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Differential Developmental Courses of Implicit and Explicit Biases for Different Other-Race Classes

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We investigated the developmental courses of both implicit and explicit racial biases in relation to the perceived social status of outgroups. We did so by assessing these biases among Chinese participants (N = 200, age range from 4- to 19-year-olds) toward 2 different other-race groups that differ in terms of perceived social status (i.e., Whites and Blacks). At the youngest age, children showed both implicit anti-White and anti-Black bias at similar levels. However, these biases had different patterns of age-related change: implicit anti-Black bias remained strong and stable over time, whereas implicit anti-White bias declined after age 10. For explicit bias, children showed a decline in anti-Black and anti-White bias. Implicit and explicit biases were uncorrelated at all ages. The observed age-related changes demonstrate that it is possible for patterns of biases toward different races to diverge with age, and that perceived social status may contribute to the differential developmental patterns.

Keywords: implicit racial bias, explicit racial bias, social economic status, social cognition, ingroup-outgroup

Racial bias refers to a tendency to react unfavorably to members of a racial group because of one’s group affiliation. Such bias is evidenced in derogatory attitudes or beliefs, negative affect, and hostile or discriminatory behavior about a racial group (Aboud, 1988, 2003; Brown, 1995). When left unchecked, racial bias can produce profound and far-reaching negative impacts at personal, group, and societal levels (Dovidio, Kawakami, & Gaertner, 2002; Kubota, Li, Bar-David, Banaji, & Phelps, 2013; see Pascoe & Smart Richman, 2009, for a review; see Kurdi et al., 2018, for a meta-analysis). Often the consequences affect people’s opportunities and resources, inclusive of limiting access to education, employment, and housing. Sometimes the consequences can threaten people’s health and even their lives, such as when people do not receive the medical care they need, or in cases of unjustified police shootings (Bailey et al., 2017).

Previous studies on the development of racial bias have primarily focused on the development of explicit racial bias, which involves conscious stereotyping, prejudice, and discriminatory behavior (Aboud, 1988, 2003). This form of bias begins in early childhood between 3 to 6 years of age (Aboud, 2003; Raabe & Beelmann, 2011). For example, when preschool children are asked to assign either positive or negative attributes to own-race or other-race individuals, they tend to assign more positive attributes (e.g., nice, friendly) to own-race individuals, and more negative attributes (e.g., bad, naughty) to other-race individuals (Aboud, 2005; Doyle & Aboud, 1995; Rutland, Cameron, Milne, & McGeorge, 2005). Also, when asked directly who they like to play with, children prefer own-race to other-race peers (Baron & Banaji, 2006; Dunham, Baron, & Banaji, 2006). The initial bias generally declines by age 7 and then disappears by around age 12 (Aboud, 2005; Raabe & Beelmann, 2011). This decline can be...
explained in terms of a range of cognitive, social, and moral factors, such as the development of children’s awareness of fairness (McAuliffe & Dunham, 2017), increasing concern for self-presentation (Rutland et al., 2005), and the increasing ability to control racist expression (Fitzroy & Rutland, 2010).

Recent methodological advances have allowed researchers to begin examining the development of implicit racial bias, which is reflected in unconscious stereotyping, prejudice, and discriminatory behavior (Banaji & Greenwald, 2013; Greenwald & Banaji, 1995). For example, 3-year-old White children in the U.S. are more likely to categorize racially ambiguous faces as belonging to other race rather than to own race when the faces are shown with an angry expression than with a happy expression (Dunham, Chen, & Banaji, 2013). More recently, similar results were found in China: Four- to 6-year-old children categorized happy racially ambiguous faces as own-race Chinese and angry ones as other-race Blacks (Xiao et al., 2015).

Early implicit bias has also been documented using assessments adapted from the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). The IAT assesses how quickly positive and negative attributes are associated with own- versus other-races (Greenwald et al., 1998; Greenwald, Nosek, & Banaji, 2003). The logic is that if participants differ in their response time to positive versus negative attributes for different races, then this outcome provides evidence of bias. Following the same logic, Baron and Banaji (2006) first developed a child-oriented version of the IAT (Child-IAT), which used graphics of own- versus other-race faces, and positive versus negative words with which children were familiar (e.g., good, bad, nice, mean) that were read out loud. Differences in response time to positive versus negative words for different races are interpreted as evidence of implicit bias.

More recently, Qian and her colleagues developed a preschool-friendly implicit racial bias test (IRBT; Qian et al., 2016). The IRBT replaces the positive and negative words of the Child-IAT with facial-graphic stimuli displaying positive versus negative expressions (e.g., smiles and frowns). It measures reaction time (RT) to associations between different races and a positive symbol (i.e., a cartoon version of a smiling face) versus a negative symbol (i.e., a cartoon version of a frowning face). Smiling and frowning faces are used as a culturally appropriate way to indicate valence more generally, as teachers usually stamp a smiling face to indicate that a child has done a good job. The use of only pictorial stimuli eliminates the need for young children to read any test materials or pay attention to audio materials. It also rules out the possibility of language-specific effects (Danziger & Ward, 2010). The adaptations are similar to what researchers have done to examine other kinds of implicit bias in young children, such as the association between gender and mathematics (Cvencek, Greenwald, & Meltzoff, 2011) and between positivity and thin body shape (Thomas, Burton Smith, & Ball, 2007).

Another advantage of the IRBT is that it reduces cognitive demands for young children. Unlike the IAT, the IRBT requires only the processing of category stimuli (rather than processing attribute and category stimuli simultaneously). It also only requires participants to keep in mind the relationship between the attribute (smile or frown) and the category (race). In contrast, the IAT requires participants to consider which button to push in addition to the associations between the attributes and categories. The IRBT additionally allows for own-race positivity effects and other-race negativity effects to be independently measured because children are given separate smile versus frown responses for individuals of both stimulus races being tested.

