Journal of Experimental Child Psychology 211 (2021) 105224

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

Why do children show racial biases in their resource allocation decisions?

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ARTICLE INFO

Article history:
Received 14 January 2021
Revised 2 June 2021

Keywords:
Resource allocation
Race
Intergroup attitudes
Economic decision making
Stereotypes
Bias

ABSTRACT

Young children often prefer people high in status and with access to resources. Children also favor fairness and equality, especially when it comes to sharing. Two studies examined how children (N = 185; age range = 4.0–6.9 years, M_{age} = 5.49 years; 45% White, 12% Asian, 11% Black, 7% Hispanic, 24% other or undisclosed) reconcile these conflicting preferences by investigating the relation between children's social preferences and resource allocations to White and Black children. Race provides an important case to examine how children resolve this conflict given that children show preferences for stereotypically high-status (White) people but also show awareness of systemic racial inequality that disadvantages Black people. In a costly sharing resource allocation task (i.e., Dictator Game) where participants were asked how much of a limited resource they wanted to share with a Black child and a White child, Study 1 revealed that participants sometimes chose to share more with a White child compared with a Black child but that biased giving was unrelated to children's biased feelings of warmth toward White children. Study 2 confirmed that biased giving was unrelated to children's feelings of warmth and instead implicated children's beliefs about race and wealth; children who expected White people to have more wealth showed more pro-White bias in their giving behavior. Together, these results suggest that cultural stereotypes about wealth might shape children's economic decision making in a way that perpetuates disadvantage,

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https://doi.org/10.1016/j.jecp.2021.105224

but they also indicate that the processes underlying resource allocation decisions warrant further study.

Introduction

From a young age, children are interested in fairness; for example, 6- to 12-month-old infants pay more visual attention to unfair resource allocation distributions than to fair ones (Ziv & Sommerville, 2017), and 15-month-olds engage in altruistic sharing (Schmidt & Sommerville, 2011). Despite the fact that children are interested in fairness, and often prefer when resources are shared equally (Fehr, Bernhard, & Rockenback, 2008; see Paulus & Essler, 2020, for a review), children themselves do not always behave in ways that are fair. There are a number of possible explanations for this biased behavior (e.g., Blake et al., 2015; Blake & Rand, 2010; Chernyak, Harris, & Cordes, 2018), including that across early childhood decisions about how to allocate resources come to be driven by a complex mix of factors, incorporating not just moral concerns (e.g., fairness) but also social concerns (e.g., group membership) (see Elenbaas, Rizzo, & Killen, 2020, for a brief overview of one relevant framework, the social reasoning developmental model).

In the United States, one prominent indicator of group membership is race. Children differentiate and categorize faces based on race during their first year of life (e.g., Kelly et al., 2007). During early childhood, children begin to view skin color as stable (Pauker, Ambady, & Apfelbaum, 2010; Rhodes & Gelman, 2009) and informative about group members' traits and behavior (Kinzler & Dautel, 2012; Mandalaywala, Ranger-Murdock, Amodio, & Rhodes, 2019). Around these same ages, children also begin to allocate more resources to White children than to Black children. For example, Zinser, Rich, and Bailey (1981) found that White preschool-aged children were more likely to share a resource (i.e., bubble gum) with a White child than with a Black child. More recently, Renno and Shutts (2015) found that a predominantly White sample of 3- to 5-year-old children allocated a greater number of resources (i.e., coins) to a White child than to a Black child. Although racial bias in resource allocation has been well documented, the reasons for this racial bias are less clear. Understanding the mechanisms underlying biased resource allocations is important because this information might help us to determine how to foster a desire to rectify inequality and reduce racial inequity. Here, we explored four factors that might contribute to the development of racial bias in resource allocation: in-group bias, racial attitudes, racial stereotypes about wealth, and racialized expectations of reciprocity.

In-group bias

Perhaps the simplest explanation for the racial bias in resource allocation observed in previous studies is that children were motivated by an in-group bias. In-group bias in resource allocation has been observed frequently across a variety of social domains, including gender (e.g., Renno & Shutts, 2015) and relationship status (e.g., family or friend bias; Moore, 2009; Olson & Spelke, 2008) and even with minimal group manipulations (Dunham, Baron, & Carey, 2011). There is some evidence that White children express in-group bias in their race-based allocation decisions as well. Both Zinser et al. (1981) and Renno and Shutts (2015) included exclusively or predominantly White samples of children in their studies, making it possible that White children's pro-White allocation bias could be explained by an appeal to in-group bias (i.e., that the White children in these samples gave more to members of their own group because they were generally biased to treat their own group more favorably). From a functional or evolutionary perspective, an in-group bias in resource allocation makes sense because it allows people to be prosocial (i.e., sharing resources) while ensuring that resources remain in one's own group (see Everett, Faber, & Crockett, 2015, for a theoretical review). If racial biases in resource allocation reflect in-group biases, then children's own racial or ethnic group membership should predict their giving behavior; however, because prior work in this area has

primarily included only White participants, whether this is the case cannot be determined from previous work.

Racial attitudes

Another possible related mechanism underlying racial bias in resource allocations could be that children rely on their feelings or attitudes toward particular social groups to make their decisions, giving to children from groups that they generally view more favorably (regardless of their own group membership). Thus, pro-White bias in resource allocation might be driven by general pro-White attitudes or preferences, which have sometimes been documented among racial/ethnic minority children as well as among White participants (Clark & Clark, 1947; Raabe & Beelmann, 2011). However, some existing data contradict this possibility. For example, Renno and Shutts (2015) found that although children gave more resources to the White child and also showed pro-White biases in their social preferences (measured separately), children's preferences were unrelated to their allocation decisions. In contrast, and confirming that the measures used were sensitive enough to find relations between general group-based preferences and allocation decisions in their study design, Renno and Shutts found that children's gender biases in giving behavior were related to their gender-based social preferences (e.g., participants who liked girls more than boys also gave more resources to girls than to boys). Thus, these findings indicate that children's biased giving might be motivated by different mechanisms across different social dimensions (in this case, gender vs. race) as well as that biased giving related to race likely involves mechanisms that extend beyond children's social preferences.

Racial stereotypes about wealth

One type of belief that might uniquely shape racial bias in resource allocation is the belief that White people are wealthier than Black people. In the United States, children as young as 3 years often view race as predictive of social status, expecting White people to have more wealth than Black people (Elenbaas & Killen, 2016; Mandalaywala, Tai, & Rhodes, 2020; Shutts, Brey, Dornbusch, Slywotzky, & Olson, 2016). The acquisition of racial stereotypes about wealth is particularly interesting because they could lead to pro-White *or* pro-Black bias in resource allocations, depending on children's motivations.[1] One possibility is that children could allocate more to people from the group they see as more resource rich (in this case, White children), perhaps out of a desire to perpetuate the status quo (Hussak & Cimpian, 2015). Alternatively, children could share more with people from groups they view as having fewer resources (in this case, Black children) out of a desire to rectify preexisting inequalities. Although older children do sometimes rectify inequalities in this way (Elenbaas, Rizzo, Cooley, & Killen, 2016; Olson, Dweck, Spelke, & Banaji, 2011; Rizzo & Killen, 2020), to our knowledge rectifying behavior has not been found in children under 7 years of age, making the latter possibility unlikely in the context of this age range.

Expectations of reciprocity

Another reason why beliefs about race and wealth might lead children to give more to White children could relate to expectations of reciprocity; for instance, children might give more to someone they perceive as being from a more resource-rich group (in this case, a White child) because they expect that person to have a greater ability to be able to share with them in the future. Consistent with

[1] Due to racial oppression and marginalization in the United States, there are pervasive differences in income and wealth between White and Black families (see Hamilton, Darity, Price, Sridharan, & Tippett, 2015). Here, we use the term *stereotype* because we are assessing children's tendency to use racial category membership to make inferences about individual people or families (i.e., our stimuli) in the absence of any information about those specific people or families (see Hamilton, 1981).

this possibility, when wealth information is explicitly provided, children as young as 4 years expect richer children to share more than poorer children (Ahl & Dunham, 2019; Ahl, Duong, & Dunham, 2019; see also Fishbein and Kaminski, 1985) and are generally more willing to share with those they expect will share with them in the future (Dunham et al., 2011; Kenward, Hellmer, Winter, & Eriksson, 2015; Renno & Shutts, 2015). Yet, whether children consider these concerns about reciprocity in resource allocation contexts involving race has rarely been examined. Renno and Shutts (2015) found that children's expectations of prosocial behavior in general (i.e., expectations about who would help if they had fallen down or who would share extra stickers with them) predicted greater resource allocation to prosocial children. However, no work has examined whether children's expectations of reciprocity vary across race and predict biases in resource allocations.

