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Testing the generalizability of minimal group attitudes in minority and majority race children

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ABSTRACT

The minimal group effect, in which people prefer ingroup members to outgroup members even when group membership is trivially constructed, has been studied extensively in psychological science. Despite a large body of literature on this phenomenon, concerns persist regarding previous developmental research populations that are small and lack racial/ethnic diversity. In addition, it remains unclear what role holding membership within and interacting with specific racial/ethnic groups plays in the development of children's group attitudes. Using a collaborative multi-site study approach, we measured 4- to 6-year-old children's (N = 716 across five regions in the United States; 47.1% girls; 40.5% White, 13.3% Black, 12.6% Asian, 24.6% Latine, 9.2% multiracial) minimal group attitudes and preference for real-world racial/ethnic ingroups and outgroups. We found that, as a whole, the minimal group effect was observed in the total sample, and no significant differences were found between racial/ethnic groups; yet exploratory analyses revealed that the minimal group effect was most strongly displayed among older children compared with younger children and, when considered separately, was more clearly present in some racial/ethnic groups (White) but not so in others (Black). In addition, there was no relationship between children's minimal group

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attitudes and racial group preferences, suggesting that factors other than ingroup/outgroup thinking may influence young children's racial bias. Taken together, results highlight the continued need for large and racially diverse samples to inform and test the generalizability of existing influential psychological theories.

Introduction

Children show a propensity to divide the social world into "us" and "them" early in development (Bigler, Brown, & Markell, 2001; Dunham, 2018; Dunham, Baron, & Carey, 2011). What's more, children prefer or favor the groups to which they belong, their ingroups, even when those groups are defined by trivial or experimentally assigned "minimal" similarities (e.g., shared T-shirt colors; Dunham et al., 2011). In the classic minimal group task with adults, participants were made aware that they would be allocated to one of two groups based on their performance in an initial assessment (e.g., a dot estimation or picture preference task; Tajfel, 1970; Tajfel et al., 1971). Following this group assignment, participants tended to distribute more resources to members of their minimally assigned group than to members of the other group. Thus, the mere experience of being socially categorized led participants to favor ingroup members even when these memberships held no real-world social significance. Subsequent studies went on to show that the minimal group effect holds despite participants having no knowledge of why they were assigned to their minimal group (Billig & Tajfel, 1973) and in the absence of status differences, contact between groups, or a history of conflict or hostility such that the effect has now been replicated scores of times (for a recent review, see Dunham, 2018). This extensive literature has been taken as prime evidence of a foundation of social cognition in which both adults and children not only distinguish between ingroups and outgroups but also prefer ingroups to outgroups.

Numerous studies have emerged outlining the consequences of minimal group membership in young children, including evaluative, coalitional, and learning outcomes. For example, children behave more positively toward ingroup members than outgroup members on a wide range of implicit and explicit attitudinal measures, generally demonstrating more positive attitudes toward ingroup members (Ashburn-Nardo, Voils, & Monteith, 2001; Dunham, Baron, & Carey, 2011; Mullen, Brown, & Smith, 1992). In terms of social-relational outcomes, preschoolers are more likely to keep a secret on behalf of their minimally assigned ingroup, and they expect loyalty from group members even when doing so is costly (Misch et al., 2014, 2016). Children also privilege resource allocation toward minimal ingroups (Plötner et al., 2015; Sparks et al., 2017) and engage in harsher third-party punishment when minimally assigned outgroup members propose resource distributions that are selfish or disadvantageous to the child's ingroup (Jordan et al., 2014). Regarding learning, children also interpret ambiguous interactions in ingroup-favoring ways and remember more positive facts attributed to ingroup members (Dunham, Baron, & Carey, 2011; Dunham & Emory, 2014; for review, see Dunham, 2018). Strikingly, minimal group effects persist even when the arbitrariness of the grouping mechanism is made salient to children (Yang & Dunham, 2019). Here, in a large-scale study, we are the first to most directly test whether minimal ingroup and outgroup attitudes differ between racial/ethnic groups or whether generally a minimal groups effect persists regardless of group membership.

Past work has suggested that children's bias toward real-world groups may be related to children's preference for minimally defined ingroups over outgroups, which is why the question of racial group membership is an intriguing one. Indeed, countless studies have documented children's bias toward real-world ingroups, finding that both explicit and implicit biases are high by the preschool years (for review, see Hailey & Olson, 2013). For example, in a study directly comparing ingroup bias toward real-world and minimal groups, Yang and colleagues (2022) found that children's bias for real-world

groups was either stronger than (in the case of gender) or similar to (in the case of race) minimal group bias. Notably, minimal groups and real-world groups differ in various ways; real-world groups are inherently more familiar or salient than minimal groups (factors that could increase liking; Zajonc, 1968). Moreover, unlike minimal groups, real-world groups carry information about social hierarchies and status (Mullen et al., 1992), which is one reason why testing minimal group effects in both racial majority and minority children is needed.

When considering the relative social position of real-world groups, children also tend to prefer high-status individuals to low-status individuals and associate high-status people with more positive attributes (Enright et al., 2020; Mistry et al., 2015; Shutts et al., 2016). Moreover, children's behaviors toward high- and low-status groups are influenced by their own group membership and beliefs about status (Straka, Albuja, et al., 2024). Previous research with real-world groups finds that both White and Black children in the United States expect Black people to have lower-status occupations compared with White people (Bigler et al., 2003), and White and Black children in the United States and South Africa expect White people to have nicer possessions than Black people (Elenbaas & Killen, 2016; Olson et al., 2012; Shutts et al., 2016). This research suggests that children's racial bias reflects not only a general bias to favor ingroups but also a sensitivity to one's group status and positioning in the broader social hierarchy. Some research with adults has argued that real-world prejudice is more about status concerns rather than ingroup/outgroup thinking, such that patterns of prejudice demonstrate a dislike of marginal or low-status groups specifically (e.g., Bergh et al., 2016). Yet the robustness of the minimal group effect, in which status differences are absent, suggests that group status cannot fully account for children's bias regarding real-world groups. If children's racial biases stem in part from a general favoring of ingroups, one would expect that children's minimal group bias would predict their racial ingroup bias, but this possibility has yet to be directly empirically assessed.

Real-world groups not only elicit stronger preferences as targets of evaluation, but membership in real-world groups also shapes children's attitudes. Specifically, majority and higher-status racial groups tend to show stronger ingroup preferences on measures of both implicit and explicit racial bias than minority groups, who display an attenuated ingroup preference or in some cases even a preference for the outgroup (Clark & Clark, 1939, 1947; Jordan & Hernandez-Reif, 2009; Newheiser et al., 2014; Newheiser & Olson, 2012; Nosek et al., 2002; Raabe & Beelmann, 2011). For example, whereas White children display robust implicit ingroup bias similar to adults, Black children display no implicit ingroup bias, and in fact Black children who explicitly expressed a strong wealth preference displayed implicit preference for a White outgroup (Newheiser & Olson, 2012). Here we asked whether this pattern of differences between racial majority and minority groups is present within minimal group effects as well. Moreover, to what extent are minimal group attitudes related to real-world group attitudes, specifically their racial/ethnic attitudes, and where do children's attitudes toward groups stem from?