Using child-friendly, IAT-variants, racial bias has been documented among 6-year-old children (Baron & Banaji, 2006; Steele, George, Williams, & Tay, 2018), or even in younger participants (Qian et al., 2016; Setoh et al., 2019). However, to date, we know very little about whether early emerging implicit biases change across development. This is because most of the existing developmental studies on implicit racial bias have included samples with relatively narrow age ranges (Baron & Banaji, 2006; Degner & Wentura, 2010; Dunham et al., 2006; Dunham, Baron, & Banaji, 2007; Dunham, Newheiser, Hoosain, Merrill, & Olson, 2014; Newheiser, Dunham, Merrill, Hoosain, & Olson, 2014; Newheiser & Olson, 2012; Steele et al., 2018), or ones that have only included young children and adults (Qian et al., 2016).

One study that did examine implicit bias over an extended age range was conducted by Dunham et al. (2013). Findings indicated that levels of implicit bias in young children were indistinguishable from those of adults in both the U.S. and Taiwan, and that this finding held for members from both socially dominant majority and disadvantaged minorities (Dunham et al., 2013). However, findings by Dunham et al. (2006) raise the possibility that there may sometimes be age-related changes in implicit bias. In this research, Japanese children started out with similar levels of anti-Black and anti-White bias and showed an age-related decline in anti-White but not anti-Black bias (Dunham et al., 2006, Study 2).

The present study therefore addresses the question of possible changes in implicit bias over development. We do so by assessing individuals from early childhood to adulthood (4- to 19-year-olds). We also concurrently examine developmental changes in both implicit and explicit racial biases to obtain a more comprehensive understanding of how bias development proceeds from early childhood to adulthood.

Prior research suggests that by preschool age, children already associate race and wealth (an indicator for social status) and prefer racial groups who are rich (Mandalaywala, Rhodes, & Tai, 2019; Newheiser et al., 2014; Olson, Shutts, Kinzler, & Weisman, 2012; Rudman, Feinberg, & Fairchild, 2002). Chen, Corrieve, Lai, Poon, and Gaither (2018) found that 4- to 6-year-olds from Hong Kong preferred higher status outgroup Whites to lower status outgroup Southeast Asians. There is also some evidence suggesting that children’s preference for high status individuals relates to their racial preferences: Newheiser and Olson (2012) found that 7- to 11-year-old Black American children’s preference for wealthy people was associated with an implicit preference for Whites (see also Newheiser et al., 2014). However, it remains unknown how perceived social status might affect the developmental trajectories of racial biases.

In the present study, we investigated a Chinese sample to examine potential social status effects by choosing two other-race outgroups of both higher status and lower status: Whites and Blacks. Qian et al. (2016) found that Chinese 3- to 5-year-olds showed the same level of implicit bias against Blacks and Whites, but that Chinese adults showed implicit bias against Blacks, although not against Whites. Studying a Chinese sample allowed us to ask whether patterns of bias differed as a function of the perceived relative status of Blacks versus Whites: this follows
from previous research suggesting that Chinese adults view Whites as having higher status (e.g., higher-status jobs, higher education levels, and richer) than Chinese, and Blacks as having lower status (e.g., lower-status jobs, lower education levels, and less wealthy) than Chinese (Qian et al., 2016).

Moreover, the historical and sociological context in China provided us with a unique way to address the role of status in the developmental pattern of racial bias. First, the difference in skin color between White and Black people is perceived to be related to beauty and social status. The link between “white skin” and social status is deeply rooted in traditional Chinese culture and Chinese people’s beliefs about beauty (Li, Min, Belk, Kimura, & Bahl, 2008). Not only does skin lightness affect perception of beauty, but it is also associated with job prospects, social status, and earning potential (Ashikari, 2003; Goon & Craven, 2003). White skin is associated with wealth, higher social-status jobs, and higher educational levels, while dark skin is associated with traditionally lower social status markers (Hall, 1992; Qian et al., 2016; Sautman, 1994). In addition, Chinese people have long held negative stereotypes about Black people, viewing them as relatively unintelligent and uninterested in education (Sautman, 1994). The portrayal of White and Black stereotypes through social media likely also strengthens race-based social status associations. For example, Whites are portrayed as working in more professional occupations, living in more upscale communities, and engaging with more advanced technologies, as compared with Blacks.

Another reason why we chose a Chinese sample is because relatively limited research has examined the development of racial biases in individuals growing up in racially homogeneous and non-Western countries (Fiske, 2017; Nielsen, Haun, Kärtner, & Legare, 2017; Waxman, 2012). China is a highly, racially homogeneous society where over 92% of the population is Han Chinese. Investigating the development of racial biases among Chinese individuals living in China can reveal the extent to which an almost complete lack of direct exposure to other-race individuals affects the development of racial biases.

Children’s implicit bias was assessed with the IRBT, a bias measure that has been validated across different cultures and ages (Qian, Heyman, Quinn, Fu, & Lee, 2017; Qian et al., 2016; Setoh et al., 2019). Explicit racial bias was measured with a forced-choice task in which individuals were asked to report on their preferences for interacting with own-race versus other-race individuals (Qian et al., 2016; see similar tasks in Baron & Banaji, 2006; Shutts, Kinzler, Katz, Tredoux, & Spelke, 2011). Perceived social status of different races was measured by a wealth-matching task (Dunham et al., 2014; Olson et al., 2012; Shutts, Brey, Dornbusch, Slywotzky, & Olson, 2016), in which participants were asked to match people from different races with higher- or lower-status belongings.

Based on the existing developmental literature on implicit and explicit racial biases among children (Dunham, Baron, & Banaji, 2008; Hailey & Olson, 2013) and adults (Baron & Banaji, 2006; Dunham et al., 2006), we first hypothesized that implicit anti-Black and anti-White biases would be evident by age 4 years. Second, we hypothesized that these biases would diverge with increased age, with the anti-Black bias remaining the same across all ages but anti-White bias decreasing with age, due to the perceived differences in social status between Blacks and Whites (Qian et al., 2016). Third, we hypothesized that explicit anti-Black and anti-White biases would decline with increased age (after emerging as early as age 4). Finally, we did not anticipate that implicit and explicit racial biases would be significantly correlated. This prediction was based on previous work showing a lack of correlation (Baron & Banaji, 2006; Dunham et al., 2006; Qian et al., 2016), and evidence that bias-reduction methods have differential effects on reducing implicit and explicit racial biases (Aboud, 2003; Gonzalez, Steele, & Baron, 2017; Qian et al., 2017a, 2017b).