The current research

Here, we built on prior work to test whether any of the above factors underlies racial biases in children's resource allocation decisions. In Study 1, we focused on affective factors (including in-group bias and racial attitudes), asking first whether children show racial biases in their resource allocations and second whether these biases are explained by children's own in-group biases (in which case biased giving in favor of White children should be found only or predominantly in White participants) or by more general racial attitudes. In Study 2, we considered these factors again and also tested whether children allocate strategically—giving more to those they expect to reciprocate in the future or to those they view as wealthier. Across both studies, we used a first-party task to allow us to explore how children decide to share in a costly context, an experimental context that mimics the types of sharing decisions children make in their daily lives (Böhm & Buttelmann, 2017; McAuliffe & Dunham, 2017). In addition, we recruited a racially diverse sample of participants to allow us to investigate whether any patterns we observed were stronger in our White participants than in our racial/ethnic minority participants and thus whether patterns might be explicable by in-group bias. We focused on children aged 4–7 years because this is when race first begins to bias many aspects of children's beliefs and behavior (see Dunham & Degner, 2013), and we were interested in capturing whether any of these developing racial beliefs and attitudes might relate to racial bias in resource allocation.

Study 1

Method

Participants

A total of 96 4.0- to 6.9-year-old children were recruited and tested in-person at the Children's Museum of Manhattan in New York City. As per our preregistration, only participants who completed both blocks of the Dictator Game were included in the final analyses (N = 91; 51.6% female; M_{age} = 5.52 years). Participants' racial/ethnic background was determined by parental report and was as follows: 37.4% White, 16.5% Asian, 10.9% Black or African American, 4.4% Hispanic, 12.1% other, and 18.7% undisclosed. Previous work has found a moderate correlation between biased social preferences and biased resource allocations (e.g., Renno & Shutts, 2015: r = .40); using this effect size, we determined the need for approximately 80 participants to detect any relations between racial bias in attitudes and in resource allocation decisions.

All work described in this article was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) and with the approval of the institutional review board at New York University. Prior to collecting any data, informed consent was obtained from the parents or legal guardians of child participants and verbal assent was obtained from the children.

Materials and procedure

All tasks were run off a laptop using Testable (https://www.testable.org), an online study administration platform. All participants completed four types of measures: Dictator Games (to assess resource allocation decisions), categorization tasks (to assess whether participants grouped targets according to race),[2] feelings thermometers (to assess affective prejudice), and a group membership task (to assess participants' racial self-identification). Participants were videotaped to enable subsequent video coding of their responses during the Dictator Game. Stimuli were taken from the Children Affective Facial Expression (CAFE) dataset (LoBue, 2014; LoBue & Thrasher, 2015) and consisted of images of European American and African American children (based on parental report) aged 2–8 years making a neutral facial expression. Each stimulus face was presented only once during the study (e.g., if a face was presented in the Dictator Game, it was not presented in the Feelings Thermometer task). All stimuli were gender matched to the participant. Details about the exact stimuli (including the stimulus ID numbers from the CAFE dataset) used for each task can be found on the Open Science Framework (OSF; https://osf.io/utvf2). Authorized Databrary users can view stimuli and examples of the tasks (https://nyu.databrary.org/volume/568). All scripts and nonprotected materials can be viewed on the OSF (https://osf.io/fnx2h/). While children completed the study with the help of a trained experimenter, parents/guardians completed a demographics survey administered via Qualtrics.

Dictator game. To measure participants' race-based resource allocation decisions, we used a virtual version of the Dictator Game, a task that assesses economic decision making by asking individuals to make decisions about how much costly sharing to engage in (i.e., sharing in which there is a limited amount of resources and the amount given away is at a cost to participants). The Dictator Game is simple enough to provide a valid measure of altruistic behavior in children as young as 4 years (Benenson, Pascoe, & Radmore, 2007). In a typical Dictator Game (see Blake & Rand, 2010; Camerer, 2003), children are given a finite number of resources (e.g., 4 stickers) and two envelopes. Participants are then told that they can give as many of their stickers as they want to another child (who they do not know) by putting the stickers they want to give away in one of the envelopes. Any stickers that they do not choose to give to the other child they can keep for themselves by putting those stickers in the other envelope. Because children might feel compelled to share their stickers (even when they do not really want to), participants make their decision in private. The number of stickers that participants give away (i.e., 0, 1, 2, 3, or 4) is counted after participants complete the study and leave.

Our version of the Dictator Game included these same core components but was adapted to be administered on a computer (with the goal of creating a version that could be administered virtually and outside a traditional lab setting, which could be used in future work). Although a trained experimenter was present for the entire study session, all information that participants heard was conveyed through prerecorded audio and the experimenter's primary function was to redirect participants' attention to the study if their attention wandered. Participants in our study were told that they had possession of virtual resources (4 "awesome animal videos") and were shown an example video (i.e., an animal GIF that was layered with amusing music and sounds; Fig. 1A). Because most participants were too young to read or write, and because they completed the task on a computer and without being observed by the experimenter, they were unable to indicate their choices using the previous envelope method (i.e., they could not place the videos they wanted to give away in a physical envelope) or their words (i.e., they could not write or say that they wanted to keep or give away the videos). Therefore, participants were trained how to use gestures to indicate when they wanted to give away a video (by pointing at the computer that displayed an image of a child) and when they wanted to keep a video for themselves (by pointing to themselves). Prior to beginning the test trials, children were asked a series of comprehension questions to assess whether or not they understood the task, including (a) who the videos belonged to at the start of the trial (correct answer: the participating children, indicated by pointing at themselves or saying "me" out loud), (b) how to indicate that they wanted to

[2] As stated in our preregistration, we included a categorization task to ensure that children in our sample would attend to race when race was made visually salient. As expected, participants categorized child stimuli based on racial group membership 79.6% of the time. Data from the categorization tasks are not examined further in this article.

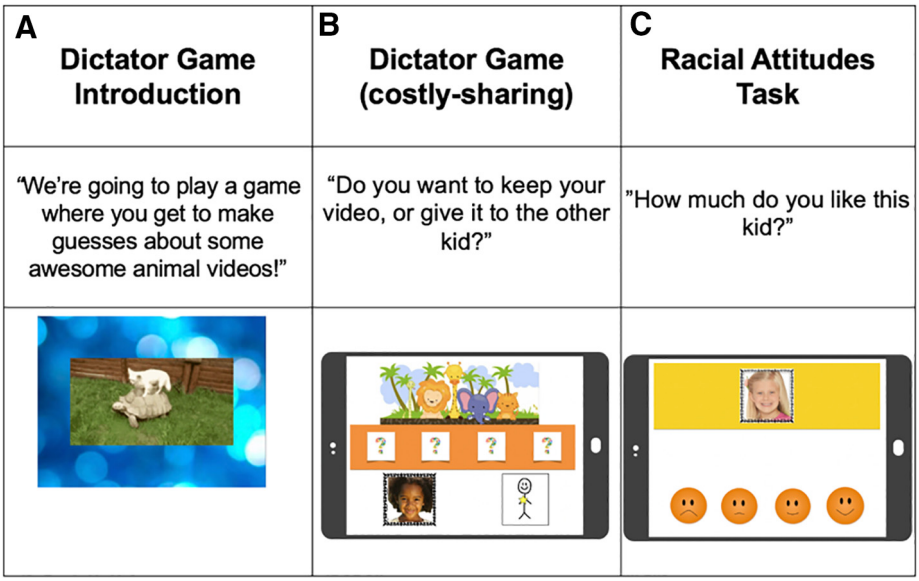

Fig. 1. Example images of each task included in Study 1. Actual child stimuli were taken from the CAFE dataset as described in the "Materials and procedure" section.

keep a video for themselves (correct answer: pointing at themselves), and (c) how to indicate that they wanted to give a video away (correct answer: pointing at the computer screen).

After testing participants' comprehension and ability to use these gestures, and providing corrective feedback to any incorrect responses and then asking the comprehension question again, participants completed two blocks of the Dictator Game. These blocks were identical except that the race of the child shown changed from Block 1 to Block 2; for example, if the child was a White boy or girl in Block 1, it would be a Black boy or girl in Block 2. At the start of the block, participants were reminded that they had 4 awesome animal videos and that they could keep or give away as many of these videos as they wanted. The experimenter then told participants that they and all other adults in the vicinity were going to close their eyes so that no one could see what participants decided to do. After the adults closed their eyes, a picture of the child who participants could allocate to came onto the screen, and participants heard "Here is the kid that you can give videos to" and saw a picture of a White or Black child (Fig. 1B). The picture of the child remained on the screen as participants made 4 allocation decisions (i.e., to give or keep a video) one at a time for each video resource (e.g., at the start of each trial, an icon representing a video would pop up on the screen and participants would be prompted with "Here is the first video. Point to the kid if you want to give them the video, or point to yourself if you want to keep the video," etc.). After completing Block 1 (completing 4 trials in which they decided to give or keep a video), participants saw a new awesome animal video and were then introduced to a new child and the task was repeated in Block 2.

