Hypodescent or ingroup overexclusion?: Children’s and adults’ racial categorization of ambiguous black/white biracial faces

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Funding information
National Science Foundation SBE Postdoctoral Research Fellowship, Grant/Award Number: 2004269; NSF CAREER, Grant/Award Number: BCS-2042433

Abstract: Two processes describe racially ambiguous Black/White Biracial categorization—the one-drop rule, or hypodescent, whereby racially ambiguous people are categorized as members of their socially subordinated racial group (i.e., Black/White Biracial faces categorized as Black) and the ingroup overexclusion effect, whereby racially ambiguous people are categorized as members of a salient outgroup, regardless of the group’s status. Without developmental research with racially diverse samples, it is unclear when these categorization patterns emerge. Study 1 included White, Black, and racially diverse Biracial children (aged 3- to 7-years) and their parents to test how racial group membership and social context influence face categorization biases. To provide the clearest test of hypodescent and ingroup overexclusion, White participants came from majority White neighborhoods and Black participants from majority Black neighborhoods (with Biracial participants from more racially diverse neighborhoods)—two samples with prominent racial ingroups. Study 2 aimed to replicate the parent findings with a separate sample of White, Black, Black/White Biracial, and Asian adults. Results suggest the ingroup overexclusion effect is present across populations early in development and persists into adulthood. Additionally, categorization was meaningfully related to parental context, pinpointing a pathway that potentially contributes to ingroup overexclusion.

KEYWORDS
biracial, children, hypodescent, ingroup overexclusion, racial categorization

RESEARCH HIGHLIGHTS
White, Black, and racially diverse Biracial children and adults tended to categorize racially ambiguous Black/White Biracial faces as racial outgroup members, even if the outgroup was White.
This contradicts most work arguing Black/White Biracial racially ambiguous people are more often seen as Black.
Children use salient physical features such as skin-tone to categorize others racially (Bigler & Liben, 2007). However, categorizing people who do not look like typical members of a racial group (i.e., racially ambiguous individuals) can follow unique patterns (Wilkins et al., 2010). Although not all Biracial people (people with parents of different racial backgrounds; Nishina & Witkow, 2020) are racially ambiguous, this population often blurs singular identity frameworks, influencing categorization differentially (Albuja et al., 2022; Chen, 2019; Pauker et al., 2018). Children and adults often categorize racially ambiguous others consistent with hypodescent and/or ingroup overexclusion (IOE) patterns. Historically, hypodescent, or the "one-drop-rule" in the U.S., whereby one drop of "Black blood" makes an individual Black, was used to maintain slavery, and uphold a racist White supremacist system (Hickman, 1996). Presently, researchers have found remnants of hypodescent when Black/White biracial people are categorized as members of their socially subordinated racial group, though this visual hypodescent is different than historical hypodescent (Hickman, 1996). Alternatively, IOE suggests people are more likely to categorize racially ambiguous individuals as members of a salient outgroup, regardless of the outgroup's status, to maintain clear boundaries between groups (Castano et al., 2002; Yzerbyt et al., 1995).

It is important to understand how diverse children and adults perceive racially ambiguous people because Biracial individuals (who are often more racially ambiguous than monoracial individuals; Chen & Hamilton, 2012) are one of the fastest growing minority populations in the U.S. (Sanchez et al., 2020), and yet it remains unknown whether their categorizations better support hypodescent or IOE. Developmental Intergroup Theory posits that children refer to themselves and their sociocultural environments when categorizing someone as similar or dissimilar to themselves (Bigler & Liben, 2007). Therefore, children from different racial backgrounds and social contexts may employ distinct heuristics when categorizing racially ambiguous faces because they may view an ambiguous other as either one’s ingroup or outgroup. However, because most developmental research on racially ambiguous categorization to date has not tested diverse samples (important exceptions are Dunham et al., 2015; Gaither et al., 2022; Roberts & Gelman, 2015), testing children from varying racial groups and contexts provides a unique opportunity to compare whether hypodescent or IOE is more common. For example, Black perceivers categorizing a White/Black target more often as Black than as another racial group is consistent with hypodescent, while categorizing that target more often as White than as another racial group is consistent with IOE because White is a perceptually salient outgroup in the U.S.