Method

Participants

The final sample consisted of 200 Chinese participants (92 males, 108 females). Participants were recruited from a kindergarten, elementary school, middle school, and high school in a medium-size city in East China, in which Han Chinese (the majority ethnic group) represents 99% of the local population. Families of the participants were from diverse socioeconomic backgrounds (parental education level ranged from Grade 9 to postgraduate level, with the median level being Grade 12). Participants ranged in age from 4.0 to 22.3 years. More detailed age information regarding the participants is provided in Table 1.

A priori power analysis by G*Power (Cohen, 2013) indicated that 162 participants were needed in total and that 27 participants in each age group were needed to have 98% power for detecting a medium-sized effect (.25) when employing the traditional .05 criterion of statistical significance, for the within-between repeated measures ANOVA. However, we received more informed consents than were planned. The additional participants were tested per our university research ethics policy. Their data were included in the subsequent analyses.

We asked teachers in each sampled class whether children in their class had any direct contact with Black or White people, and all reported that they had not. Additionally, we asked adults the following question: “Have you had any direct contact with Black or White people?” All responded that they had none. Adult participants were given written consent prior to their participation and were compensated for their participation. Informed consent was obtained from all parents or legal guardians, and oral assent was obtained from all child participants. The study was approved by the Zhejiang Normal University Research Ethics Review Committee (“The Development of Racial Attitudes: Cognitive and Social Factors, Intervention Approaches”).

Table 1

<table>
<thead>
<tr>
<th>Age groups</th>
<th>N (male)</th>
<th>Mean age</th>
<th>Age range</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year-old</td>
<td>44 (16)</td>
<td>4.6</td>
<td>4.0–5.0</td>
</tr>
<tr>
<td>7-year-old</td>
<td>30 (13)</td>
<td>7.5</td>
<td>7.0–8.0</td>
</tr>
<tr>
<td>10-year-old</td>
<td>36 (18)</td>
<td>10.5</td>
<td>10.0–11.6</td>
</tr>
<tr>
<td>13-year-old</td>
<td>30 (19)</td>
<td>13.5</td>
<td>13.1–14.1</td>
</tr>
<tr>
<td>16-year-old</td>
<td>30 (15)</td>
<td>16.6</td>
<td>15.6–17.5</td>
</tr>
<tr>
<td>19-year-old</td>
<td>30 (11)</td>
<td>19.5</td>
<td>17.9–22.3</td>
</tr>
</tbody>
</table>
Procedure and Materials

Participants were tested individually in a quiet room at their school (or university for the 19-year-olds). Two female Chinese graduate students tested all participants in Mandarin.

**Measure of implicit racial bias.** Chinese children’s implicit bias was measured by the IRBT (Qian et al., 2016), adapted from the IAT (Greenwald et al., 1998). The IAT assesses how quickly positive and negative attributes are associated with own- versus other-race (Greenwald et al., 1998, 2003).

For the present study, the Chinese-Black IRBT and the Chinese-White IRBT were used to examine the biases of Chinese participants toward Blacks and Whites, separately. In particular, the Chinese-Black IRBT examined differences in RT to map Chinese and Black faces onto smiling and frowning symbols. Participants viewed Black and Chinese faces on Microsoft Surface Pro 2.0 with a touch screen, using E-prime 2.0 (Psychology Software Tools, Sharsburg, PA). They were instructed to touch either the smile or frown symbol when they saw a face from a particular race. The IRBT consists of two blocks: For “congruent” blocks, participants were instructed to touch the smile symbol when they saw a Chinese face and to touch the frown symbol when they saw a Black face. For the “incongruent” blocks, they were instructed to do the reverse. Half of the participants started with a congruent block, and the other half started with an incongruent block. The Chinese-White IRBT was identical to the Chinese-Black IRBT except that Black faces were replaced by White faces.

Color photos of 20 Chinese faces (10 females and 10 males) and 20 Black faces (10 females and 10 males) were used as stimuli in the Chinese-Black IRBT. A different set of color photos of 20 Chinese faces (10 females and 10 males) and 20 White faces (10 females and 10 males) were used as stimuli in the Chinese-White IRBT. All photos were chosen from an existing face database (Ge et al., 2009), standardized at 480 pixels (17 cm) wide and 600 pixels (21 cm) high, and had a resolution of 72 pixels per inch. The face images were frontal view without obvious marks such as beards, glasses, or facial makeup. Further, the faces were chosen according to the results of a rating experiment in which all faces in the database were rated in terms of attractiveness by Chinese adults who did not participate in the current study. There was no significant difference between the Chinese and Black faces, or between the Chinese and White faces, all $t < .69$, $p > .48$. All faces were overlaid with the same elliptical shape so that hair was not visible.

**Measure of explicit racial bias.** Explicit racial bias was measured with a forced-choice task in which children were asked to report their preference for interacting with own-race versus other-race individuals (Qian et al., 2016; see similar tasks in Baron & Banaji, 2006; Shutts et al., 2011). In this task, children were asked to report their preference between an own-race Chinese face and an other-race Black face in the Chinese-Black set or between an own-race Chinese face and an other-race White face in the Chinese-White set.

Four contexts were presented: summer camp counselor in Scenario 1 (e.g., Imagine that you are going to a summer camp. In the camp, you can choose one person to be your counselor. Which one would you like to choose?); birthday cake in Scenario 2 (e.g., Imagine that today is your birthday. After you blow out the candles and make a wish, you get to cut the birthday cake. Who do you want to give the first slice of cake to?); tour guide in Scenario 3 (e.g., Your mother will take you on vacation. On your trip, you can choose one person as your travel guide. Which one would you like to choose?); and swimming coach in Scenario 4 (e.g., This summer, your mother will take you to a swimming class. In the class, you can choose one person to coach you to swim. Which one would you like to choose?). These scenarios were presented in a random order for each participant. Own- and other-race individuals were represented using cartoon faces.