Participants' responses in the Dictator Game were coded from video by two independent coders; agreement was generally quite high (κ = .89). However, when these two coders disagreed on a participant's decision, a third coder independently coded the participant's response. Individual trials within a block were excluded from analyses when two of the three coders could not agree on a participant's decision (e.g., the decision was not unambiguously "give" or "keep") or when a participant made no decision. The total number of unambiguous trials (1–4) was calculated for each participant for each block, and participants who did not provide at least one unambiguous response on Block 1 and Block 2 were excluded from analyses (n = 4). Most participants (96%) provided at least 3 usable trials for each child stimulus.

We determined the proportion of resources each participant gave to a White child (number of resources given to a White child/number of unambiguous Dictator Game trials for the White child stimulus) and the proportion of resources each participant gave to a Black child (number of resources given to a Black child/number of unambiguous Dictator Game trials for the Black child stimulus). Each of these proportions fell between 0 (no resources allocated) and 1 (all resources allocated). To assess the degree to which participants' economic decision making reflected any racial biases, we calculated a resource allocation bias score for each participant by subtracting the proportion of resources allocated to a Black child from the proportion of resources allocated to a White child:

$$\text{Resource allocation bias score} = \frac{\text{Number of resources given to the White child}}{\text{Number of unambiguous Dictator Game trials for the White child stimulus}} - \frac{\text{Number of resources given to the Black child}}{\text{Number of unambiguous Dictator Game trials for the Black child stimulus}}$$

A score of zero on this variable indicated equal giving to both White child and Black child stimuli (no bias), a positive score indicated that more resources were allocated to the White child stimulus (pro-White bias), and a negative score indicated that more resources were allocated to the Black child stimulus (pro-Black bias).

Racial attitudes task. To assess participants' affect toward different racial groups, participants completed 4 trials of a feelings thermometer (e.g., Mandalaywala et al., 2019, adapted from Amodio & Devine, 2006), twice with a picture of a White child and twice with a picture of a Black child. For each picture of a child, participants were asked to indicate how much they liked that child on a 4-point scale from *really not like* (big frowny face, scored 1) to *really like* (big smiley face, scored 4) (Fig. 1C). Pictures of the stimulus children were presented in a randomized order. We calculated a racial attitudes bias score by averaging average warmth scores for White children and for Black children separately and then subtracting warmth toward Black children from warmth toward White children. A positive value indicated more warmth toward White children, a negative value indicated more warmth toward Black children, and a value of zero indicated no differences.

Group membership. Finally, to begin to understand how participants viewed their own racial/ethnic group membership, at least when based on broad phenotypic markers (e.g., based on images of White, Black, Asian, and Hispanic children that were presented in the absence of any verbal racial/ethnic labels), participants completed a group membership task. Participants were presented with four children of different racial/ethnic backgrounds (White, Black, Asian, and Hispanic, based on parent report in the CAFE dataset), and were asked to indicate which one was "most like you." Participants could refrain from answering the question if they felt that none of the stimuli was representative of them, but experimenters encouraged participants to "make your best guess." It is worth noting that because of how this task was designed, it is impossible to know whether children were using racial/ethnic categories to make their decisions (e.g., viewing each image as an exemplar of a racial category and selecting the category exemplar that matches beliefs about their own racial identity) or whether children were engaging in something closer to phenotype matching (e.g., deciding which picture most closely resembled them physically based on skin color and/or physiognomy irrespective of racial category membership). This question was outside the bounds of this study, but for the purposes of reporting these results we refer to children's response on this task as their self-reported racial group identity.

All but 3 participants completed this question (n = 88), with 25% of participants self-identifying as White, 13% as Black, 28% as Asian, and 34% as Hispanic. Because our goal was to understand whether in-group bias might explain biased resource allocations, and because we were insufficiently powered to be able to examine this question in our Black participants (given the small number of participants who self-identified, or were identified by their parents, as Black), we examined whether allocation decisions of racial/ethnic minority participants (grouped together) differed from allocation decisions of White participants.

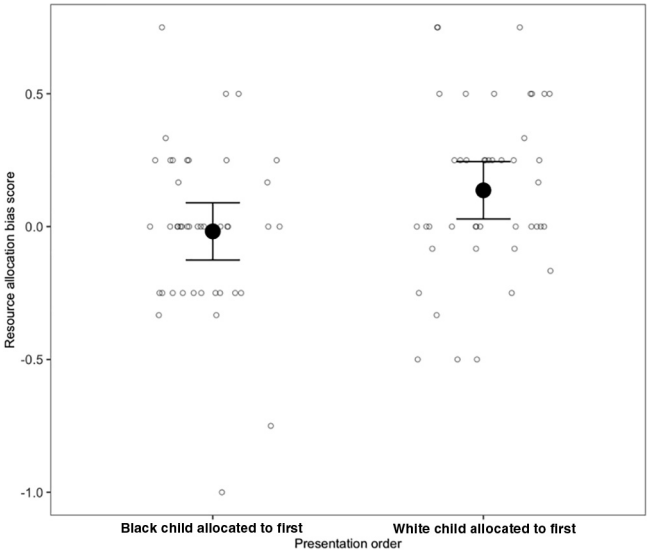

Fig. 2. Resource allocation bias scores as a function of presentation order in Study 1. Large circles represent the means for the groups, and error bars represent 97.5% confidence intervals around the means. Small circles represent individual participants.

Data analysis

Data were analyzed in R (Version 3.6.3) using the lme4 package (Bates, Mächler, Bolker, & Walker, 2015). In a preliminary model, we found that presentation order affected participants' resource allocation bias score (e.g., whether participants allocated different amounts of resources to White and Black children; see Fig. 2). Therefore, for all subsequent models where resource allocation bias score was the outcome variable, we used mixed-effects models with an *lmer* function and included a random intercept for presentation order in the Dictator Game to account for this order effect. Throughout, we report parameter estimates and confidence intervals (CIs) for mixed-effects models. To correct for multiple analyses, we employed a more stringent 97.5% CI and considered any CI not including zero to be a significant effect; for p values for linear regression models, we applied a Bonferroni correction and considered any $p < .025$ to be significant. To examine whether participants' allocation decisions were driven by their racial attitudes, we examined the main and interactive effects of the racial attitude bias score and age (both mean centered) on resource allocation bias scores. Next, to examine whether allocation decisions could be explained by in-group bias (in which case biases in favor of giving to the White child should be found primarily among White participants), we examined whether resource allocation bias scores differed by participants' racial/ethnic background (dummy coded: White participants = 1 vs. racial/ethnic minority participants = 0) and whether this changed with age (mean centered). We ran two separate in-group bias models, one using parental report of race (n = 74; White n = 34, racial/ethnic minority n = 40) and one using child self-report of racial group membership (n = 88; White n = 22, racial/ethnic minority n = 66). For 45 of our participants, child and parent reports of race matched; for 29 of our participants, child and parent reports did not match (see Table 1).

Deviations from the preregistration. First, instead of assessing children's mean allocation decisions toward Black and White child stimuli in a within-participant repeated-measures fashion, as described in the preregistration, we decided to conduct our analyses using participants' resource allocation bias scores. We made this change because this approach allowed us to account for individual variation in children's baseline tendencies to give resources (a more critical issue in Study 2). Second, to examine whether an in-group preference explained bias in allocation decisions, we ran two additional analyses to explore whether pro-White biases in allocation were limited to White participants; in the

Table 1
Description of child and caregiver racial category decisions.

	White category	Black category	Asian category	Hispanic category
Child and caregiver selected the same racial categories	13	6	13	13
Child and caregiver selected different racial categories	6	4	7	12

preregistration, these were indicated as secondary exploratory analyses. The preregistration, data, and analytic code can be found on the OSF (https://osf.io/2tsr4).

Results

Do children allocate resources on the basis of race?

Overall, children were more likely to allocate resources to a picture of a White child (proportion of resources allocated to a White child: $M = .41$, $SE = .03$) than to a picture of a Black child (proportion of resources allocated to a Black child: $M = .34$, $SE = .03$), $t(90) = 2.01$, $p = .048$. However, children's race-based allocations varied depending on whether children allocated resources to the White child or the Black child first (main effect of presentation order: $\beta = -0.16$, $SE = 0.067$, $z = -2.32$, $p = .023$) (Fig. 2). In particular, when children were presented with the picture of the White child first, they gave more to the White child than to the Black child ($M_{\text{bias score}} = .14$, $SE = .05$), whereas when they were presented with the picture of the Black child first, responses did not vary by picture race ($M_{\text{bias score}} = -.02$, $SE = .05$) (see Fig. 2). There were no main or interactive effects of age, suggesting no age-related changes in allocation biases in this sample of participants (all *p*s where age was included >.10).

What predicts children's resource allocation decisions?