From as early as infancy, children notice social category distinctions (e.g., Kelly et al., 2009; Quinn et al., 2002), and across early development their social learning about these categories becomes more elaborate, affecting their attitudes and behaviors (e.g., Clark & Clark, 1939, 1947; Jordan & Hernandez-Reif, 2009; Newheiser et al., 2014; Newheiser & Olson, 2012; Nosek et al., 2002; Raabe & Beelmann, 2011). Yet the robust minimal group literature suggests that a basic tendency to prefer generic, minimally defined ingroups is present at least by early childhood (e.g., Dunham, 2018; Dunham & Emory, 2014). Therefore, it is possible that the minimal group effect represents an abstract cognitive template about group thinking that children in turn apply when learning about real-world groups in their environment (e.g., Yang et al., 2022). If so, one would expect to see no difference between racial/ethnic groups on the minimal group effect. However, if children instead extend their social learning about real-world groups and bias (e.g., racial bias) to the minimal group context (e.g., Yang et al., 2022), one would expect that racial majority groups would demonstrate a stronger minimal ingroup effect compared with racial minority groups. Another possibility is that children may indeed begin with an abstract notion that ingroups are preferable to outgroups but apply this notion only to cases in which their social learning makes a particular distinction salient to them (Jordan & Wynn, 2022). If so, one might expect that children from different racial/ethnic communities may differ in the extent to which they show a minimal group effect based on different social input and/or experiences they

have encountered. Moreover, age is also a potential factor in shaping the robustness of minimal group effects in that the more lived experiences with exclusion could shift minimal group recognition.

Extant literature is limited in addressing this question for several reasons. First, small and non-diverse sample sizes restrict our current understanding of these effects. Because the developmental literature to date has relied on modest sample sizes, this compromises our ability to determine the robustness and average size of minimal group preferences in children. For example, from the developmental experimental literature cited here, the average participant sample size was 138 (median = 94). This issue is further reflected in recent work raising concerns about low statistical power in developmental psychology experiments in general (Davis-Kean & Ellis, 2019), such that larger-scale studies demonstrating minimal group bias in young children are timely. Furthermore, because most minimal group studies with children have been conducted with U.S. participants who identify as White (e.g., Pechar & Kranton, 2017), this lack of racial diversity makes it more challenging to determine the generalizability of minimal group effects to other demographics who may consider group membership differently due to minority status.[1] To fully elucidate the origins of intergroup bias, it is thus critical to determine the extent to which a preference for one's ingroup results from a history of experience as a member of that group or a more general preference for members of one's own group. The current work examined the relative contribution of one's experience as a member of a relatively high-status racial group versus a lower-status group on preference toward minimal and real-world groups.

The current study

The data discussed in this article were collected as part of a multi-site collaborative study that administered a variety of tasks assessing the development of a diverse set of children's intergroup attitudes across five regions of the United States. Including Honolulu, Hawaii; Seattle, Washington; Long Beach, California; New Haven, Connecticut; and Durham, North Carolina.[2] We focused on 4 to 6 years of age because this range reflects the emergence of racial classification processing and the beginnings of racial identity development (see Iruka et al., 2021, for review). In addition, ingroup biases in minimal group paradigms have been robustly shown within these ages (Dunham et al., 2011). Furthermore, in line with social identity development theory (Nesdale, 2004), children at this age are especially oriented to their ethnic ingroups, and this age range also marks the early stages of children encountering more peers, and subsequently groups, when they enter school settings for the first time.

To test whether the minimal group effect drives children's real-world bias, in this pre-registered study we compared children's performance on both a minimal group task and a racial group preference task. The first task employed a child-friendly adaptation of the classic minimal group paradigm (Billig & Tajfel, 1973; Tajfel, 1970; Tajfel et al., 1971) in which children were randomly assigned to one of two color-marked groups (Bigler, Jones, & Lobliner, 1997; Dunham, Baron, & Carey, 2011; Dunham & Emory, 2014; Patterson & Bigler, 2006). After group assignment, children were asked to indicate, on an attitudinal smiley face scale, the extent to which they like members of their minimally assigned ingroup and the outgroup. To test the universality of the minimal group effect, we compared the average minimal group effect across all racial groups tested. The second task explored children's racial preferences by having them indicate, on the same smiley face scale, the extent to which they like children from their own racial group and three other racial outgroups. We compared these two tasks to identify whether racial ingroup preference may be predicted by a minimal group effect. This addressed the question of whether stronger racial ingroup bias stems from differences in minimal group bias between racial groups.

[1] Regional diversity may also affect the development of racial prejudice (Pauker et al., 2016) as well as minimal group effects if they reflect a generalization from other learned attitudes given that increased intergroup contact can reduce affective measures of prejudice (Pettigrew & Tropp, 2006; Tropp & Pettigrew, 2005). Thus, sufficient representation from diverse populations is becoming increasingly essential to further understand the development of minimal ingroup biases.

[2] These regions have distinct demographic characteristics. For example, Honolulu has a majority Asian population (51.7%), whereas Seattle has a majority White population (61.2%). Of these regions, Long Beach has the largest Latine population comparatively (44.1%), and Durham has the largest Black population (35.8%). Moreover, most of New Haven's population is trisected between White (32.2%), Black (28%), and Latine (30%) (U.S. Census Bureau, 2023). See online supplementary material (Section 2) for additional analyses comparing these multiple lab locations.

Method

Transparency and openness

This study's design and its analysis were pre-registered as noted on the Open Science Framework (OSF; https://osf.io/fn5ut?view_only=b6b20b57ffee4607a7c6613becde9a81). Below we report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study. All data and code are available on the OSF. Data were analyzed using R Version 4.0.0 (R Core Team, 2020) and G*Power 3.1 (Faul et al., 2009).

Participants

Here we include data from participants who completed both the minimal groups and social preference tasks from a larger battery of six pre-registered session tasks assessing children's early intergroup reasoning (see OSF for full study method overview, study-wide pre-registrations relevant to all six tasks, and study-specific pre-registration of the current study). Following our pre-registration for this study, this analysis includes participants aged 4.0 to 6.99 years[3] across five study sites located in different regions of the United States.[4] Data collection concluded prematurely due to the COVID-19 pandemic near the end of the associated grant period. No data were collected after this point due to the in-person tasks needed for assessment, and all data analysis began thereafter. Because final samples were below the pre-registered recruitment goals, we report post hoc observed power for each test within the results.

As described in our pre-registration, participants were excluded from the final sample based on the following: participants stopping the study during or before the start of any task (n = 0), participants not completing either task specific to this analysis (n = 13), participants only partially completing either task (n = 0), parental/teacher interference (e.g., if a teacher entered the testing area or interfered with the task) (n = 2), or external interference (e.g., fire alarm) (n = 2). The final sample included 716 children.

Either while the children were completing the study or in advance of the study (depending on location and availability of the parent), the parents or caregivers completed a questionnaire. Gender and racial/ethnic demographics for the participants who were included in the current study are as follows: 337 girls, 379 boys, 289 White participants (142 girls and 147 boys; M_{age} = 4.97 years, SD = 0.70); 95 Black participants (43 girls and 52 boys; M_{age} = 4.96 years, SD = 0.70); 90 Asian participants (45 girls and 45 boys; M_{age} = 5.05 years, SD = 0.75); 176 Latine participants (78 girls and 98 boys; M_{age} = 4.84 years, SD = 0.69); 66 multiracial participants (29 girls and 37 boys; M_{age} = 5.00 years, SD = 0.71). Full demographic data (e.g., parent education, parent annual income) are available on the OSF.