1.1 Hypodescent versus IOE categorizations

Infants can categorize faces by race at 6-months old, and by 9-months old infants are better able to differentiate racial ingroup faces than outgroup faces, similarly to adults (Kelly et al., 2009; Pauker et al., 2016). However, children aged 4- to 9-years-old appear to rely on skin tone more than physiognomy, demonstrating differences in categorization processes between children and adults (Balas et al., 2015; Dunham et al., 2015). Similarly, use of racial labels appears to develop over time, with children aged 3- to 5-years old showing low use of racial labels, while older children aged 6- to 8-years-old reliably categorized others by race using labels such as "White" and "Black" (Lam et al., 2011; Pauker et al., 2016). However, less is known about children's categorization of racially ambiguous faces.

Early research on children's categorization of racially ambiguous faces demonstrates variability consistent with hypodescent and IOE. Work with predominately White children aged 4- to 9-years-old found no evidence of hypodescent when the children categorized novel members of a high or low status non-race related group (Roberts et al., 2020). However, when visually categorizing Black/White Biracial girls as Black or White, White children aged 4- to 13-years-old demonstrated hypodescent while same aged Black children did not show a categorization bias (Roberts & Gelman, 2015).

Cross-cultural categorization research conducted with racial minority children demonstrates how perceivers’ sociocultural contexts may influence children's categorizations of Biracial faces in support of IOE processes. Three to 7-year-old Asian American and Taiwanese children both categorized Black/White Biracial faces more often as White in a force-choice categorization task (Gaither et al., 2022). These findings support IOE over hypodescent, which would have resulted in increased Black categorizations (Gaither et al., 2022). Moreover, Asian/White Biracial faces were categorized differently depending on whether the perceiver was a majority or minority group member. Taiwanese children (who are members of the racial majority group in Taiwan) demonstrated evidence of IOE, categorizing Biracial Asian/White faces more often as White, a salient outgroup. Asian American children (who are members of a racial minority group in the U.S.) showed no bias when categorizing the same faces (Gaither et al., 2022). Additionally, Taiwanese children aged 9- to 12-years-old and Taiwanese adults also demonstrated IOE by categorizing Asian/White Biracial faces more often as White (Chen et al., 2016, 2019). Moreover, a recent meta-analysis of adults’ categorization of racially ambiguous targets found that White participant samples and the use of Black/White Biracial
faces in a dichotomous forced-choice task (i.e., “is this face Black or White?”) increased hypodescent, while racial minority participants did not demonstrate clear evidence of hypodescent (Young et al., 2021). Thus, although hypodescent is commonly cited, IOE may better explain racially ambiguous categorization when both racial-cultural group and context are considered.

1.2 | Child racial cognition

Children’s categorization of racially ambiguous faces could be related to their racial cognition, including their essentialism (i.e., the belief that races are discrete, unchanging categories; Gelman, 2003) and racial constancy (i.e., the belief that racial group membership is permanent; Bigler & Liben, 2007). Research investigating children’s memory of racially ambiguous Black/White biracial faces found White children aged 4- to 9-years-old with higher levels of racial constancy remembered White faces significantly better than Black and racially ambiguous Black/White biracial faces (Gaither et al., 2014). Yet, White children with lower levels of racial constancy remembered White and racially ambiguous Black/White biracial faces significantly better than Black faces (Gaither et al., 2014). Relatedly, children who endorse racial constancy view racial groups as rigid, suggesting they may have clearer boundaries of ingroups and outgroups (Gaither et al., 2022). Because racial constancy and essentialist beliefs promote group boundaries and status differences between groups (Roberts et al., 2017), greater essentialism and racial constancy would likely be associated with categorizing more faces as Black for White participants (consistent with both IOE and hypodescent), and with categorizing more faces as White for Black participants (consistent with IOE).