Racial attitudes

Overall, participants felt more warmly toward White children ($M = 3.07$, $SE = 0.08$) than toward Black children ($M = 2.69$, $SE = 0.09$), $t(87) = -3.60$, $p < .001$. To examine whether this bias to feel more warmly toward White children as compared with Black children was driven by White participants (and thus is explicable by in-group bias), we tested whether this bias was predicted by participant group membership (both parentally identified membership and self-identified membership in two separate models). Neither parentally identified membership nor self-identified membership predicted racial attitudes bias score, a pattern that did not change across age (all *p*s > .10).

Although participants felt more warmly overall toward White children than toward Black children, their allocation decisions could not be explained by bias in racial attitudes. In a model including racial attitudes bias score and participant age, there were no main or interactive effects of any predictors on children's giving behavior (all 97.5% CIs included zero[3]).

In-group bias

Children's allocation decisions could not be explained by in-group bias. Contrary to the possibility that the overall tendency to give more to pictures of White children than to pictures of Black children was driven by a tendency of White participants themselves to give more to their own group, there were no main or interactive effects of group membership (either parent identification or self-identification) and age on resource allocation bias score (all 97.5% CIs included zero).

[3] To examine whether the racial attitudes bias score might affect resource allocation decisions differently among White participants versus racial/ethnic minority participants, we ran a model including the main and interactive effects of racial attitude bias, group identification (including either parent identification or self-identification in separate models), and age. There were no main or interactive effects in either of these models (all 97.5% CIs included zero).

Discussion

The goal of Study 1 was to better understand, across a diverse sample of participants, how race factors into children's resource allocation decisions using a new iteration of the Dictator Game that uses a virtual currency (animal GIFs) rather than a physical one (stickers). Using this new task, children allocated resources similarly to previous Dictator Game studies; in previous work, 3- to 6-year-old children have tended to share 40% of a preferred sticker type and 50% of a less preferred sticker type with others (Blake & Rand, 2010). Here, children allocated about 34% to 40% of their virtual resource, suggesting that children found this new resource to be desirable and also suggesting that this version of the Dictator Game task elicits giving at comparable rates to previous work using physical resources.

Central to our primary research question, we found that race can affect how children choose to allocate a finite set of resources, but only under certain circumstances. When children allocated resources to a White child first (and a Black child second), children allocated more to the White child than to the Black child. In contrast, when children allocated resources to a Black child first (and a White child second), children allocated approximately equal numbers of resources to both children. Although some children engaged in biased resource allocation, this study does not explain why children exhibited biased behavior given that neither racial attitudes nor in-group bias explained children's biased giving. This pattern is consistent with previous work finding no relation between racial attitudes and allocation decisions (Renno & Shutts, 2015) even though our measure of resource allocation was different in important ways (e.g., being costly allocations rather than third-party allocations). In addition, biased allocation behavior could not be attributed to in-group bias given that biased giving was not stronger or more evident among White children in this sample.

Although we do not have any data to speak directly to *why* children allocated in a distinct manner depending on the order in which they received the stimuli in the Dictator Game, this effect might present some hints about how children made their decisions. In particular, this effect raises the possibility that children engaged in *two* types of processes when deciding how to allocate resources. Children's first decision (i.e., deciding how many resources to give to the first child) could have been made without consideration of the recipient's race or to the relation between the two recipients at all (because only one recipient was known at this time); thus, participants allocated the maximum number of resources they felt comfortable allocating. In contrast, children's second decision *was* relational and thus could have been sensitive to the race of the pictured child. To illustrate, consider participants who allocated to a Black child first. When these participants saw the Black child in the first block, they allocated the maximum number of resources they felt comfortable sharing. Then, when these participants subsequently saw the White child in the second block, they allocated approximately the same number of resources. Now, consider participants who allocated to a White child first. When these participants saw the White child in the first block, they allocated the maximum number of resources they felt comfortable sharing. Then, when these participants subsequently saw the Black child in the second block, they allocated relatively fewer resources.

Why might children share fewer resources with a Black child, but only after sharing resources with a White child? It cannot simply be that the Black child was presented in the second block given that we did not observe a comparable decrease in sharing behavior when the White child was allocated to in the second block. One plausible explanation is that children factored racial stereotypes about wealth into their decision making, but only when race was made salient. If Black children are stereotyped as being materially disadvantaged, and thus unlikely to be able to reciprocate in some hypothetical future exchange, children might be relatively less likely to share with a Black child than with a White child when making that second race-conscious decision. In contrast, when children were faced with a picture of a White child second, factoring the picture's race into their decision led children to allocate maximally again, perhaps because they expected the White child to have ample resources and thus to be able to reciprocate sharing in the future.

To explore these possibilities, we conducted a second study that examined how children's resource allocation decisions were affected by (a) the race of the stimulus child, (b) expectations of reciprocity from hypothetical White or Black children, (c) racial stereotypes about wealth, and (d) racial attitudes (with this last variable included to test for replication of the null result from Study 1). In addition, we modified the tasks so that children could complete the entire study independently on a tablet.

Although in Study 1 the experimenter looked away from children while children made their decisions in the Dictator Game, it is possible that the mere presence of an experimenter could have affected children's allocation decisions. Creating a tablet-based study that could be completed independently by children allowed us to minimize the extent to which children might be affected by concerns of social desirability, which might reduce children's motivation to do the socially acceptable action and share equally. Finally, to better understand the potential relational and race-conscious processes underlying children's allocation decisions, we modified the Dictator Game to give children more information, and perhaps make race more salient, from the start. In particular, we showed children both of the pictures of children they would be allocating resources to at the start (Fig. 3A) and only then counterbalanced the order in which they completed the Dictator Game. In this way, children could plan ahead and decide to allocate evenly or in a biased manner regardless of who they allocated to first.

Study 2

Method

Participants

A total of 96 4.0- to 6.9-year-old children (51.1% female; M_{age} = 5.46 years) were recruited and tested in-person at the Children's Museum of Manhattan in New York City to participate in a 15-min tablet activity. As per our preregistration, only participants who made at least one allocation decision on each block of the Dictator Game were included in the final analyses (N = 94). The racial/ethnic breakdown of the sample was as follows: 53.1% White, 11.4% Black or African American, 10.4% multiracial, 8.3% Asian, and 6.2% undisclosed. Overall, 10.4% of participants reported themselves as being of Hispanic, Latino, or Spanish origin. We again calculated sample size as in Study 1. As part of this sample, we attempted to collect data from a group that included approximately 40 children from racial/ethnic minority groups in order to once again test whether giving behavior varied by children's own racial/ethnic group memberships (in particular, whether we replicated the finding from Study 1 where biased giving was *not* unique to White children in the sample).

Materials and procedure

The full study protocol for Study 2 is available on the OSF (https://osf.io/fnx2h/); authorized users of Databrary can view an example test session (https://nyu.databrary.org/volume/831). This study was conducted on a tablet computer that allowed children to indicate their response by selecting their choice on the touchscreen. A single researcher guided participants through the initial training phase of the study protocol and then moved away from children and the tablet device to allow all tasks to be completed by children alone. Participants wore headphones that provided verbal instructions on how to guide themselves independently through each task. Prior to beginning the study, each participant was given a gold star that matched the gold star on the stick figure image being used to represent the participant on the screen. All participants completed each task in the order described below. Participants were randomly assigned to one of two conditions that differed only in the order that the Black and White recipient children were allocated to (i.e., participants allocated to a Black child *or* to a White child first). As before, stimuli were taken from the CAFE dataset, and each stimulus face was presented only once. Details about the exact stimuli (including the stimulus ID numbers from the CAFE dataset) used for each task can be found on the OSF (https://osf.io/utvf2).