Materials

Unique stimuli were used for each of the trials that participants completed in both the minimal group and social group preference tasks so that children never saw a target's picture twice. Past work has used a variety of cartoon stimuli (e.g., Dunham & Emory, 2014; Yang & Dunham, 2019), puppet stimuli (e.g., Misch et al., 2016), and real-life stimuli (e.g., Dunham, Baron, & Carey, 2011; Misch, Over, & Carpenter, 2014) to assess children's group-based social reasoning. The eight pictures in the current minimal groups task were cartoon depictions of children created using the Vyond animation software tool (https://www.vyond.com) that depicted a person wearing a green or orange sticker. These cartoon images were gender-matched to participants (e.g., female participants were presented with all female cartoons) but varied in skin color and hair color. The photographs used in the social preference task were selected from a large pool of photographs (N = 405) from official datasets

[3] For analyses including all participants tested (including those with unverified ages (n = 12) and those outside of the pre-registered age range (n = 13), see supplementary material. All results hold across both sets of analyses.

[4] See supplementary material for exploratory analysis comparing study regions (Table S2). No differences in minimal group bias or racial preference were found based on the study site region.

(e.g., CAFÉ [Child Affective Facial Expression] dataset; LoBue & Thrasher, 2015), photographs of children that were acquired through internet searches, and photographs from the participating research labs. All photos were shown in color and were adjusted to uniform size and resolution.

Social preference task: Face ratings

To select pictures for each of these tasks, we wanted to ensure that pictures were matched on age, affect, and attractiveness and that all pictures were generally seen by adults as members of the relevant race and gender groups. We had 10 to 12 adult raters (each of whom had spent considerable time working with children) independently estimate the approximate age of each child, attractiveness (rated from 1 [*not attractive*] to 5 [*very attractive*]), and affect (rated from 0 [*neutral*] to 4 [*happy*]). These adult raters also independently categorized each photograph by race/ethnicity[5] (options: Asian, Black, Latine, White, and multiracial) and independently categorized each photograph by perceived gender (writing in a comment if the child was not gender-informing). Only pictures in which there was more than 90% agreement on gender identity and more than 70% agreement on race/ethnicity were used. Interrater agreement was high for age (*SD* = 1.17, Cronbach's alpha = .92), attractiveness (*SD* = .78, Cronbach's alpha = .84), and affect (*SD* = .72, Cronbach's alpha = .96). We used these ratings to match stimuli across trials. All matches were within 1 standard deviation for age, attractiveness, and affect.

Additional task-specific materials are on the OSF (link here for https://osf.io/492mx/?view_only=17dc25f77fcf4d3db60c754fb96c0bb6 and protocol and link here for overall pre-registrations).

Procedure

All participants completed the study in a quiet space (i.e., lab, school, or museum space). Participants who were monoracial Asian, Black, Latine (including Latine/White), or White were mostly run by an experimenter who was the same race/ethnicity as the participants, although not necessarily the same gender as the participants (see Table S1 in online supplementary material).[6] Multiracial participants were run by a monoracial experimenter who was from one of the racial groups that was part of their racial/ethnic background. In addition, because the task was slightly modified for each monoracial participant group, the multiracial participants were run through a version of the task designed for children of the monoracial background that matched the experimenter who was working with them (and therefore aligned with part of their racial/ethnic background). Before starting the tasks, the experimenter obtained verbal assent. The experimenter also explained that participants could skip any questions they wanted to skip and could stop the study at any time.

The following two tasks were part of the larger battery of six tasks presented in random order as a part of the large-scale study. All tasks were completed using Qualtrics on a tablet.

Prior to whichever of the two tasks analyzed here was randomly presented first, the minimal group task or the social preference task, the experimenter began by showing children a 6-point smiley face scale ranging from *really, really don't like* to *really, really like*. The experimenter explained that participants would use the smiley faces to indicate how much they do or do not like something by pointing to a face on the scale.

Minimal group task and bias

The purpose of the minimal group task was to determine whether participants preferred members of their own randomly assigned group to members of the outgroup (Dunham et al., 2011). To assign the minimal groups, the experimenter told each participant that in order to figure out which group he or she was in, the participant would need to draw a token from a bag. The experimenter showed the

[5] There are important distinctions between "race" and "ethnicity" (see Barkan, 2016; Smedly, 1998, 2007), yet research shows that people tend to use these terms interchangeably (e.g., Suyemoto et al., 2020), and even designated ethnic groups (e.g., Latine) have documented racialized experiences (e.g., Maldonado, 2009; Massey, 2014; Straka, Martinez, et al., 2024). Still, it is critical to note that these groups are richly heterogeneous (see "Limitations and future directions" section for further discussion).

[6] See supplementary material for additional analysis of minimal group bias and racial preference by racial/ethnic group and racial/ethnic group of the experimenter.

child a small black drawstring bag that contained two tokens, one orange and one green, and instructed the child to reach in and pick one. The experimenter then told the participant that he or she was a member of either the orange or green group, depending on the token the child drew. Participants were given a sticker and wristband of the same color to wear throughout the task as a reminder of which group they belonged to. Participants were then asked to identify which group they were assigned to by selecting either an orange or green circle on the iPad screen. If children incorrectly identified their group twice, the minimal group task was skipped (90.1% of participants passed the first comprehension check, and 100% of participants passed by the second check).

Participants were then shown a set of eight randomized cartoon stimuli displayed one at a time (four targets from each minimal group). All eight cartoon stimuli were gender-matched to the participant. For each minimal group, the four cartoons represented four different ethnic/racial groups (i.e., White, Black, Asian, and Latine; see Fig. 1). After each stimulus was presented, children were asked "How much do you like this kid? Can you point?" and used the smiley faces ranging from *really, really don't like* to *really, really like*. Our final dependent measure was the relative evaluation of minimal ingroup versus outgroup, calculated by averaging the scores of preference for each minimal group type and then subtracting the score of participants' respective minimal outgroup from the score of the minimal ingroup. This minimal group bias score ranges from negative values indicating favoritism toward the minimal outgroup to positive values indicating favoritism toward the minimal ingroup, with a score of 0 indicating no preference in either direction.

Racial preference task and bias

The goal of the racial preference task was to determine how much participants like members of various racial/ethnic and gender groups[7] (Dunham et al., 2011). Participants were introduced to the same 6-point smiley face scale described above, again ranging from *really, really don't like* to *really, really like,* and they were instructed to point to the face that best indicated how they felt about each target child. Participants completed 16 race/ethnicity trials involving four gender-matched targets from each of the following groups: Asian, Black, Latine, and White (see Fig. 2). The relative evaluation of preference for participants' own racial ingroup versus all racial outgroups was calculated by first averaging each racial group's rating of their own racial ingroup and subtracting the average rating of all racial outgroup targets (averaged first within race and then across races). This racial preference score ranges from negative values indicating more favorable evaluations of racial outgroups to positive values indicating favorable evaluations toward the respective racial ingroup.