**Measure of perceived social status.** Previous research has established that Chinese people view Whites as having higher status than Chinese and Blacks (Qian et al., 2016). In that research, social status was assessed by asking participants about educational level and occupational status. Because our goal in the present research was to find a measure of social status that could be effectively used across the wide age span we tested, and because the earlier measure is not appropriate for young children, we used an alternate measure that is appropriate for young children. The measure, adapted from Olson et al. (2012), consisted of a matching task that assessed whether children are more likely to associate expensive versus inexpensive possessions (a large house vs. a shack; a new car vs. a used car) with individuals of different races.

The matching task consisted of eight trials: Four trials included photographs of an own-race Chinese and an other-race Black, and the other four trials included photographs of an own-race Chinese and an other-race White. The matching task also included photographs of houses and cars. Expensive houses were large and fancy, while inexpensive houses were small and broken down. Similarly, expensive cars were fancy and new, while inexpensive cars were old and broken down. On each trial, the experimenter presented participants with one low-wealth belonging alongside one high-wealth belonging. The experimenter pointed to each house/car and said “See this house (or car)?” Then the experimenter showed participants photographs of an own-race Chinese person and an other-race Black person in the Chinese-Black comparison, or an own-race Chinese person and an other-race White person in the Chinese-White comparison. Participants were finally asked to put the person in their house (on trials showing two houses) or to put the person with their car (on trials showing two cars). The photos appeared below the houses/cars and were arranged vertically so that each photo was equidistant from each of the houses/cars.

Results

**Implicit Racial Bias**

Consistent with procedures from previous IAT studies with adults (Greenwald et al., 2003) and children (Cvencek et al., 2011), eight children (seven children in the 4-year-old group and one in the 7-year-old group) were excluded due to excessive errors above 30%, leaving 192 participants to be included in the analyses. We used the standard D score to measure implicit racial bias as in previous research (Greenwald et al., 2003). The D score is the difference between the average responses latencies between contrasted pairings divided by standard deviation of response latencies across the pairings (Greenwald et al., 1998, 2003). The D score measured by the IRBT reflects ingroup preference and outgroup dislike concurrently, given how it is calculated as below in Equation 1a and 1b.
Developmental change in implicit racial bias. To examine developmental change in implicit racial bias, we conducted correlation analyses between age and implicit racial bias scores. Results indicated that there was a negative correlation between age and implicit anti-White bias, \( r(191) = - .223, p = .002 \), but no significant correlation between age and implicit anti-Black bias, \( r(192) = - .006, p = .932 \). These results suggest that children's implicit anti-Black bias remained stable with increased age, while their implicit anti-White bias declined with age.

To further examine the fine-grained development of implicit racial biases in Chinese toward Blacks and Whites, we divided participants into six evenly distributed age groups, and conducted a 6 (Age Group: 4-, 7-, 10-, 13-, 16-, and 19-year-old) × 2 (Race: Chinese-Black vs. Chinese-White) repeated measures ANOVA with age group as a between-subjects variable and race as a within-subjects variable. For the Chinese-Black set, Chinese participants showed strong implicit anti-Black bias and this bias did not change with increased age. For the Chinese-White set, Chinese participants did not show implicit anti-White bias, all \( p > .05 \).

Outgroup negativity was calculated by the difference between ingroup positivity and outgroup negativity. For the Chinese-Black IRBT, ingroup positivity was calculated by the difference between response latencies across these pairings. We conducted correlation analyses between age and ingroup positivity, and between age and Black negativity. We did not find significant correlations between age and ingroup positivity, \( r(192) = .05, p = .525 \), or between age and Black negativity, \( r(192) = -.07, p = .332 \).

To further examine developmental change, we conducted a one-way ANOVA on Chinese positivity and Black negativity. We did not find a main effect of age on Chinese positivity, \( F(5, 186) = 1.04, p = .398 \), partial \( \eta^2 = .03 \), or on Black negativity, \( F(5, 186) = .51, p = .765 \), partial \( \eta^2 = .01 \). These results suggest that Chinese positivity and Black negativity did not change with increased age.

To additionally assess whether participants in each age group showed significant Chinese positivity and Black negativity, we performed one-sample t tests to compare Chinese positivity and Black negativity scores against zero (no bias). Results indicated that all age groups showed reliable Chinese positivity, all \( t > 3.43, p < .002 \), Cohen’s \( d > .51 \), and Black negativity, all \( t > 2.95, p < .01 \), Cohen’s \( d > .48 \). However, 13-, 16-, and 19-year-olds did not show significant anti-White bias, all \( t < 1.01, p > .295 \), Cohen’s \( d < .18 \). The mean D scores and standard errors for the different age groups in the Chinese-Black IRBT and Chinese-White IRBT are shown in Figure 1.
Chinese positivity and White negativity. For the Chinese-White IRBT, ingroup positivity was calculated in the same way as in the Chinese-Black IRBT. Outgroup negativity was calculated by the difference between White-Positive associations and White-Negative associations, divided by the standard deviation of response latencies across these pairings.

Results of the Pearson correlation indicated that there was a negative correlation between age and implicit ingroup positivity, r(191) = −.176, p = .014, suggesting that children showed a decrease in implicit Chinese positivity with increased age when the outgroup was White. However, we did not find a significant correlation between age and White negativity, r(191) = −.121, p = .094.

To further probe developmental change, we conducted a one-way ANOVA on Chinese positivity and White negativity. We found a main effect of age on Chinese positivity, F(5, 185) = 2.37, p = .041, partial η² = .06, but not on White negativity, F(5, 186) = 1.66, p = .148, partial η² = .04. Post hoc testing (LSD) revealed that this significant difference was due to the fact that 13-, 16-, and 19-year-old children had significantly lower Chinese positivity when compared to 7- and 10-year-old children, all ps < .042. These results suggest that the main developmental changes in children’s bias against Whites were driven by the decline in their Chinese positivity when the outgroup was White.