Dictator game. As in Study 1, participants completed two rounds of a virtual Dictator Game, one with a White child as the social partner and one with a Black child as the social partner, where they were given the opportunity to make decisions about how many of the 4 individual resources (i.e., funny animal videos) they would share in each round. In contrast to Study 1, here the participants were shown pictures of both child stimuli they would be allocating to before making any allocation decisions. Prior to beginning the test trials, children were asked a series of comprehension questions to assess whether or not they understood the task, including (a) who the videos belonged to at the start of the trial (correct answer: the participating children), (b) where to click if they want to keep the video for them-

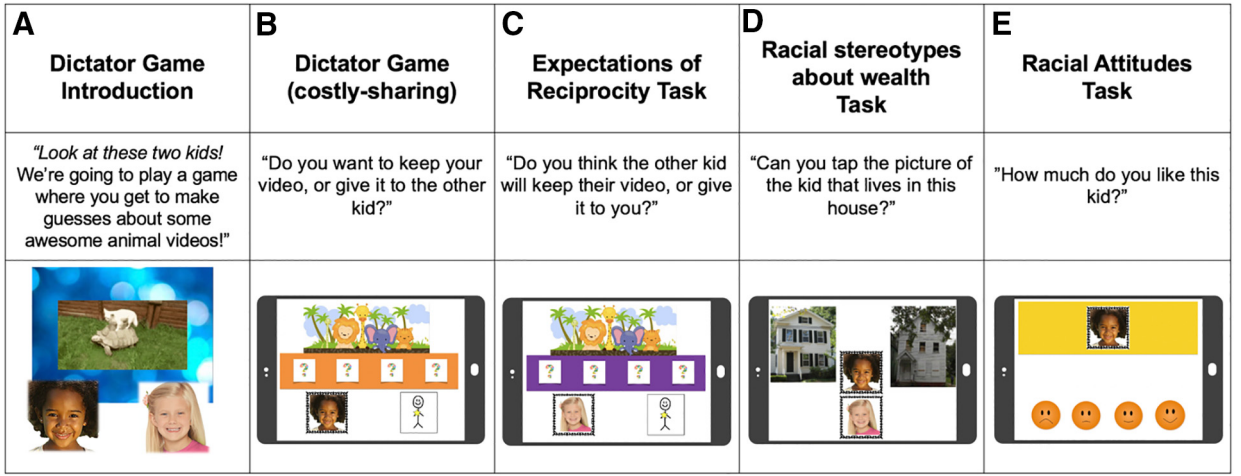

Fig. 3. Example images of each task included in Study 2. Actual child stimuli were taken from the CAFE dataset as described in the "Materials and procedure" section in Study 1. For the racial stereotypes about wealth task, children made a decision about who lived in each house independently; that is, the house currently pictured on the left side of the screen would be animated to jiggle, and participants would guess which child lived in that house.

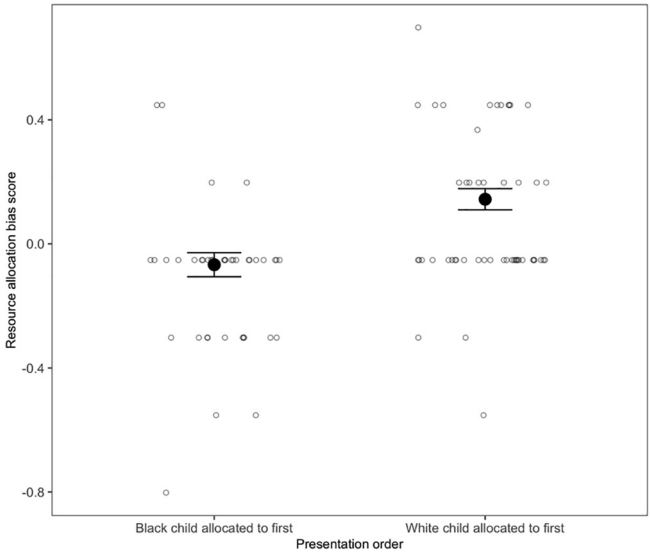

Fig. 4. Resource allocation bias scores as a function of presentation order in Study 2. Large circles represent the means for the groups, and error bars represent 97.5% confidence intervals around the means. Small circles represent individual participants.

selves (correct answer: the stick figure marked with a star, which represented the participant on the screen), and (c) where to click if they wanted to give the video away (correct answer: the picture of the other child) (Fig. 3B). Participants responded with 100% accuracy on these comprehension checks, indicating that they understood the task instructions and the narrative. During the Dictator Game, children occasionally skipped trials; however, participants made 3.85 decisions (out of 4 possible) on average for each block of the Dictator Game. As in Study 1, we created a resource allocation bias score to use in analyses.

Reciprocity task. To assess children's expectations of reciprocity, participants played a game where they were asked to predict how many resources they thought another child would share with them. Prior to beginning the reciprocity task, participants were guided through a training phase and a series of comprehension checks to ensure that they understood that the videos were now in possession of the other child, similar to those for the Dictator Game. In particular, children were asked to indicate where they would click if they thought the other child would keep the video for himself or herself and where they would click if they thought the other child would share the video with them. Participants responded with 100% accuracy on these comprehension questions, suggesting that they understood the scenario and task instructions. Participants completed two blocks of test trials, one with a White child and one with a Black child, where they were given the opportunity to make decisions about 4 individual resources in each block (Fig. 3C). The order in which the White child and the Black child were presented on the reciprocity task was matched with the presentation order in the Dictator Game. On average, participants made 3.47 expectation of reciprocity decisions for each block. We created an expectation of reciprocity bias score that followed the same logic as our resource allocation bias score (e.g., a positive value indicated greater expectation of reciprocity from a White child, a negative value indicated greater expectation of reciprocity from a Black child, and a value of zero indicated equal expectations of reciprocity from both White and Black children).

Racial stereotypes about wealth task. Participants were shown images of a White child and a Black child, as well as images of a relatively expensive-looking house and of a relatively less expensive-looking house, and were asked to predict which kid lived in each house (Olson, Shutts, Kinzler, &

Weisman, 2012) (Fig. 3D). This task assessed whether children use racial cues to make predictions about whether someone is relatively wealthy and whether they do so in a stereotypical manner. Predicting that the White child lived in the relatively more expensive-looking house, and that the Black child lived in the relatively less expensive-looking house was considered an expression of a race–wealth stereotype and was coded as 1, whereas the inverse prediction was coded as 0.

Racial attitudes task. As in Study 1, participants were administered feelings thermometers asking them to indicate the extent to which they liked each of four children presented in photographs (Fig. 3E). Participants were shown two White children and two Black children in a randomized order, and a racial attitudes bias score was calculated as in Study 1.

Data analysis

Data were again analyzed in R using the lme4 package, using mixed-effects models with an *lmer* function because our preliminary model revealed that, as in Study 1, presentation order affected resource allocation in the Dictator Game (see Figs. 2 and 4). Therefore, we included a random intercept for presentation order in the Dictator Game in all models where resource allocation bias score was the outcome variable.

We examined each predictor in its own model (e.g., expectations of reciprocity and racial stereotypes about wealth were not included as predictors in the same model). Continuous predictor variables were mean centered (expectation of reciprocity bias score and racial attitudes bias score), categorical predictor variables were dummy coded (for racial stereotypes about wealth: 1 expresses a racial stereotype about wealth, 0 does not express a stereotype; for in-group bias: 1 represents White participants, 0 represents racial/ethnic minority participants), and each of these models included mean-centered age to explore whether there were age-related changes in participants' allocation decisions and whether the effects of each predictor changed across development (e.g., main and interactive effects of each predictor and age). Children did not complete a group membership task in Study 2; therefore, we used parental report of group membership as the in-group bias predictor (N = 87; White n = 49, racial/ethnic minority n = 38). Analyses examining the interaction of various predictors can be found in the online supplementary material; none of these supplemental analyses alters the interpretation of results presented in the main text. Throughout, we report parameter estimates and CIs for mixed-effects models. To correct for multiple analyses, we employed a more stringent 97.5% CI criterion and considered any 97.5% CI not including zero to be a significant effect; for p values for linear regression models, we applied a Bonferroni correction and considered any $p < .016$ to be significant.

Deviations from preregistration

As in Study 1, instead of assessing children's mean allocation decisions toward Black and White stimuli, we used a bias score variable because we realized that this approach would allow us to account for individual variation in children's baseline tendencies to give or expect to receive certain numbers of resources. The preregistration, data, and analytic code can be found on the OSF (https://osf.io/cxjnu).

Results

Do children allocate resources on the basis of race?

As in Study 1, children gave more resources on average to a White child (proportion of resources allocated to a White child: M = .42, SE = .03) compared with a Black child (proportion of resources allocated to a Black child: M = .37, SE = .03), indicating a pro-White allocation bias in children's overall giving behaviors, $t(93) = 1.95$, $p = .05$. Also as in Study 1, children's allocation decisions were influenced by the order in which children made their decisions (main effect of presentation order: $\beta = -0.21$, $SE = 0.05$, $z = -4.08$, $p < .001$) (Fig. 4); participants who were asked to make decisions about a White child first exhibited more pro-White bias in their allocation decisions ($M_{\text{bias score}}$ = .14,

SE = .03) compared with those who were asked to make decisions about a Black child first ($M_{\text{bias score}}$ = −.07, *SE* = .04). We found no age-related changes in these patterns (p = .47).[4]

What predicts children's resource allocation decisions?

Expectations of reciprocity. Overall, children expected to receive resources from a White child (proportion of resources expected from a White child: M = .59, *SE* = .03) and from a Black child (proportion of resources expected from a Black child: M = .57, *SE* = .04) at approximately equal rates, $t(83) = 0.57$, p = .57, and bias scores on these items did not vary by presentation order or participant age (all ps > .19). Children's expectations of reciprocity did not predict their allocation decisions in the Dictator Game, and there was no interaction of expectation of reciprocity and age on giving behavior (all 97.5% CIs include zero).