Results

The following analyses detail a set of pre-registered and exploratory analyses. These results investigated (1) whether minimal ingroup and outgroup attitudes differed between racial/ethnic groups (dependent variable (DV): minimal ingroup and outgroup attitudes; pre-registered); (2) whether all racial/ethnic groups tested demonstrated a minimal group bias effect (DV: minimal group bias; exploratory); (3) differences on minimal group bias between racial/ethnic groups (DV: minimal group bias; pre-registered); (4) differences in racial ingroup/outgroup attitudes and racial preference between racial/ethnic groups (DV: racial ingroup and outgroup attitudes and racial preference; exploratory); (5) whether minimal group bias predicted a preference for one's own racial/ethnic group (DV: racial preference; pre-registered); and (6) whether participant age predicted minimal group bias and racial group preference (DV: minimal group bias and racial preference; exploratory). Exploratory analyses were included to support the interpretation of the pre-registered analyses. To account for limitations in interpreting some of our pre-registered analyses due to low statistical power, we also report exploratory bootstrapping analyses, testing 1000 bootstrap samples drawn from the observed data with statistical significance determined on 95% confidence intervals (e.g., Efron, 1979). In addi-

[7] Four additional trials focusing on gender were part of the task. See Halim et al. (2024) and supplementary material (Section 3) for additional results comparing minimal group effect with gender bias.

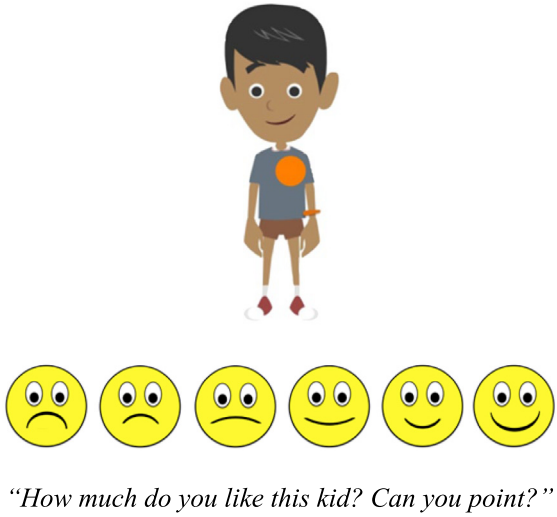

Fig. 1. Minimal group test trials: An example from the minimal group preferences task. The scale ranges from *really, really don't like* to *really, really like.* The target wears an orange sticker and armband.

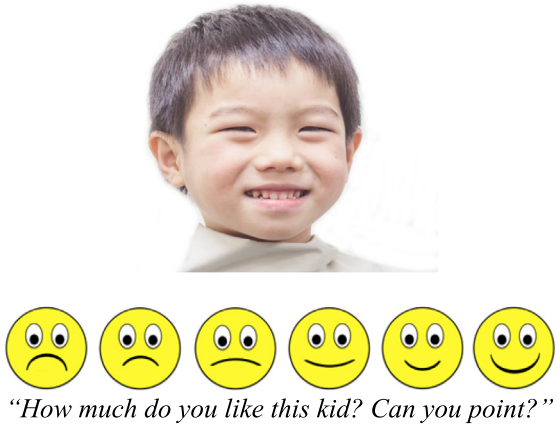

Fig. 2. Racial preference test trials: An example from the racial preference task displays. The scale ranges from *really, really don't like* to *really, really like.*

tion, we conducted exploratory Bayes factor analyses to aid in interpretation of our results. Bayes factor provides an indicator of the relative likelihood that either the alternative or null hypothesis is true (Wagenmakers et al., 2018). Lastly, to be inclusive of a large population of the participants in this study, these analyses slightly deviate from the pre-registration by including multiracial as a tested racial group within the analysis of the minimal group attitudes and bias.

1. Minimal ingroup and outgroup attitudes: Racial/Ethnic group comparison

Because the minimal group bias measure was based on minimal ingroup and outgroup attitudes, we first tested whether there was a difference between the racial/ethnic groups on their attitudes toward minimal ingroups and outgroups. This analysis sought to answer whether any of the racial/

ethnic groups tested (Black, Latine, Asian, White, or multiracial) demonstrated stronger or weaker attitudes toward minimal ingroups or outgroups. Model assumptions of normality were violated for minimal ingroup attitudes and outgroup attitudes (Shapiro–Wilks *ps* < .05), but assumptions of homogeneity of variances were met for both minimal ingroup and outgroup attitudes (Levene's test, *ps* > .343). Here we report two analyses of variance (ANOVAs) that are robust to violations of normality (ANOVA was used in place of the pre-registered *t* test to control for Type I error rate).

A one-way ANOVA of minimal ingroup attitudes revealed no significant difference between racial/ethnic groups, $F(4, 689) = 0.23$, $p = .921$, $\eta^2_p = .00$, $1 - \beta = .55$ (bootstrapped 95% confidence interval (CI): [−2.77, 0.31]) (see Table 1). Based on interpretation thresholds suggested by Lee and Wagenmakers (2013), the estimated Bayes factor ($BF = 0.004$) provided extreme evidence to support the null hypothesis—that there was no difference between racial/ethnic groups' minimal ingroup attitudes. Similarly, a one-way ANOVA of minimal outgroup attitudes also revealed no significant difference between racial/ethnic groups, $F(8, 689) = 1.14$, $p = .336$, $\eta^2_p = .01$, $1 - \beta = .61$ (bootstrapped 95% CI: [−3.27, 1.94]) (see Table 1). The estimated Bayes factor ($BF = 0.021$) provided very strong evidence to support that there was no difference between racial/ethnic groups' minimal outgroup attitudes. In sum, the racial/ethnic groups tested did not differ in their attitudes toward either minimal ingroups or outgroups.

2. Minimal group bias: Overall and by racial/ethnic group level

Next, to verify that children in the current study displayed the minimal group effect, we tested whether the overall sample showed a significant preference for minimal ingroup versus outgroup members. Model assumptions of normality were violated for the minimal group bias effect, $W(689) = 0.95$, $p < .001$, but assumptions of homogeneity of variances were met, $F(4, 689) = 0.61$, $p = .658$ (non-parametric Wilcoxon rank-sum test also reported). A one-sample *t* test comparing overall minimal group bias (i.e., calculated via the total sample) ($M = 0.31$, $SD = 1.42$) with 0 (or no preference) revealed a significant difference, $t(693) = 5.77$, $p < .001$; $z = 104818$, $p < .001$; $d = 0.22$, $1 - \beta = .99$ (bootstrapped 95% CI: [3.87, 7.68]). In addition, the estimated Bayes factor ($BF = 457{,}360.60$) provided extreme evidence to support the alternative hypothesis. Overall, there was an observed preference for minimal ingroup members over minimal outgroup members.