One-sample t tests to compare Chinese positivity and White negativity scores against zero (no bias) indicated that 4-, 7-, and 10-year-olds showed reliable implicit Chinese positivity and White negativity, all ts > 2.25, ps < .033, Cohen’s ds > .42, but 13-, 16-, and 19-year-olds did not show a significant implicit Chinese positivity, ts < 1.15, ps > .26, or White negativity, ts < 2.01, ps > .06. The mean D scores and standard errors for Chinese positivity and White negativity in the Chinese-White IRBT are shown in Figure 2.

Taken together, we found ingroup preference and outgroup dislike by age 4 and that these tendencies were affected both by age and the race of outgroup: Ingroup preference decreased with age when the outgroup was Whites but remained stable when the outgroup was Blacks. Similarly, outgroup dislike decreased with age when the outgroup was Whites but remained stable when the outgroup was Blacks.

Explicit Racial Bias

The choice of participants for the own-race (Chinese) adult over the other-race adult (Black or White) was coded as 1 and their choice of the other-race (Black or White) adult over the own-race (Chinese) adult was coded as −1 for each of the four scenarios in both the Chinese-Black set and Chinese-White set. The scores were added up and divided by 4, with 0 as the no-bias score.

To examine developmental change in explicit racial bias, we conducted correlation analyses between age and explicit racial bias scores. Results of the Pearson correlation indicated that there was a negative correlation between age and explicit anti-Black bias, r(192) = −.189, p = .009, and between age and explicit anti-White bias, r(192) = −.209, p = .004. These results suggest that children’s explicit anti-Black and anti-White biases declined with increased age.

To further evaluate developmental change in explicit racial biases toward Blacks and Whites, we divided participants into six evenly distributed age groups and conducted a 6 (Age Group: 4-, 7-, 10-, 13-, 16-, and 19-year-old) × 2 (Race: Chinese-Black vs. Chinese-White) repeated measures ANOVA on the explicit racial bias scores of the participants with age group as a between-subjects factor and race as a within-subject factor. Results showed a main effect of race, F(1, 186) = 4.41, p = .037, partial η² = .02, indicating that Chinese showed a stronger bias against Blacks (M = 31, SE = .05) than Whites (M = .18, SE = .05). There was also a significant main effect of age group, F(5, 186) = 2.92, p = .015, partial η² = .07. Post hoc testing (LSD) revealed that this significant effect was due to the 4-year-old children having significantly higher explicit bias than older age groups, all ps < .026. However, the interaction between race and age group was not significant, F(5, 186) = .29, p = .917, partial η² = .008. These outcomes indicate a decline in explicit racial bias with increased age.

To also consider whether participants in each age group had significant explicit racial bias, we performed one-sample t tests to compare each age group’s mean explicit score against zero (no bias). Means and standard errors of the explicit bias scores for Chinese faces over Black faces and White faces are presented in Figure 3. Results on explicit anti-Black bias showed that 4-, 7-, 10-, and 13-year-olds showed significant explicit anti-Black bias, all ts > 2.24, ps < .032, Cohen’s ds > .38, and that 16- and 19-year-olds did not show explicit anti-Black bias, all ps > .060. Results on explicit anti-White bias showed that 4-, 7-, and 10-year-old children showed significant explicit anti-White bias, all ts > 2.35, ps < .037, Cohen’s ds > .43, and that 13-, 16-, and 19-year-old children showed no explicit anti-White bias, all ts < .87, ps > .256. These results indicate that explicit racial bias begins as early as age 4 and disappears around age 13. Moreover, the findings suggest that both explicit anti-Black and anti-White biases declined with increased age.
Correlation Between Implicit and Explicit Racial Biases

Pearson analyses were conducted to examine the correlations between implicit anti-Black and explicit anti-Black biases, and between implicit anti-White bias and explicit anti-White biases, for each age group. We found no significant correlations between the implicit and explicit biases against Blacks or Whites (see results in Table 2).

We also found the following partial correlations, when controlling age on the relationship between implicit and explicit racial bias against Blacks, $r(189) = .08, p = .279$, and when controlling age on the relation between implicit and explicit racial bias against Whites, $r(188) = -.09, p = .211$.

Perceived Socioeconomic Status (SES)

In the wealth matching task, matching of own-race Chinese with higher status belongings and other-race (Blacks or Whites) with lower status belongings by the participants was scored as “1,” and matching of other-race (Blacks or Whites) with higher status belongings and own-race Chinese with lower status belongings was scored as “−1.” Perceived SES scores were added up and divided by 4 with 0 as the baseline score (indicating that Blacks or Whites were perceived to have the same SES as Chinese).

To examine developmental change in perceived social status, we conducted correlation analyses between age and perceived social status. The Pearson correlation indicated that there was a negative correlation between age and perceived social status of Chinese over Blacks, $r(192) = -.27, p < .001$, suggesting that with increased age, children were less likely to perceive Chinese as higher social status than Blacks. We also found a negative correlation between age and perceived social status of Chinese over Whites, $r(192) = -.17, p = .018$, suggesting that with increased age, children were more likely to perceive Whites as higher social status than Chinese.

To further look into developmental change in perceived SES difference in Chinese toward Blacks and Whites, we conducted a 6 (Age Group: 4-, 7-, 10-, 13-, 16-, and 19-year-old) x 2 (Race: Chinese-Black vs. Chinese-White) repeated measures ANOVA with age group as a between-subjects variable and race as a within-subject variable on the perceived SES scores of the participants. Results showed an interaction between age group and race, $F(5, 186) = 10.48, p < .001$, partial $\eta^2 = .29$. We also conducted one-way ANOVAs separately in the Chinese-Black and Chinese-White comparisons. Results showed a main effect of age group in the Chinese-Black comparison, $F(5, 186) = 9.01, p < .001$, partial $\eta^2 = .20$. Post hoc testing (LSD) revealed that 10- and 13-year-olds, when compared with 4-, 7-, 16-, and 19-year-olds, perceived Chinese to have higher SES than Blacks, all $t$s > 2.99, all $p$s < .001, while 16- and 19-year-olds did not, all $t$s < 1.96, all $p$s > .06.