Stereotypes about race and wealth. Nearly two thirds (64%; n = 50) of participants expressed a racial stereotype about wealth (i.e., predicting that the White child lived in the relatively more expensive-looking house and that the Black child lived in the relatively less expensive-looking house), whereas 36% (n = 28) made counterstereotypical predictions (i.e., predicting that the White child lived in the relatively less expensive-looking house and the Black child lived in the relatively more expensive-looking house). A binomial test indicated that more children expressed this stereotype than would be expected by chance (p = .017). Children who thought the White child lived in the relatively more expensive-looking house showed more pro-White bias in their sharing decisions in the Dictator Game than participants who thought the Black child lived in the relatively more expensive-looking house (main effect of stereotype expression on giving behavior: β = 0.12, *SE* = .05, t = 2.25, 97.5% CI [0.001, 0.23]) (Fig. 5). This pattern did not interact with age (both 97.5% CIs with age included zero).[5]

Racial attitudes. Overall, participants felt more warmly toward White children (M = 2.90, *SE* = .10) than toward Black children (M = 2.51, *SE* = .11), $t(79) = 3.00$, p = .004. This pro-White bias in attitudes was not predicted by participant group membership and thus could not be explained by in-group bias (p > .10), and bias did not significantly strengthen with age (p = .048). As in Study 1, children's allocation decisions could not be explained by bias in racial attitudes. In a model including racial attitudes bias score and participant age, there were no main or interactive effects of racial attitudes bias score and no interaction with age (all 97.5% CIs included zero).

In-group bias. As in Study 1, we found no difference in resource allocation bias scores between White and racial/ethnic minority participants, a pattern that did not change with age (all 97.5% CIs included zero).

Discussion

In this study, we replicated our findings from Study 1; we again found a pro-White bias in resource allocation decisions that was affected by characteristics of the study design (i.e., the order in which the child stimuli were presented). As in Study 1, children behaved comparably on this new tablet-based iteration of the Dictator Game as in previous methods (e.g., Blake & Rand, 2010), sharing similar proportions of resources overall. We also replicated our null effects from Study 1; the pro-White bias in resource allocation was not predicted by the pro-White bias in racial attitudes, and biased allocation could not be explained by in-group bias. These findings replicate work from others (i.e., Renno & Shutts, 2015) and suggest that childhood biases in resource allocation are not grounded in affective

[4] Although we found no effect of age on resource allocation behavior here, in subsequent models (where other predictors are included) we sometimes found evidence of age-related changes in allocation behavior (controlling for these other predictors). In particular, in the model including racial attitudes as a predictor, we found an age-related decrease in pro-White allocation bias (main effect of age: β = −0.10, *SE* = 0.03, t = −2.91, 97.5% CI [−0.174, −0.023]). Because age was inconsistently related to biased resource allocation across all models, we encourage cautious interpretation of any age-related results.

[5] When both racial stereotypes about wealth and expectations of reciprocity were included in a single model, we found only the same main effect of racial stereotypes presented here. Full model results are available in the online supplementary material.

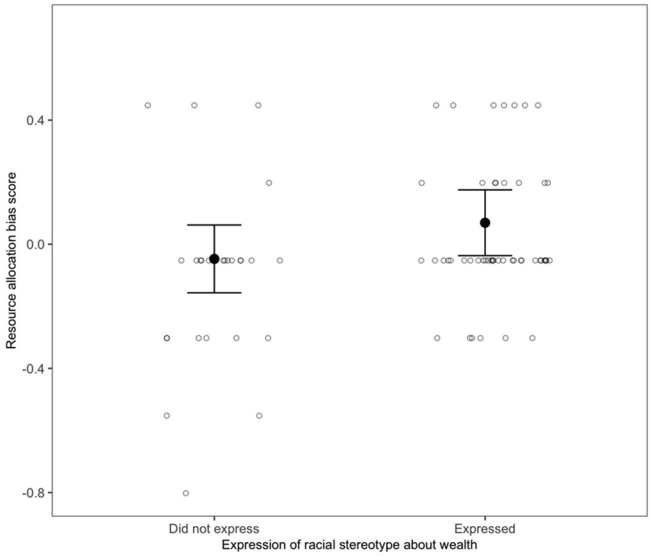

Fig. 5. Resource allocation bias scores as a function of the expression of racial stereotypes about wealth in Study 2. Large circles represent the means for the groups, and error bars represent 97.5% confidence intervals around the means. Small circles represent individual participants.

processes but rather might indicate more strategic economic decision making. Supporting that possibility, we found that pro-White bias in children's resource allocation was predicted by the expression of racial stereotypes about wealth. As in previous work (Elenbaas & Killen, 2016; Mandalaywala et al., 2020; Olson et al., 2012; Shutts et al., 2016), the majority of children in our sample expressed racial stereotypes about wealth. Children who expressed the view that White children live in relatively more expensive-looking houses than Black children allocated a greater number of resources to the White child than to the Black child, a pattern that did not change across development. This shows that by 4 years of age, children are already thinking strategically about who to share with and are choosing to selectively engage in costly sharing with those they consider to be part of a stereotypically wealthier group.

Given the relation between pro-White allocation biases and racial stereotypes about wealth, we might have expected to find that children's pro-White allocation bias was also predicted by their expectations of reciprocity, with those who expected greater reciprocity from a White child also choosing to share more with a White child. However, we found no evidence for this. In addition, we found no relation between children's racial stereotypes about wealth and their expectations of reciprocity (see supplementary material for full analysis details). The disconnect between expectations of reciprocity and racial stereotypes about wealth suggests that children might not have been using racial stereotypes to make guesses about expected reciprocity. Why this is the case is a bit of a puzzle. One alternate explanation for children's responses on the reciprocity task is that children's reciprocity decisions were motivated by their own idealized desires rather than by their beliefs about the most likely outcome. In this case, participants might have *wanted* these hypothetical children to share with them, and this desire overwhelmed expression of the belief that Black and White children—by virtue of racial stereotypes about wealth—might not be able to share at similar rates. Regardless of the precise factor underlying this disconnect, our findings illustrate that awareness of societal stereotypes about wealth might affect some behaviors (e.g., how much each child chooses to share with White and Black children) while not affecting others (e.g., children's explicit inferences about the likely sharing behavior of others).

General discussion

Across two studies, children's resource allocation decisions were biased by race; on average, children allocated more resources to White children than to Black children (particularly when they made decisions about White children before making decisions about Black children). We found no evidence that biased giving was related to in-group biases (at least among White participants, given that biased giving was not more common among the White participants in our sample) or by affective racial biases (given that biased giving was unrelated to biases in how warmly children felt toward members of each group among all participants in our sample). We also found no evidence that children were thinking in a purely strategic manner by sharing only with those who they expected to share with them in the future (given that biased giving was unrelated to expectations of reciprocity). However, children's racial stereotypes about wealth were indeed related to biases in their allocations; children who expected White children to live in relatively more expensive-looking houses than Black children allocated resources in a biased manner that favored the person from the group they viewed as having more wealth. In contrast, children who did not respond to the wealth stereotype task in this manner showed unbiased allocations. The result adds to the broader literature examining the development of children's stereotypes about wealth and status, which has predominantly explored whether children manifest pro-wealth preferences in their attitudes and affiliation decisions (e.g., Horwitz et al., 2014; Li et al., 2014; Shutts et al., 2016). Here, we expanded that work to demonstrate that children who express racial stereotypes about wealth also prefer to share more with White children. Moreover, considering the pattern of results across our measures in Study 2, especially the disconnect between racial stereotypes and racialized expectations of reciprocity, these findings indicate that children who have race-related expectations about wealth might give more to members of a resource-rich group out of a general abstract desire to maintain the status quo rather than because of strategic beliefs about the potential reciprocity of particular members.

More generally, these studies illustrate the complexity of children's economic decision making and, together with previous work (e.g., Renno & Shutts, 2015), suggest that even young children incorporate a wide variety of information, beliefs, and attitudes into their resource allocation decisions. As illustrated here, many of the factors we might expect to be most closely related to children's economic decision making were not. In particular, it is worth considering the general implications of the finding, across two studies here as well as in Renno and Shutts (2015), that children's resource allocation behavior was *not* predicted by their racial attitudes. The lack of relation between these two dimensions of bias (attitudes vs. behaviors) illustrates the disconnect between indicators of bias often seen in adults (see Tropp & Pettigrew, 2005) and sometimes observed in children as well (including developmental work using a novel groups context where children exhibited biased resource allocation while not demonstrating affective bias; Rhodes, Leslie, Saunders, Dunham, & Cimpian, 2018).

Although secondary to our primary goal of understanding the cognitive mechanisms underlying racial bias in resource allocation, we presented several additional findings that might shed light more broadly on how children incorporate race into their beliefs and behaviors.