We then analyzed whether this minimal group bias effect could be observed within each racial/ethnic group tested in this study (i.e., Asian, Black, Latine, White, and multiracial). Model assumptions of normality were violated for all racial/ethnic groups (Shapiro–Wilks *ps* < .05; non-parametric Wilcoxon rank-sum test also reported). For White, Asian, Latine, and multiracial participants, the mean of minimal group bias was significantly different from 0 (see Table 1). Bootstrapped confidence intervals supported these significant effects for White, Asian, and Latine participants, but not for multiracial participants (i.e., multiracial confidence interval contained 0). Furthermore, estimated Bayes factors provided extreme evidence in support of the alternative hypothesis (that minimal group scores differed from 0) for White participants and only anecdotal evidence in support of the alternative hypothesis for Asian and multiracial participants; conversely, Bayes factor provided anecdotal evidence supporting the null hypothesis (that minimal group scores were not different from 0) for Latine participants (see Table 1). For Black participants, the mean of minimal group bias was not significantly different from 0, indicating no significant preference for minimal ingroup or outgroup members, which was also supported by the bootstrapped confidence intervals (see Table 1 and Fig. 3). Bayes factor analyses also indicated moderate evidence for the null hypothesis (that minimal group scores were not different from 0) for Black participants.

In sum, when considering each racial/ethnic group separately, the minimal group effect was clearly demonstrated in some groups but not in others. Specifically, these analyses demonstrated that the minimal group effect was robustly observed among White participants and, to a somewhat lesser extent, among Asian participants. Evidence between the bootstrapping and Bayesian analyses suggests that Latine and multiracial participants displayed weak, if any, minimal group effect and Black participants displayed no minimal group effect.

Table 1
One sample and independent sample *t* tests of racial/ethnic groups on minimal group bias

	Means of minimal ingroup and outgroup attitudes							
	Minimal ingroup attitudes[1]				Minimal outgroup attitudes[2]			
Racial/Ethnic group	*M* (*SD*)	*n*	95% LCL	95% UCL	*M* (*SD*)	*n*	95% LCL	95% UCL
Asian	4.27 (1.18)[1a]	88	4.01	4.53	3.92 (1.31)[2a]	88	3.64	4.20
Black	4.35 (1.28)[1a]	94	4.10	4.60	4.14 (1.39) [2a]	94	3.87	4.41
Latine	4.39 (1.13)[1a]	166	4.21	4.58	4.18 (1.20) [2a]	166	3.98	4.39
White	4.33 (1.27)[1a]	281	4.18	4.47	3.95 (1.38) [2a]	281	3.79	4.10
Multiracial	4.43 (1.30)[1a]	65	4.13	4.73	4.07 (1.35) [2a]	65	3.75	4.39

One sample *t* test: Minimal group bias

Racial/Ethnic group	*M* (*SD*)	*t* Value	*df*	*d*	*p*	95% LCL	95% UCL	Wilcoxon *z*	*p*	1 − *β*	B LCL	B UCL	*BF*
Asian	0.35 (1.44)	2.57	87	0.27	.012	0.08	0.62	1768	.022	.63	0.76	4.41	2.60^{1}
Black	0.21 (1.60)	1.27	93	0.13	.209	−0.12	0.53	2237	.245	.24	−0.63	3.12	0.25^{-2}
Latine	0.21 (1.34)	1.88	165	0.15	.046	0.00	0.41	5625.5	.035	.54	0.02	3.94	0.62^{-1}
White	0.38 (1.44)	4.39	280	0.26	<.001	0.21	0.55	16516	<.001	.99	2.86	6.23	692.17^{5}
Multiracial	0.36 (1.37)	2.10	64	0.26	.040	0.08	0.70	1020.5	.017	.57	−0.28	3.98	1.05^{1}

Independent sample *t* test: Minimal group bias

Group 1	Group 2	*t* Value	*df*	*d*	Adjusted *p*	95% LCL	95% UCL	Wilcoxon *z*	*p*	1 − *β*	B LCL	B.UCL	*BF*
White	Asian	0.15	367	0.02	1	−0.31	0.36	12544	1	.05	−2.10	1.83	0.14^{-2}
	Black	0.96	373	0.11	1	−0.18	0.52	12647	1	.15	−2.98	1.02	0.20^{-2}
	Latine	1.23	445	0.12	.877	−0.10	0.44	22638	1	.24	−3.33	0.78	0.23^{-2}
	Multiracial	0.11	344	0.01	1	−0.37	0.41	8501	1	.05	−1.99	2.16	0.15^{-2}

Note. Means of minimal ingroup/outgroup attitudes: Superscripts 1 and 2 indicate the sets of scores compared within one-way analyses of variance. Different lettered superscripts designate significantly different means within these two groups. *One-sample t test:* Racial/Ethnic groups' minimal group bias scores were compared with 0 (no preference). *Independent t test:* Minority racial group scores were compared with majority (White). Independent sample *t* test results are adjusted for multiple comparisons (Bonferroni). 1 − *β*, post hoc estimated power; B LCL, 95% bootstrapped lower confidence limit; B UCL, 95% bootstrapped upper confidence limit; *BF*, Bayes factor. *Superscripts mark Bayes factor interpretation:* $^{-5}$extreme evidence for null hypothesis (H_0); $^{-4}$very strong evidence for H_0; $^{-3}$strong evidence for H_0; $^{-2}$moderate evidence for H_0; $^{-1}$anecdotal evidence for H_0; ^{0}no evidence; ^{1}anecdotal evidence for alternative hypothesis (H_1); ^{2}moderate evidence for H_1; ^{3}strong evidence for H_1; ^{4}very strong evidence for H_1; ^{5}extreme evidence for H_1 (e.g., Lee & Wagenmakers, 2013).