We conducted the same one-way ANOVA for the Chinese-White comparison, and found a significant main effect of age, $F(5, 186) = 17.17, p < .001$, partial $\eta^2 = .32$. Post hoc testing (LSD) revealed that the significant difference was due to the fact that children at 10 and 13 years of age had significantly lower perceived SES scores, when compared with the other age groups, all $p$s < .011. One-sample $t$ tests moreover indicated that 4- and 7-year-olds perceived Chinese to have higher SES than Whites, all $t$s > 2.31, all $p$s < .027, Cohen’s $d$s > .39, 10- and 13-year-olds perceived Whites to have higher SES than Chinese, all $t$s > −12.99, all $p$s < .001, Cohen’s $d$s > .36, and 16- and 19-year-olds perceived no difference in SES between Chinese and Whites, all $t$s < .53, all $p$s > .256, Cohen’s $d$s < .09. The perceived SES scores and standard errors for the different age groups in the Chinese-Black and Chinese-White comparisons are shown in Figure 4.

Regression Analysis of Racial Bias

Regression analysis of implicit racial bias. To better understand the factors that affect developmental change in implicit racial bias, we conducted separate regression analyses. For each regression analysis, we entered the gender of the participants in the first step, age in the second step, and perceived socioeconomic status in the third step (see Table 3).

Implicit bias against Blacks. The regression analysis with Chinese children’s implicit racial bias against Blacks as the dependent variable revealed no significant effects in the first step, $\Delta F(1, 190) = .49, p = .49$; second, $\Delta F(1, 189) = .02, p = .90$; or third step, $\Delta F(1, 188) = .36, p = .55$. These outcomes suggest that...

Table 2: Correlations Between Implicit and Explicit Racial Biases for Each Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Correlations between implicit and explicit anti-Black biases</th>
<th>Correlations between implicit and explicit anti-White biases</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year-old</td>
<td>$r = -.06, p = .740$</td>
<td>$r = -.004, p = .980$</td>
</tr>
<tr>
<td>7-year-old</td>
<td>$r = .33, p = .085$</td>
<td>$r = -.13, p = .513$</td>
</tr>
<tr>
<td>10-year-old</td>
<td>$r = -.11, p = .507$</td>
<td>$r = -.07, p = .673$</td>
</tr>
<tr>
<td>13-year-old</td>
<td>$r = .30, p = .108$</td>
<td>$r = -.004, p = .985$</td>
</tr>
<tr>
<td>16-year-old</td>
<td>$r = -.05, p = .778$</td>
<td>$r = -.09, p = .626$</td>
</tr>
<tr>
<td>19-year-old</td>
<td>$r = .13, p = .49$</td>
<td>$r = -.24, p = .197$</td>
</tr>
</tbody>
</table>
children from 4 years of age show strong implicit anti-Black bias, and that such bias remains stable throughout the development.

**Implicit bias against Whites.** The same regression analysis with Chinese children’s implicit racial bias against Whites as the dependent variable revealed no significant effects in the first step, $\Delta F(1, 189) = .35, p = .56$. However, the second step accounted for a significant proportion of variance, $\Delta F(1, 188) = 9.63, p = .002$. Age was a significant predictor, $\beta = -.221, p = .002$, part correlation $= -.22$, suggesting that with increased age, children displayed less implicit racial bias against Whites. The third step accounted for a nonsignificant proportion of variance, $\Delta F(1, 187) = .69, p = .41$. These results indicate that children display strong implicit anti-White bias at age 4, and that such bias declines with increased age.

**Regression analysis of explicit racial bias.** We conducted the same regression analyses for children’s explicit racial bias. For each regression analysis, we entered the gender of the participants in the first step, age in the second step, and perceived SES in the third step (see Table 4).

**Explicit bias against Blacks.** The regression analysis with Chinese children’s explicit racial bias against Blacks as the dependent variable revealed no significant effects in the first step, $\Delta F(1, 190) = .55, p = .461$. However, the second step accounted for a significant proportion of variance, $\Delta F(1, 189) = 7.25, p = .008$. Age was a significant predictor, $\beta = -.192, p = .008$, part correlation $= -.19$, suggesting that with increased age, children displayed less explicit racial bias against Blacks. The third step also accounted for a significant proportion of variance, $\Delta F(1, 188) = 14.19, p < .001$. Children’s perceived SES was a significant predictor, $\beta = 27, p < .001$, part correlation $= .27$. Thus, the results suggest that the perception that Chinese had higher social status than Blacks was linked to stronger explicit anti-Black bias.

**Explicit bias against Whites.** The same regression analysis with Chinese children’s explicit racial bias against Whites as the dependent variable revealed no significant effects in the first step, $\Delta F(1, 190) = .006, p = .93$. However, the second step accounted for a significant proportion of variance, $\Delta F(1, 189) = 8.72, p = .004$. Age was a significant predictor, $\beta = -.210, p = .004$, part correlation $= -.21$, suggesting that with increased age, children displayed less explicit racial bias against Whites. The third step additionally accounted for a significant proportion of variance, $\Delta F(1, 188) = 6.67, p = .011$. The significant predictors are children’s age, $\beta = -.24, p = .001$, part correlation $= -.24$, and perceived SES, $\beta = .19, p = .011$, part correlation $= .19$. These results suggest that the perception that Chinese had higher social status than Whites was linked to stronger explicit anti-White bias.

In summary, the regression analysis on the implicit racial bias measure suggests that implicit anti-Black bias remains stable throughout development while implicit anti-White bias declines with increased age. Our results also suggest that explicit anti-Black and anti-White biases both decline with increased age, and that the perception that Chinese have higher social status than Blacks (or Chinese over Whites) is positively related to increased explicit anti-Black (or Anti-White) bias.