First, across both studies we found an effect of presentation order (i.e., allocating to the White child or the Black child first) on resource allocations. This is especially curious in Study 2, where we showed participants, prior to making any decisions, both children they would be sharing with. Why did children continue to show pro-White resource allocation bias only when allocating to the White child first even when they knew in advance who both recipients would be? One possibility is that although children had relevant information prior to the task, they lacked the executive function or memory capacities to use this information during the task itself. It is also possible that a brief look at stimuli that varied in race—without explicit verbal labeling of their racial group memberships—did not make race salient in participants' minds and that it was only during the task itself that children began to attend to race (see Weisman, Johnson, & Shutts, 2015, for evidence that children at these ages do not spontaneously attend to racial information). Future studies should explore these questions by varying the salience of race prior to the task or by keeping both stimuli visually accessible during the task to reduce memory or planning demands. In addition, it would be interesting in future work to test how children's giving behavior, as well as the effect of presentation order on any biases in their giving

behavior, varies across children with levels of different experiences with racial diversity. Because there are reasons to expect that study and task characteristics might affect children's decisions, we find it especially interesting that rates of resource allocation found here were similar to rates found in previous work (e.g., Blake & Rand, 2010). Not only did the resource used differ from previous studies (being a digital resource rather than a physical resource), but the way in which children made their decisions differed as well (making a series of decisions about each individual resource rather than making a single decision about a group of resources). Children's similar performance across these different versions of a resource allocation task are echoed in recent work examining resource allocation in a novel groups context (see Leshin, Leslie, & Rhodes, 2021; Rhodes et al., 2018).

Second, it was surprising that we did not observe an enhanced pro-White sharing bias among the White children in our sample (given that biased giving did not vary by participants' racial/ethnic background). One possibility is that White participants in this sample were particularly concerned about social desirability and that this concern mitigated any general effects of in-group bias in this context. This is congruent with recent evidence that children as young as 6 years sometimes avoid explicitly responding in line with racial stereotypes about wealth, although they still demonstrate stereotype awareness when assessed with more implicit measures (e.g., reaction time based; Tai, Mandalaywala, & Rhodes, 2016). The lack of pro-White bias, and a potential concern with appearing in a socially desirable light, is a particularly compelling explanation when we consider that this study was administered in a large, urban, progressive city. Parents and guardians at our testing site often lean liberal and highly educated (e.g., in this dataset, approximately 60% of families identified as liberal and 89% of our families had at least one parent/guardian with a college degree). Among adults, both liberalism and higher education are associated with increased social desirability concerns (e.g., Janus, 2010); thus, it is possible that these concerns influenced children's responses in this context as well. The role of social desirability and reputational concerns in children's race-based giving behavior will need to be considered directly in future work, especially because in the current studies we attempted to mitigate social desirability concerns across all trials by having children give their responses in private.

There is clearly much work needed to be done to better understand the development of young children's economic decision making in the domain of race, especially in clarifying how abstract beliefs, such as racial stereotypes, translate into concrete behavior. This piece of the puzzle is especially important because beliefs, attitudes, and economic tendencies during childhood are likely to lay the foundation for beliefs, attitudes, and economic tendencies during adulthood. Here, we focused on children aged 4–7 years because this is when race first begins to bias many aspects of children's beliefs and behavior (see Dunham & Degner, 2013). In the current study, we generally did not find changes across this age range, although it is possible that we did not have adequate statistical power to detect effects of how age might interact with the various mechanisms considered here. Thus, future work should examine possible developmental changes in the mechanisms underlying children's group-based giving behavior in more detail. Older children begin to take into account a host of economic factors—such as the number of resources an individual starts off with—when making allocation decisions, shifting their goal from equality to equity and reducing the extent to which in-group favoritism affects allocations (Elenbaas et al., 2016; Olson et al., 2011). For example, although 3- to 5-year-old children view unequal allocations as unfair only when they disadvantage their own in-group (Blake et al., 2015), by 10 or 11 years of age children view allocations that perpetuate existing inequality as unfair and attempt to rectify them even when those allocations advantage the in-group (Elenbaas et al., 2016). Moreover, because children reason differently about sharing luxury resources as compared with necessary resources (e.g., Rizzo, Elenbaas, Cooley, & Killen, 2016), future work should explore how children's costly, race-based resource allocation varies across different resource types, where there might be real consequences in refusing to share.

Children also develop a host of other sociocognitive capacities at these ages, including the ability to reason in essentialist terms about a wide range of social domains (Gelman, 2003; Rhodes & Mandalaywala, 2017). These types of essentialist beliefs have only rarely been studied in relation to resource allocation, but one recent study using a novel groups paradigm found that children who expressed essentialist beliefs about a novel group were less inclined to share resources with that group, although their general attitudes toward the essentialized group remained unaffected

(Rhodes et al., 2018). Examining how other early-emerging facets of social cognition—especially about real-world groups—affects children's resource allocation decisions will help us to incorporate additional nuance into our understanding of children's economic reasoning. Finally, although we found no evidence that pro-White racial bias in resource allocation could be explained by ingroup bias among our White participants, due to a small number of Black participants in our sample, we were unable to examine this question among our Black participants. Some aspects of racial cognition in Black children exhibit a different developmental pattern or expression than in their White peers (e.g., Black children reliably express essentialist beliefs about race at a younger age than White children; Kinzler & Dautel, 2012). Subsequent work on the topic of racial bias in resource allocation should focus on how bias is expressed and predicted among Black children who are likely to reason about and consider race in distinct ways from their White peers by virtue of racialized variation in children's experiences and social networks (Cox, Navarro-Rivera, & Jones, 2016) and even the frequency of conversations where race is discussed explicitly (Hughes et al., 2006). Furthermore, this study was underpowered to examine whether biased resource allocation, and what predicts bias, varied among participants from different racial/ethnic minority groups (e.g., Asian, Hispanic, multiracial). This too is an important gap to fill in future research because each of these groups has a distinct history of oppression and privilege in the United States (Perez & Hirschman, 2009) that is likely to inform the beliefs, attitudes, and behaviors of group members. In general, research—ours included—must move beyond an overly generalized conceptualization of racial majority and minority groups to better capture the nuance of children's actual lived experiences and the consequences that follow.

Despite the need for much more research, the studies presented here shed light on the development of economic decision making in real-world domains as well as the mechanisms underlying these decisions. Clarifying both mechanisms and developmental changes helps us to understand when and why people engage in socially relevant economic behaviors such as donating to charities or other organizations and voting for and supporting social welfare programs. With this knowledge, we can hope to gain insight into the most effective ways of reducing bias that harms marginalized communities, and in this way help to foster more equitable outcomes.

Acknowledgments

Research reported in this publication was supported by a Scholars Award from the James S. McDonnell Foundation to M. Rhodes and by the Eunice Kennedy Shriver National Institute of Child Health and Human Development of the National Institutes of Health (R01HD087672). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jecp.2021.105224.

References

Ahl, R. E., & Dunham, Y. (2019). "Wealth makes many friends": Children expect more giving from resource-rich than resource-poor individuals. *Child Development, 90*, 524–543.

Ahl, R. E., Duong, S., & Dunham, Y. (2019). Children employ wealth cues when predicting others' sharing. *Developmental Psychology, 55*, 303–314.

Amodio, D. M., & Devine, P. G. (2006). Stereotyping and evaluation in implicit race bias: Evidence for independent constructs and unique effects on behavior. *Journal of Personality and Social Psychology, 91*, 652–661.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software, 67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01.

Benenson, J., Pascoe, J., & Radmore, N. (2007). Children's altruistic behavior in the Dictator Game. *Evolution and Human Behavior, 28*, 168–175.

Blake, P. R., McAuliffe, K., Corbit, J., Callaghan, T. C., Barry, O., Bowie, A., ... Warneken, F. (2015). The ontogeny of fairness in seven societies. *Nature, 528*, 258–262.

Blake, P. R., & Rand, D. G. (2010). Currency value moderates equity preference among young children. *Evolution and Human Behavior, 31*, 210–218.

