). Perhaps these factors overshadow the role of effort[11] that goes into preparing food (especially for children who rarely cook themselves).

One intriguing question is whether children's inability to generate effort-based explanations in our study also made it difficult for children to grasp this explanation when provided and/or to deem the explanation irrelevant to resource allocation judgments and social preferences, as we observed. We think the story is more complicated. First, our pattern of results cannot be explained by children simply ignoring or failing to understand the provided effort-based explanation given that children, like adults, correctly recalled it when it was provided (see supplementary material, Section II.1) and relied on it to generalize the inequality to a new resource domain. Second, although adults rarely spontaneously came up with effort-based explanations of the starting inequality (similar to children), they were highly responsive to them once they were provided. In other words, providing an explanation that is not chronically available (i.e., one that would not have occurred to a person without a prompt) had a pronounced effect on judgments for adults, but not for children. Articulating and testing a consistent account of developmental changes in explanation generation, responsiveness to explanations, and the psychological mechanisms connecting them is an important direction for future work.

Our study documented another interesting juxtaposition of developmental change and continuity from early childhood to adulthood. Overall, in the absence of a provided explanation, adults were more inclined toward rectification than children in both actions and evaluations. Notably, however, children and adults showed striking qualitative and quantitative similarity in their *responses* to structural explanations—that is, they were equally affected by the structural explanation, relative to baseline, in their allocations and social preferences. If reliable, this pattern adds an important caveat to the notion that internalist thinking constitutes an early cognitive default (consistent with Seiver et al., 2013; see also Noyes & Keil, 2020). This early and robust responsiveness to structural explanations contrasts intriguingly with their relative scarcity in child-generated responses. Thus, the latter could reflect limited exposure to such explanations in children's input (Gonzalez et al., 2022), rather than any inherent complexity that renders structural explanations less comprehensible or intuitive to preschoolers. This highlights the importance of including historical structural explanations in educational contexts and parent–child interactions.

Our key finding that structural explanation promotes inequality rectification invites new questions about the mechanisms and boundary conditions of this effect. One important question relevant for

[11] One interesting question is whether an alternative explanation in terms of ability would fare similarly to effort. On the one hand, similar to effort explanations, children in the baseline condition never generated ability explanations. Moreover, some classic work argues that young children do not fully grasp the role of ability/skill in explaining performance until 10 years of age (Harari & Covington, 1981; Nicholls, 1978), and generally struggle to understand the role of dispositional traits in shaping behaviors (Rholes & Ruble, 1984), suggesting that ability explanations might prove to be even more challenging, especially for the youngest participants. On the other hand, more recent evidence suggests that young children can reason about dispositional traits (Boseovski & Lee, 2006; Heyman & Gelman, 1999), and children as young as 4 years can cite ability/skill in explanations of (academic) performance (Muradoglu & Cimpian, 2020), opening up the possibility that children could be more responsive to ability explanations in their social preferences and/or resource allocation judgments even if they do not consider such explanations spontaneously. We thank two anonymous reviewers for raising these points.

translating our work to real-world situations concerns the relationship between structural and internalist explanations. In principle, a structural explanation does not rule out the existence of matching internal factors such as preferences that align with structural barriers (e.g., if women not only face employment discrimination but also want to stay home). These internal factors may be seen as independent sufficient causes of the same effects (constituting causal over-determination) or as causes or effects of the structural factors (e.g., the current social structures accommodate preexisting inherent inclinations; the current deep-seated inclinations are products of early structural influences that mold individuals to develop particular characters). Merely including structural factors as one element in an otherwise internalist explanation of inequality might not be as effective for promoting rectification (Rangel & Keller, 2011). A person who holds an internalist explanation of why a particular structure exists might approve of that structure and endorse the resulting inequalities. For example, a person might endorse the structural power differential between adults and children by invoking inherent age differences in capacities and see no need to rectify it by offering more power to children. Thus, endorsement of the social structure may moderate the effects of structural explanation, and internalist explanations may play a role in such endorsement.

Another important future question is whether structural explanations promote taking a particularly resilient stance toward rectification. Li et al. (2014) reported an intriguing and somewhat disturbing finding: The preference to allocate a single resource to an individual who began with less can be flipped to allocating that resource to the individual who began with more by introducing a short 2-min delay and a distractor. Li et al. proposed an "affective tagging" mechanism to explain this; children initially form positive attitudes favoring the wealthy individuals, and when they forget the details of who had less and who had more, they rely on their affective preference—as a result, rewarding the rich. Can structural explanations support a more resilient stance? Our findings suggest that they can at least disrupt the affective tagging mechanism by evening out initial social preferences across resource-rich and resource-poor groups; but do they also perhaps support better memory for which group is disadvantaged and promote allocations driven by considerations of moral fairness over affective preferences?

Yet another important direction concerns the tension between descriptive and normative expectations (Roberts et al., 2017). Although people expect inequalities stemming from either internalist or structural causes to generalize to new cases, they could vary in their stance on whether these regularities *ought* to be preserved. We expect normative expectations that support inequalities (status quo approval) to more often accompany an internalist construal than a structural construal (Tworek & Cimpian, 2016). Participants' evaluations of perpetuation versus rectification of observed inequalities supports this; both children and adults judged inequality perpetuation as most "not okay" in the structural condition. Thus, structural explanations might neutralize "system justification" tendencies (Jost et al., 2004), driving a wedge between observing and expecting pronounced social inequalities, on the one hand, and the inference that these should be retained, on the other. More work is needed to examine the effectiveness of structural explanations in real-world contexts.

In sum, we offer important evidence of how explanations powerfully shape social reasoning and action. We replicate Vasilyeva et al. (2018) and Vasilyeva and Lombrozo (2020) by documenting receptivity to structural explanations in children and adults, and we report new results concerning the effects of structural explanations on judgments and actions in resource allocation contexts. In children, a structural explanation can override tendencies to perpetuate inequality or divide resources equally, suggesting that even young children are not in principle incapable of appreciating equity concerns; instead, they might be uncertain about the origins of inequality and/or struggle to spontaneously generate possible non-internalist explanations of inequality. In adults, a structural explanation promotes resource allocations that rectify inequality, but an effort-based explanation intensifies inequalities. These novel results shed light on the early origins of our capacity to understand the social world and the factors that guide normative evaluations and social change and help to formulate important new questions for further research.

CRediT authorship contribution statement

Ny Vasil: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Mahesh Srinivasan:** Conceptualization, Writing – review & editing, Methodology. **Monica E. Ellwood-Lowe:** Conceptualization, Methodology, Writing – review & editing. **Sierra Delaney:** Data curation, Methodology, Project administration. **Alison Gopnik:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing. **Tania Lombrozo:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jecp.2024.105896.

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