**Discussion**

We investigated age-related changes in implicit and explicit racial biases among Chinese participants who ranged in age from 4 to 19 years. In doing so, we systematically examined perceptions of two racial outgroups with which our participants had no direct contact: Whites, who are viewed as having higher status than Chinese, and Blacks, who are viewed as having lower status than Chinese (Qian et al., 2016). We found that implicit bias against both groups was evident at age 4 and that implicit anti-Black bias remained stable over time, while implicit anti-White bias declined with increased age. We also found that explicit anti-Black and anti-White biases emerged at age 4 and declined with age.

Our findings that both anti-Black and anti-White implicit biases were already in place by age 4 are consistent with previous research suggesting that implicit ingroup preference starts as young as 3 years of age (Dunham et al., 2013; Qian et al., 2016;...
Setoh et al., 2019). It is also notable that anti-Black and anti-White implicit biases were at comparable levels at age 4, which is consistent with other findings suggesting that young children show similar levels of implicit bias for different outgroups (Dunham et al., 2006; 2013; Qian et al., 2016). In contrast, we found that after age 10, implicit anti-Black bias remained stable while implicit anti-White bias receded. This is consistent with evidence suggesting that implicit biases for some outgroups decline with age (Dunham et al., 2006; Qian et al., 2016). However, our findings differ from the age-invariant pattern observed in Taiwanese 4- to 12-year-olds and adults (Experiment 3 in Dunham et al., 2013). The difference may be a function of the different measures of implicit bias: Unlike the IRBT that was used in the present research, Dunham et al. (2013) used a task in which children categorized ambiguous computer-generated faces with affective attributes (i.e., happy or angry) as Blacks or Whites.

Why did we observe a decline in implicit anti-White bias that was not seen with the implicit anti-Black bias? An increasing awareness of socioeconomic status differences with age is likely one important reason, given that individuals tend to prefer social groups with higher social status (Dunham et al., 2013; Horwitz, Shutts, & Olson, 2014). Previous work that has assessed social status by measuring perceptions of income and education level, suggests that the groups are viewed differently: Chinese adults in China report perceiving Whites to have higher social status than Chinese, and Chinese to have higher social status than Blacks (Qian et al., 2016). These findings, along with the age-related trajectory in implicit bias in the present research, suggest that positive status associations may lead to a reduction in bias. Additional evidence pointing to the importance of social status can be seen from a comparison of Figures 1 and 4: Shifts in both implicit and perceived social status are most pronounced between age 10 to 13.

Although implicit anti-White bias declined at around the same age that participants started viewing Whites as having higher social status than Chinese, there was no significant correlation between perceived social status of the individual participants and their implicit racial bias. This null result suggests that social status cannot explain the individual differences in implicit bias and that it cannot fully account for the patterns of age-related changes in implicit bias that we observed. Other developing cognitive abilities such as perspective taking (Todd, Bodenhausen, Richeson, & Galinsky, 2011), different levels of exposure to people from different races (Chen et al., 2018; Qian et al., 2017a, 2017b), and cultural learning (Rudman, 2004; Skinner & Meltzoff, 2018), might also contribute. Future studies are needed to examine the role of these factors across development.

In addition to addressing our main research questions, analyses were conducted to separate out the developmental trajectories of ingroup positivity and outgroup negativity. We found that implicit ingroup positivity exists starting as early as age 4 regardless of the race of outgroup, which is consistent with previous research (Dunham et al., 2008; Williams & Steele, 2017). We also found evidence of outgroup negativity toward Blacks and Whites by age 4, a finding which differs from some previous work indicating a lack of such negativity in preschool- and school-age children (Bettelmann & Böhm, 2014; Degner & Wentura, 2010; Williams & Steele, 2017).

Along with the early development of implicit racial bias, we found evidence of an early emergence of explicit racial bias against both Whites and Blacks. Moreover, unlike the diverging developmental patterns of change in implicit bias, both explicit anti-Black and anti-White biases declined with increased age. These findings are consistent with prior work suggesting that explicit racial bias undergoes a steady decline with age, and disappears by around age 12 (Baron & Banaji, 2006; Dunham et al., 2006; Rutland et al., 2005; see Raabe & Beelmann, 2011, for a meta-analysis). The decline of explicit racial bias could be due to cognitive, social, or moral development, or some combination (Killen, Hitti, & Mulvey, 2015; Rutland & Killen, 2015). For example, the development of children’s sense of fairness might override their racial bias against other-race individuals when making decisions about resource allocation with ingroup and outgroup members (McAuliffe & Dunham, 2017). Other factors like the developing ability to reason about the mental states of other social groups (Abrams & Rutland, 2008), and the ability to control the expression of bias (FitzRoy & Rutland, 2010; Rutland & Killen, 2015) may also contribute to the observed decline in explicit racial bias. For example, Rutland et al. (2005) showed that when 5- to 16-year-olds are told that they will be video-recorded while completing bias assessments, self-presentation was less biased. FitzRoy and Rutland (2010) further found that 6- to 9-year-olds high in social emotions (e.g., theory of social mind; Abrams, Rutland, Pelletier, & Ferrell, 2009) showed lower intergroup bias, thus pointing to affective and social–cognitive contributions in the control of ethnic bias.