Böhm, R., & Buttelmann, D. (2017). The impact of resource valence on children's other-regarding preferences. *Developmental Psychology, 53*, 1656–1665.
Camerer, C. F. (2003). Behavioural studies of strategic thinking in games. *Trends in Cognitive Sciences, 7*, 225–231.
Chernyak, N., Harris, P. L., & Cordes, S. (2018). Explaining early moral hypocrisy: Numerical cognition promotes equal sharing behavior in preschool-aged children. *Developmental Science, 22* e12695.
Clark, K. B., & Clark, M. K. (1947). Racial identification and preference in Negro children. In E. L. Hartley (Ed.), *Readings in social psychology* (pp. 169–178). New York: Holt, Rinehart, & Winston.
Cox, D., Navarro-Rivera, J., & Jones, R. P. (2016). *Race, religion, and political affiliation of Americans' core social networks*. Washington, DC: Public Religion Research Institute. Retrieved from https://www.prri.org/research/poll-race-religion-politics-americans-social-networks.
Dunham, Y., Baron, A. S., & Carey, S. (2011). Consequences of "minimal" group affiliations in children. *Child Development, 82*, 793–811.
Dunham, Y., & Degner, J. (2013). From categories to exemplars (and back again). In S. Gelman & M. Banaji (Eds.), *Navigating the social world: What infants, children, and other species can teach us* (pp. 275–280). New York: Oxford University Press.
Elenbaas, L., & Killen, M. (2016). Age-related changes in children's associations of economic resources and race. *Frontiers in Psychology, 7*. https://doi.org/10.3389/fpsyg.2016.00884.
Elenbaas, L., Rizzo, M. T., Cooley, S., & Killen, M. (2016). Rectifying social inequalities in a resource allocation task. *Cognition, 155*, 176–187.
Elenbaas, L., Rizzo, M. T., & Killen, M. (2020). A developmental-science perspective on social inequality. *Current Directions in Psychological Science, 29*, 610–616.
Everett, J. A. C., Faber, N. S., & Crockett, M. (2015). Preferences and beliefs in ingroup favoritism. *Frontiers in Behavioral Neuroscience, 9*. https://doi.org/10.3389/fnbeh.2015.0001.
Fehr, E., Bernhard, H., & Rockenback, B. (2008). Egalitarianism in young children. *Nature, 454*, 1079–1083.
Fishbein, H. D., & Kaminski, N. K. (1985). Children's reciprocal altruism in a competitive game. *Developmental Psychology, 3*, 393–398.
Gelman, S. A. (2003). *The essential child: Origins of essentialism in everyday thought*. New York: Oxford University Press.
Hamilton, D. L. (1981). Stereotyping and intergroup behavior: Some thoughts on the cognitive approach. In D. L. Hamilton (Ed.), *Cognitive processes in stereotyping and intergroup behavior* (pp. 333–353). Hillsdale, NJ: Lawrence Erlbaum.
Hamilton, D., Darity, W., Jr., Price, A. E., Sridharan, V., & Tippett, R. (2015). *Umbrellas don't make it rain: Why studying and working hard isn't enough for Black Americans*. New York: The New School.
Horwitz, S. R., Shutts, Kristin, & Olson, K. R. (2014). Social class differences produce social group preferences. *Developmental Science, 17*(6), 991–1002. https://doi.org/10.1111/desc.12181.
Hughes, D., Rodriguez, J., Smith, E. P., Johnson, D. J., Stevenson, H. C., & Spicer, P. (2006). Parents' ethnic-racial socialization practices: A review of research and directions for future study. *Developmental Psychology, 42*, 747–770.
Hussak, L. J., & Cimpian, A. (2015). An early-emerging explanatory heuristic promotes support for the status quo. *Journal of Personality and Social Psychology, 109*, 739–752.
Janus, A. L. (2010). The influence of social desirability pressures on expressed immigration attitudes. *Social Science Quarterly, 91*, 928–946.
Kelly, D. J., Quinn, P. C., Slater, A. M., Lee, K., Ge, L., & Pascalis, O. (2007). The other-race effect develops during infancy: Evidence of perceptual narrowing. *Psychological Science, 18*, 1084–1089.
Kenward, B., Hellmer, K., Winter, L. S., & Eriksson, M. (2015). Four-year-olds' strategic allocation of resources: Attempts to elicit reciprocation correlate negatively with spontaneous helping. *Cognition, 136*, 1–8.
Kinzler, K. D., & Dautel, J. B. (2012). Children's essentialist reasoning about language and race. *Developmental Science, 15*, 131–138.
Leshin, R., Leslie, S. J., & Rhodes, M. (2021). Does it matter how we speak about social kinds? A large, pre-registered, online experimental study of how language shapes the development of essentialist beliefs. *Child Development. Advance online publication.*. https://doi.org/10.1111/cdev.13527.
Li, V., Spitzer, B., & Olson, K. R. (2014). Preschoolers Reduce Inequality While Favoring Individuals With More. *Child Development, 85*, 1123–1133. https://doi.org/10.1111/cdev.12198.
LoBue, V. (2014). The Child Affective Facial Expression (CAFE) set. *Databrary*. https://doi.org/10.17910/B7301K.
LoBue, V., & Thrasher, C. (2015). The Child Affective Facial Expression (CAFE) set: Validity and reliability from untrained adults. *Frontiers in Psychology, 5*. https://doi.org/10.3389/fpsyg.2014.01532.
Mandalaywala, T. M., Ranger-Murdock, G., Amodio, D. M., & Rhodes, M. (2019). The nature and consequences of essentialist beliefs about race in early childhood. *Child Development, 90*, e437–e453.
Mandalaywala, T. M., Tai, C., & Rhodes, M. (2020). Children's use of race and gender as cues to social status. *PLoS One, 15*(6) e234398.
McAuliffe, K., & Dunham, Y. (2017). Fairness overrides group bias in children's second-party punishment. *Journal of Experimental Psychology: General, 146*, 485–494.
Moore, C. (2009). Fairness in children's resource allocation depends on the recipient. *Psychological Science, 20*, 944–948.
Olson, K. R., Dweck, C. S., Spelke, E. S., & Banaji, M. R. (2011). Children's response to group based inequalities: Perpetuation and rectification. *Social Cognition, 29*, 270–287.
Olson, K. R., Shutts, K., Kinzler, K. D., & Weisman, K. G. (2012). Children associate racial groups with wealth: Evidence from South Africa. *Child Development, 83*, 1884–1899.
Olson, K. R., & Spelke, E. S. (2008). Foundations of cooperation in young children. *Cognition, 108*, 222–231.
Pauker, K., Ambady, N., & Apfelbaum, E. P. (2010). Race salience and essentialist thinking in racial stereotype development. *Child Development, 81*, 1799–1813.
Paulus, M., & Essler, S. (2020). Why do preschoolers perpetuate inequalities? Theoretical perspectives on inequity preferences in the face of emerging concerns for equality. *Developmental Review, 58* 100933.
Perez, A. D., & Hirschman, C. (2009). The changing racial and ethnic composition of the US population: Emerging American identities. *Population and Development Review, 35*, 1–51. https://doi.org/10.1111/j.1728-4457.2009.00260.x.

Raabe, T., & Beelmann, A. (2011). Development of ethnic, racial, and national prejudice in childhood and adolescence: A multinational meta-analysis of age differences. *Child Development, 82*, 1715–1737.
Renno, M. P., & Shutts, K. (2015). Children's social category-based giving and its correlates: Expectations and preferences. *Developmental Psychology, 51*, 533–543.
Rhodes, M., & Gelman, S. A. (2009). A developmental examination of the conceptual structure of animal, artifact, and human social categories across two cultural contexts. *Cognitive Psychology, 59*, 244–274.
Rhodes, M., Leslie, S. J., Saunders, K., Dunham, Y., & Cimpian, A. (2018). How does social essentialism affect the development of inter-group relations? *Developmental Science*. https://doi.org/10.1111/desc.12509.
Rhodes, M., & Mandalaywala, T. M. (2017). The development and developmental consequences of social essentialism. *Wiley Interdisciplinary Reviews: Cognitive Science, 8*(4), e1437.
Rizzo, M. T., Elenbaas, L., Cooley, S., & Killen, M. (2016). Children's recognition of fairness and others' welfare in a resource allocation task: Age related changes. *Developmental Psychology, 8*, 1307–1317.
Rizzo, M. T., & Killen, M. (2020). Children's evaluations of individually and structurally based inequalities: The role of status. *Developmental Psychology, 56*, 2223–2235.
Schmidt, M. F. H., & Sommerville, J. A. (2011). Fairness expectations and altruistic sharing in 15-month-old human infants. *PLoS One, 6*(10), e23223.
Shutts, K., Brey, E. L., Dornbusch, L. A., Slywotzky, N., & Olson, K. R. (2016). Children use wealth cues to evaluate others. *PLoS One, 11*(3) e149360.
Tai, C., Mandalaywala, T. M., & Rhodes, M. (2017). *Egalitarian beliefs affect the expression of stereotypes about social status in older (but not younger) children*. Portland, OR: Cognitive Development Society.
Tropp, L. R., & Pettigrew, T. F. (2005). Differential Relationships Between Intergroup Contact and Affective and Cognitive Dimensions of Prejudice. *Personality and Social Psychology Bulletin, 31*(8), 1145–1158. https://doi.org/10.1177/0146167205274854.
Weisman, K., Johnson, M. V., & Shutts, K. (2015). Young children's automatic encoding of social categories. *Developmental Science, 18*, 1036–1043.
Zinser, O., Rich, M. C., & Bailey, R. C. (1981). Sharing behavior and racial preference in children. *Motivation and Emotion, 5*, 179–187.
Ziv, T., & Sommerville, J. A. (2017). Developmental differences in infants' fairness expectations from 6 to 15 months of age. *Child Development, 88*, 1930–1951.