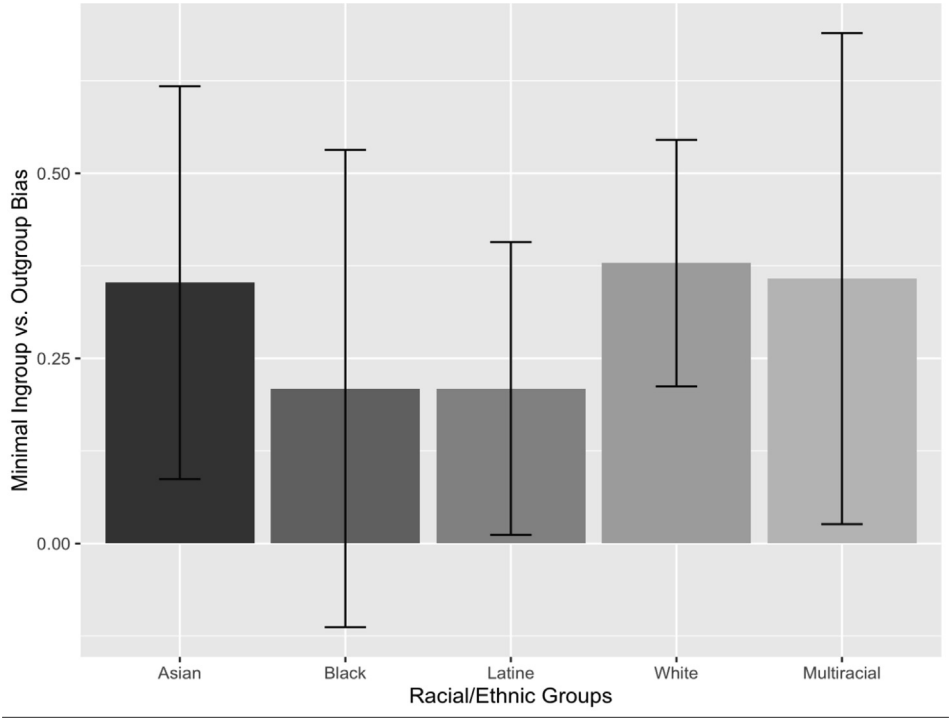

Fig. 3. Minimal group bias effect by racial/ethnic group: Means of minimal group bias across five racial/ethnic groups. Scores higher than 0 indicate preference for a minimal ingroup over outgroup (e.g., the minimal group bias effect). Error bars represent 95% confidence intervals. There was no significant difference in the minimal group evaluation scores compared across each racial/ethnic group. Exploratory analyses, however, suggest that when testing whether each individual racial/ethnic group displayed the minimal group effect (e.g., minimal group bias significantly different from 0), White children demonstrated the clearest minimal group effect, whereas Black children did not show a significant preference for minimal ingroup over outgroup.

3. Minimal group bias: Racial group comparisons

Here we examined whether a majority/high-status racial group (White) showed a stronger minimal ingroup bias than minority/lower-status groups. Independent sample *t* tests were conducted to compare White participants with all other racial/ethnic groups (Asian, Black, Latine, and multiracial) on relative evaluations of minimal ingroups versus outgroups. Model assumptions of normality were violated (Shapiro–Wilks $p < .05$), but assumptions of homogeneity of variances were met;, thus, we report the pre-registered independent sample *t* tests as well as results of a non-parametric test. In contrast to the findings above, there was no significant difference of minimal group bias between White and other racial/ethnic groups (*p*s > .876). Furthermore, estimated Bayes factors provided moderate evidence in favor of the null hypothesis, and bootstrapped 95% confidence intervals suggested that none of the minority racial/ethnic groups significantly differed from White participants (see Table 1 and Fig. 3).

One secondary question of this research was whether non-White racial groups differed from one another in the degree to which they showed minimal group preferences. To test this, a one-way ANOVA was conducted on the minimal group bias as a function of racial minority group (Black, Latine, Asian, or multiracial). The one-way ANOVA revealed no significant effect of racial minority group on minimal group bias, $F(3, 411) = 0.03$, $p = .787$, $\eta^2_p = .00$, $1 - \beta = .21$ (bootstrapped 95% CI: [−3.42, 0.59]), and the estimated Bayes factor ($BF = 0.02$) provided strong evidence for the null hypothesis. The minority racial/ethnic groups did not differ from one another in their evaluations of minimal groups.

4. Racial ingroup/outgroup attitudes and racial ingroup bias

Because the racial bias measure is based on racial ingroup and outgroup attitudes, we also tested whether there was a difference between the racial/ethnic groups on their attitudes toward racial ingroups and outgroups. This analysis answered whether different racial/ethnic group members (Black, Latine, Asian, or White) demonstrated stronger or weaker attitudes toward racial ingroups or outgroups. Model assumptions of normality were violated for racial ingroup attitudes and outgroup attitudes (Shapiro–Wilks *p*s < .01, with the exception of Asian participants' scores of racial outgroup attitudes, $p = .068$). Assumptions of homogeneity of variances were met for both racial ingroup and outgroup attitudes (Levene's test *p*s > .062).

A one-way ANOVA of racial ingroup attitudes revealed no significant difference between racial groups, $F(3, 640) = 1.25$, $p = .290$, $\eta_p^2 = .01$, $1 - \beta = .14$. A one-way ANOVA of racial outgroup attitudes revealed a marginal difference between racial groups, $F(3, 641) = 2.41$, $p = .066$, $\eta_p^2 = .01$, $1 - \beta = .22$) (see Table 2). The racial/ethnic groups tested did not significantly differ in their attitudes toward racial ingroups or outgroups.

To verify that children in the current study displayed racial ingroup bias, we tested whether the overall sample participants showed a significant preference for their respective racial ingroup versus outgroup members. Model assumptions of normality were violated for the racial group bias effect, $W(640) = 0.98$, $p < .001$, but assumptions of homogeneity of variances were met, $F(3, 640) = 0.58$, $p = .626$ (non-parametric Wilcoxon rank-sum test also reported). A one-sample *t* test comparing overall racial group bias ($M = 0.13$, $SD = 1.09$) with 0 (or no preference) revealed a significant difference, $t(643) = 3.35$, $p = .001$; $z = 101926$, $p < .001$; $d = 0.13$, $1 - \beta = .95$. Overall, there was an observed preference for racial ingroup members over racial outgroup members.

We then analyzed whether this racial group bias effect could be observed within each racial/ethnic group tested (i.e., Asian, Black, Latine, and White). Model assumptions of normality were violated for all racial/ethnic groups (Shapiro–Wilks *p*s < .05; non-parametric Wilcoxon rank-sum test also reported), with the exception of Asian, $W(640) = 0.99$, $p = .767$. For only White and Latine participants, the mean of racial group bias was significantly different than 0, demonstrating a preference for racial ingroup members over outgroup members. For Black and Asian participants, the mean of racial group bias was not significantly different than 0, indicating no preference for racial ingroup or outgroup members (see Table 2).

In addition, we tested whether racial groups differed from one another in the degree to which they showed racial ingroup preferences with a one-way ANOVA on the racial group bias as a function of

Table 2
Means and one sample *t* tests of racial/ethnic groups on racial group bias

Racial/Ethnic group	Racial ingroup attitudes[1]				Racial outgroup attitudes[2]			
	M (*SD*)	*n*	95% LCL	95% UCL	*M* (*SD*)	*n*	95% LCL	95% UCL
Asian	4.29 (1.16)[1a]	89	4.03	4.03	4.16 (1.02)[2a]	89	3.94	4.38
Black	4.60 (1.23)[1a]	95	4.35	4.35	4.56 (0.96)[2a]	95	4.35	4.77
Latine	4.57 (1.17)[1a]	173	4.39	4.39	4.43 (0.97)[2a]	173	4.27	4.59
White	4.52 (1.28)[1a]	287	4.38	4.38	4.35 (1.13)[2a]	288	4.23	4.47

One sample *t* test

Racial/Ethnic group	*M* (*SD*)	*t* Value	*df*	*D*	*p*	95% LCL	95% UCL	Wilcoxon *z*	*p*	$1 - \beta$
Asian	0.13 (0.97)	1.30	88	0.14	.197	−0.07	0.32	1978	.201	.37
Black	0.04 (1.18)	0.29	94	0.03	.771	−0.20	0.27	2049	.569	.09
Latine	0.14 (1.02)	1.79	172	0.14	.075	−0.14	0.29	7417.5	.033	.57
White	0.16 (0.97)	2.87	286	0.17	.004	0.05	0.28	20760	.004	.89

Note. Means of racial ingroup/outgroup attitudes: Superscripts 1 and 2 indicate the sets of scores compared. Different lettered superscripts designate significantly different means within these two groups. *One-sample t test:* Racial/Ethnic groups' racial group bias scores were compared with 0 (no preference).

racial minority group (Black, Latine, Asian, or White). The one-way ANOVA revealed no significant effect of racial group on racial group bias, $F(3, 640) = 0.39$, $p = .764$, $\eta_p^2 = .00$, $1 - \beta = .07$. The racial/ethnic groups did not differ from one another in their evaluations of racial groups.