Our findings additionally speak to important questions about the development of social status evaluations. We found that Chinese children between ages 4 and 7 regarded Chinese to be of higher social status than both Blacks and Whites. However, with in-

Table 4
Summary of Hierarchical Multiple Regression Analysis for Variables Predicting Explicit Racial Bias Against Blacks and Whites

<table>
<thead>
<tr>
<th>Variables</th>
<th>Explicit anti-Black bias</th>
<th></th>
<th></th>
<th>Explicit anti-White bias</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>$F$ for $\Delta R^2$</td>
<td>$B$</td>
<td>$SE (B)$</td>
<td>$\beta$</td>
<td>$\Delta R^2$</td>
</tr>
<tr>
<td>Step 1</td>
<td>.003</td>
<td>.55</td>
<td>-03</td>
<td>.05</td>
<td>-05</td>
<td>.000</td>
</tr>
<tr>
<td>Gender</td>
<td>.037</td>
<td>7.25**</td>
<td>-.01</td>
<td>.004</td>
<td>-19**</td>
<td>.044</td>
</tr>
<tr>
<td>Step 2</td>
<td>.067</td>
<td>14.19***</td>
<td>.30</td>
<td>.08</td>
<td>.27***</td>
<td>.033</td>
</tr>
<tr>
<td>Step 3</td>
<td>Perceived SES of Chinese over Other-race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05. **p < .01. ***p < .001.
creased age, children between ages 7 and 13 regarded Chinese to be higher in social status than Blacks, but lower in social status than Whites. These results are consistent with previous findings showing that third and fifth grade White American children systematically believe that Black children are poor (Radke & Trager, 1950; Zinser, Rich, & Bailey, 1981). Our results raise an important question about how children come to form associations between race and wealth after age 7. Children might learn race-based differences from media portrayals describing Whites as working in more professional occupations, living in more upscale communities, and engaging with more advanced technologies, as compared with Blacks. Our data further raise the question of how to break race-based social-status associations. Work by Gonzalez, Steele, and Baron (2017) suggests that one possible way to do so is through exposure to exemplars that violate status associations, such as telling children about a Black individual who is an excellent doctor. Gonzalez et al. (2017) found this approach to be successful with older (9- to 12-year-olds) but not younger (5- to 8-year-olds) children, but it may be that the optimal period for intervention depends on the specific intervention strategy used.

Also relevant to the development of social status evaluations was our finding that after age 16, Chinese, Blacks, and Whites were no longer rated as having different social status. We believe that this outcome reflects newly emerging concerns about appearing unbiased or a newly emerging awareness that it is not socially desirable to make status distinctions based on race, at least with reference to associations between expensive and inexpensive properties, as was assessed in the current research. Interestingly, Qian et al. (2016) found that even adults evaluated the racial groups as having different racial status when social status was measured by asking about issues of job status, education, and wealth. We selected a new measure of social status in the present research that would be appropriate to use with young children, and that we had thought would be appropriate to use across the broad span of ages tested in the current research.

As revealed by the hierarchical regression analysis, perceived social status of Chinese over other-race Blacks (and Whites) was linked to stronger explicit anti-Black (and anti-White) biases, a link that was not found at the implicit level. It is possible that views of relative social status offer a means for people to consciously justify their racial preferences (Horwitz et al., 2014; Olson, Dweck, Spellke, & Banaji, 2011). Another potential explanation is that perceived social status and explicit bias share more variance as a function of both being measured through explicit measures based on self-report. For example, both methods might be affected by the same self-presentation concerns.

Consistent with the previous literature, we found that implicit and explicit racial biases were not correlated at any point during development (Baron & Banaji, 2006; Dunham et al., 2006; McConnell & Leibold, 2001; Qian et al., 2016). One possible account of the dissociation is that implicit and explicit racial biases are related but distinct constructs (Nosek, 2005). Implicit racial bias involves unconscious evaluative associations in reaction to race, while explicit racial bias entails prosocial propositional reasoning, such as declaring “I should not say that I have negative feelings toward social groups” (Gawronski & Bodenhausen, 2006). Thus, for explicit bias, but not implicit bias, self-presentation concerns may affect responses (Nosek, 2005, 2007). However, this explanation might not be sufficient to explain the dissociation between the two forms of bias in children, who do show explicit racial bias.

This observation raises the possibility of other moderators for an implicit-explicit link (Hofmann, Gschwendner, Nosek, & Schmitt, 2005; Nosek, 2007; Nosek & Smyth, 2007). For example, the lack of simple, bipolar comparisons between concepts (e.g., liking for Whites does not imply dislike for Blacks) have been found to elicit a weak implicit-explicit correlation (Nosek, 2007). This is because in a bipolar comparison (e.g., pro-choice as the opposite of pro-life), evaluations may be activated more automatically and consistently across different measures and contexts (Bargh, 1994; Judd & Kukil, 1980; Nosek, 2007). It is also possible that implicit and explicit racial biases might be affected by different factors. Implicit racial bias may be influenced to a greater extent by direct perceptual experiences, such as different levels of exposure to own- and other-race faces (Prestwich, Kenworthy, Wilson, & Kwan-Tat, 2008), racial diversity in children’s daily environment (Chen et al., 2018; McGlothlin & Killen, 2006), and the expertise to recognize and differentiate between own- and other-race people (Qian et al., 2017a, 2017b; Xiao et al., 2015). Explicit racial bias, on the other hand, may be more vulnerable to social interactions, such as interracial friendship and social learning from parents and peers (Gawronski & Bodenhausen, 2006; Pettigrew & Tropp, 2006).

The current work helps to disentangle ingroup-outgroup versus social status effects (Dunham et al., 2013, 2014; Newheiser et al., 2014; Olson et al., 2012), and deepens our understanding of bias development in non-WEIRD samples (Henrich, Heine, & Norenzayan, 2010). However, there are limitations that need to be acknowledged. First, methodological variations need to be addressed in the future. For the explicit racial bias task, it will be important to use additional explicit bias measures, given that the method we used has only moderate reliability (α = .63, as reported in Qian et al., 2017a). For the IRBT, more diverse stimulus attributes (e.g., nice and mean personal traits) could be used to better understand the racial concepts the IRBT is capturing, and to directly compare the results of the IBRT and the well-validated Child-IAT. Second, it will be important to examine the role of social status in shaping the development of racial bias among participants from social groups with lower SES to better understand the role of the relative status. Third, work is needed to validate the proposed developmental trajectory using longitudinal designs.

In summary, we found that implicit bias emerged early in development, and showed different developmental patterns for groups perceived to have higher versus lower socioeconomic status. Specifically, implicit anti-White bias disappeared with age while anti-Black implicit bias remained stable. We additionally found that both explicit anti-Black and anti-White bias declined with increased age. Overall, our study has revealed ways in which racial biases for different outgroups can change over an extended period of development, and also highlights the role of social status in these trajectories.

References


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