5. Are racial/ethnic group preferences predicted by minimal group bias?

Another secondary research question was whether children's evaluations of their racial ingroups over outgroups could be predicted by their evaluations of minimal ingroups over minimal outgroups and whether this varied by racial group (see Table 2 for means). To test this, we regressed the racial preference rating variable on the minimal group bias variable and tested for interactions with participant's racial group.[8] The linear model did not predict a significant proportion of the variance in racial group preference, $F(7, 615) = 0.31$, $p = .950$, $R^2 = -0.01$, $1 - \beta = .66$ ($BF = 0.000$, bootstrapped 95% CI [0.05, 0.28]) (see Table 3). Neither minimal group bias nor participant's racial group significantly predicted racial group preference.

6. Participant age as predictor

Lastly, we explored whether minimal group bias and racial preference were predicted by participant age (continuous). To test this, we ran two linear models that regressed the minimal group bias and the racial preference variable on participants' age at the time of the study and tested whether this varied by racial/ethnic group membership. Neither of the full linear models predicted a significant proportion of the variance in minimal group bias, $F(1, 684) = 1.34$, $p = .214$, $R^2 = .00$, $1 - \beta = .30$, $BF = .000$ (bootstrapped 95% CI [−2.52, 0.56]), or in racial preference, $F(1, 636) = 1.41$, $p = .199$, $R^2 = .00$, $1 - \beta = .28$, $BF = .000$ (bootstrapped 95% CI [−2.10, 0.27]). Minimal group bias was significantly predicted by participant age, $B = 0.24$, $t(684) = 2.04$, $p = .042$, but not racial group membership ($ps > .230$) (see Table 4), such that older children showed stronger preference for their minimal ingroup over outgroup than younger children (Fig. 4). Neither participant age nor racial group membership predicted racial preference ($ps > .095$).

Discussion

Here we tested one of the most robust phenomena from the intergroup literature, the minimal group effect, with a uniquely large sample of young children from diverse racial/ethnic backgrounds and regions within the United States. We tested whether a minimal group effect would be observed across different racial/ethnic groups and whether this effect would be stronger among certain racial/ethnic groups compared with others. We also tested whether these minimal group effects would predict racial ingroup preference.

First, we found that there was no difference between racial/ethnic groups in their attitudes toward a minimal ingroup or outgroup. Second, we observed that a minimal group effect was present for the overall sample; that is, as a whole, participants reported more favorable attitudes toward a minimal ingroup than outgroup. However, when looking at each racial group in the sample separately, we found that the minimal group effect is present in some racial/ethnic groups but not in others. In particular, White participants displayed the clearest preference for a minimal ingroup over outgroup, followed by Asian participants. Latine and multiracial participants displayed a weak effect, and Black participants demonstrated no minimal group effect. However, these differences in significance levels should be interpreted cautiously given that, when comparing the average minimal group effect between racial groups, we found no significant difference. Finally, we found that minimal group bias did not predict preference for one's own racial ingroup. Additional exploratory analyses also found that minimal group effects were stronger in older versus younger children in this study. Although this

[8] Multiracial participants were not included in this analysis because there was no standard racial ingroup or outgroup that all multiracial participants rated, and ingroup/outgroup racial distinction might not have been readily meaningful to this group within this design.

Table 3
Predictors of racial group preference

Variable	ß	*SE*	*t*	*p*	η^2_p
Minimal group bias	0.01	0.04	0.25	.801	<.01
Monoracial group: Black	−0.13	0.12	−1.09	.276	<.01
Monoracial group: Latine	0.02	0.10	−0.17	.863	<.01
Monoracial group: Asian	−0.03	0.13	−0.20	.841	<.01
Minimal Group Bias × Black	0.02	0.08	0.26	.794	<.01
Minimal Group Bias × Latine	−0.03	0.07	−0.35	.728	<.01
Minimal Group Bias × Asian	−0.08	0.09	−0.80	.422	<.01

Note. Dummy-coded racial/ethnic groups were compared with White reference group.

Table 4
Predictors of minimal group bias and racial preference

Variable: Minimal group effect	ß	*SE*	*t*	*p*	η^2_p
Participant age	0.24	0.12	2.04	.042*	.01
Racial group: Asian	0.01	1.18	0.01	.990	<.01
Racial group: Black	−0.42	1.21	−0.35	.729	<.01
Racial group: Latine	−0.12	0.99	−0.12	.903	<.01
Racial groups: Multiracial	1.61	1.41	1.15	.251	<.01
Age × Asian	−0.01	0.23	−0.05	.960	<.01
Age × Black	0.05	0.24	0.21	.832	<.01
Age × Latine	−0.00	0.20	−0.02	.983	<.01
Age × Multiracial	−0.33	0.28	−1.18	.239	<.01
Variable: Racial preference	**ß**	***SE***	***t***	***p***	η^2_p
Participant age	0.00	0.08	0.03	.974	.01
Racial group: Asian	−1.04	0.84	−1.24	.217	<.01
Racial group: Black	−1.20	0.85	−1.40	.161	<.01
Racial group: Latine	−1.15	0.69	−1.67	.095	<.01
Age × Asian	0.20	0.17	1.20	.230	<.01
Age × Black	0.22	0.17	1.27	.206	<.01
Age × Latine	0.23	0.14	1.67	.096	.01

Note. Dummy-coded racial/ethnic groups were compared with White reference group. Higher scores indicate more ingroup preference.
* $p < .05$.

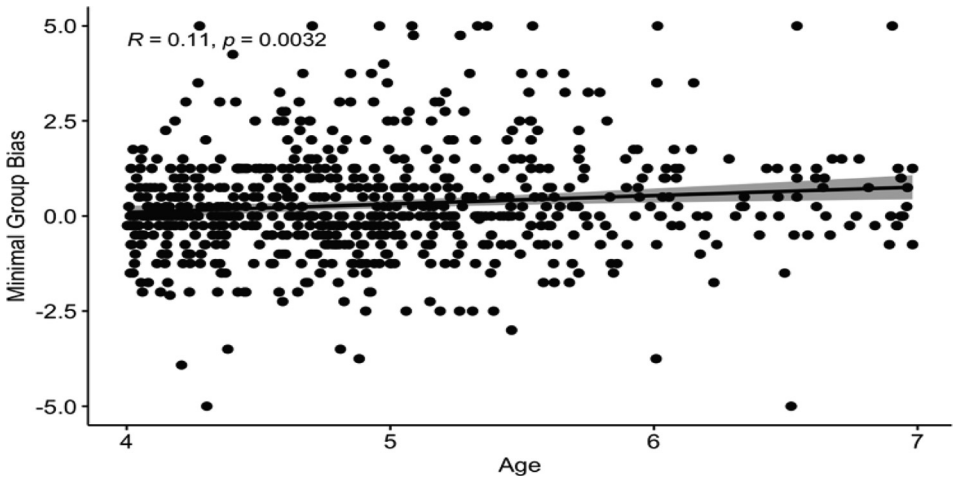

Fig. 4. Minimal group bias by age. In children aged 4 to 6 years, older children demonstrate a stronger preference for a minimal ingroup than younger children.

age effect should also be interpreted with caution (because it is possible that younger children may have been more likely to forget their minimal group allocation than older children even with sticker and wristband allocations), it is consistent with some past work finding that minimal ingroup effects are somewhat less readily detected in preschool children as compared with early elementary school children (e.g., Dunham & Emory, 2014; Richter et al., 2016). More likely, we believe that children's notion of group membership likely becomes more strict and defined as they get older, supporting the current set of results. This may reflect that as children are increasingly exposed to more social group contexts (e.g., school), it reinforces their ingroup/outgroup thinking.

However, we also found mixed evidence supporting the robustness of minimal group bias. First, we observed a minimal ingroup bias when analyzing the overall sample and found no significant differences between racial groups' average minimal group bias score, suggesting a robust effect common across racial groups. Conversely, building on previous research identifying differences of racial ingroup bias between racial/ethnic groups, (Newheiser & Olson, 2012; Nosek et al., 2002), our exploratory analyses suggested that the minimal group effect may be stronger among some groups (e.g., White) than among others (e.g., Black). Despite the low effect sizes reported here, these results highlight the need for future work to more directly assess status as a potential factor in minimal group effects. This may lend support to the hypothesis that children may apply their social knowledge about real-world groups to the minimal group context (e.g., Yang et al., 2022). However, settling this matter may require a more targeted investigation with a larger sample of non-White children, particularly Black children, at least within a U.S.-specific context.

This study also presented mixed evidence that social learning contributes to the development of minimal group bias as the minimal group effect increases with age, and the pattern of this effect differs somewhat by one's membership within specific racial/ethnic groups. Although the average minimal group bias effect did not significantly differ between each racial group, within each racial group tested, preference toward a minimal ingroup was displayed by a high-status racial group (e.g., White), whereas a low-status racial group (e.g., Black) displayed no preference for a minimal ingroup. We interpret these results to suggest that the strength of this effect may vary in studies that prioritize the inclusion of racial minority group members. Furthermore, in the current research, we did not find that minimal group bias predicted racial group bias, suggesting that children's racial bias may stem from other factors, such as status concerns, experience with other racial groups, social messages about racial groups, and exposure to representation, rather than only ingroup/outgroup thinking. It remains unclear whether status specifically, defined by either power or wealth, or another factor like concerns around cooperation (e.g., Misch et al., 2021) or group identity salience (e.g., Leonardelli & Brewer, 2001) may account for racial bias outcomes.

Limitations and future directions

The current study reported comparatively large sample sizes for developmental research, especially including representation of racial/ethnic minority participants across various regions of the United States. Yet the current sample was statistically underpowered for the small effect sizes observed when we focused on individual racial groups. Thus, results should be interpreted cautiously. Furthermore, the current work was restricted to U.S.-based samples, which may also influence the strength of the minimal group effect (e.g., Falk et al., 2014). Although there is a growing body of work assessing minimal group effects cross-culturally (e.g., Wu & Gao, 2018; Yang et al., 2021), future research is needed to explore the robustness of the minimal group effect in racial/ethnic minorities and non-Western populations, particularly among children.

There were methodological limitations in the current study that future research should address. First, the current laboratory design was limited in its ability to represent the diversity and nuance within racial/ethnic groups represented by the photo stimuli. For example, the Latine community includes members of varying skin tones, racial backgrounds, and nationalities. Similar points can be made as well for the diversity of the Asian community (e.g., Goh et al. 2023) and the multiracial community (Gaither, 2015). Thus, future research should engage with the nuances and diversity that exists within these groups and assess possible stimuli skin color preferences across groups.

Second, in line with some previous work, the current study's minimal group task used cartoon stimuli images (e.g., Dunham & Emory, 2014; Yang & Dunham, 2019), whereas the race bias task used real-life stimuli images (e.g., Newheiser & Olson, 2012; Pauker et al., 2016). We acknowledge the possibility that the salience of the images may have differed across tasks and participant racial groups. However, we do not think that this difference affected our results given that prior work using different stimulus modalities has elicited similar effects to those of the current work (e.g., Dunham et al., 2011, found a comparable minimal group effect using real-world stimuli images; Jordan & Hernandez-Reif, 2009, found comparable racial ingroup preference effects, and lack thereof, for White and Black children, respectively, using cartoon stimuli images).

In addition, the current study included only one outcome measure of intergroup bias—an explicit preference for the ingroup or outgroup. It remains unclear whether the current pattern of results would replicate by investigating any of the multiple other intergroup outcomes (e.g., resource allocation, implicit attitudes, inclusive behaviors; Dunham, Baron, & Carey, 2011; Straka, Albuja, Leer, Brauher, & Gaither, 2024). Furthermore, a recent study that included both racially diverse participants and stimuli (as done in the current research) found no minimal group effect on explicit or implicit preference but did find an effect on expectations of reciprocity, suggesting potential moderation by dependent measure (Brew et al., 2021). More research is necessary to understand under which dependent measures ingroup bias may be observed or not.

Finally, we acknowledge that the outgroup in the minimal group task may have been more salient than the outgroups in the race preference task given that the minimal group task contrasted only two groups, whereas the race task contrasted four groups. Still, we found that some children (e.g., Black children) showed no minimal group bias when their data were analyzed independently and that, among the larger sample, minimal group bias still had no effect on racial preference despite this possible added salience.

Conclusion

Using a multi-site study design including a diverse cohort of 716 4- to 6-year-old children, we measured minimal group attitudes and racial group attitudes to test the generalizability of the minimal group effect and the relationship between the minimal group effect and racial bias. Overall, the minimal group effect was observed across the sample, and no significant differences were found between racial/ethnic groups. However, results also highlight the need for racially diverse research samples. Finally, we found no relationship between minimal group attitudes and children's racial bias, suggesting that other factors should be explored as part of children's development of racial attitudes.

CRediT authorship contribution statement

Brenda Straka: Writing – review & editing, Writing – original draft, Visualization, Investigation, Formal analysis, Data curation, Conceptualization. **Ashley E. Jordan:** Writing – review & editing, Writing – original draft, Investigation. **Alisha Osornio:** Writing – review & editing, Visualization, Data curation. **May Ling Halim:** Writing – review & editing, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Kristin Pauker:** Writing – review & editing, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Kristina R. Olson:** Writing – review & editing, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Yarrow Dunham:** Writing – review & editing, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Sarah Gaither:** Writing – review & editing, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Data availability

Data and code are shared and housed on OSF links included in manuscript document. Study-wide design https://osf.io/492mx/?view_only=17dc25f77fcf4d3db60c754fb96c0bb6; Study-wide stimuli: https://osf.io/9htqs/?view_only=e623b2d51d9148c985ca945ed522b456; Study data and code: https://osf.io/32kvn/?view_only=None.

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Data availability

The data that support the findings of this study will be openly available on the OSF following the publication of the findings and findings from the larger study (https://osf.io/492mx/?view_only=17dc25f77fcf4d3db60c754fb96c0bb6).

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jecp.2024.106133.

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