1.3 | Parental influences

As exploratory measures, the present work examined how parents’ racial-ethnic socialization, essentialism, color evasiveness, and their own racial categorizations relate to children’s categorization. Racial-ethnic socialization, or the messages children receive about race, could shape how racially ambiguous others are perceived because parents’ racial-ethnic socialization of their children relates to children’s perceptions of intergroup relations (Priest et al., 2014). Specifically, Black parents’ racial socialization includes messages promoting racial pride, and preparing children to experience bias (Lesane-Brown, 2006; Williams & Banerjee, 2021). In contrast, though some engage in anti-racism socialization (Gillen-O’Neel et al., 2022; Hagerman, 2017), White parents often do not talk to their children about race (Abaied & Perry, 2021; Brown et al., 2010), and when they do, they often use a color evasive approach, emphasizing that race is not important to acknowledge (Vittrup, 2018). Lastly, Biracial socialization can include similar messages, though other work finds parents socialize their Biracial children to specific racial identities, particularly among Black/White Biracial youth (Atkin & Yoo, 2019). Thus, racial-ethnic socialization could influence how children perceive both their racial ingroups and outgroups, with implications for racial categorizations.

Parents’ racial essentialism and color evasiveness may also relate to how children categorize faces (Rhodes et al., 2012). Research on children’s memory of racially ambiguous faces described above pinpointed racial essentialism as one cognitive mechanism associated with White children’s tendency to see racially ambiguous faces more often as Black than White (Gaither et al., 2014). Thus, parents’ racial essentialism could influence their children’s racial essentialism, and children’s essentialism can influence racially ambiguous face perceptions. Relatedly, color evasive ideology purports that race should be ignored, suggesting people may show no clear categorization bias (Garay & Remedios, 2021).

Lastly, parents’ own categorization of racially ambiguous faces may predict how their children categorize these faces. For example, White kindergarteners’ anti-Black attitudes were predicted by their mother’s implicit prejudice levels (Castelli et al., 2009). Other perceptions of race may be similarly taught implicitly or explicitly through family members. By analyzing how parent and children’s racially ambiguous face categorizations relate to one another, we may uncover implicit racial attitudes in the form of face categorizations in both parents and their children.

1.4 | Intergroup contact

Greater intergroup contact is associated with giving less perceptual weight to outgroup features, as people have greater visual experience with more diverse phenotypic presentations (Anzures et al., 2013). Roberts and Gelman (2015) asked parents to report the racial makeup of each participant’s friend network and neighborhood to evaluate the potential influence of intergroup contact on racially ambiguous face categorization. In both White and Black 4- to 13-year-old children, more reported in-group contact (i.e., White children interacting with White people and Black children interacting with Black people) was associated with greater hypodescent, or categorizing more racially ambiguous Black/White Biracial people as Black. However, Black children with more racial out-group contact increased in likelihood of categorizing the faces as White, demonstrating IOE (Roberts & Gelman, 2015). The present studies measured self-reported and Census-based intergroup contact to explore how exposure to racial outgroup members relates to categorization of racially ambiguous faces.

1.5 | The current studies

The current studies addressed the following research questions: (1) How does categorization of Black/White Biracial racially ambiguous faces vary by participant race? (2) How does child racial cognition (racial constancy, essentialism), parent influence (racial categorization, racial socialization, color evasiveness socialization, essentialism, color
We report all data exclusions, measures, and how sample size was determined. The studies were not pre-registered, but data, analysis code and research materials are available on the Open Science Framework (OSF) at: https://osf.io/che7t/?view_only=89553dfdf8f8649a8b5394e160643185b. Data analysis was conducted using RStudio 2022.03+492 (R Core Team, 2020). The studies received approval from the Institutional Review Board at the authors’ institution.

2 | STUDY 1

2.1 | Participants

Two hundred and forty-five White, Black, and Biracial 3- to 7-year-old children and their parents participated using a department developmental database and a campus-affiliated school in the Chicago, Illinois area. Fifteen participants were out of the age range but were tested anyway because they signed up and 15 participants were excluded ($n = 3$ computer error, $n = 10$ did not follow directions, $n = 2$ no racial information was provided). The responses of 215 participants (Black $n = 61$, 30 female, 31 male, $M_{\text{age}} = 5.0$, $SD = 1.1$; White $n = 71$, 35 female, 36 male, $M_{\text{age}} = 5.1$, $SD = 1.1$; Biracial $n = 83$, 49 female, 34 male, $M_{\text{age}} = 5.1$, $SD = 1.1$) were analyzed. Of the Biracial participants, 16 identified as Black/White Biracial, 28 identified as Asian/White Biracial, 20 identified as White/Latino Biracial, and 19 identified as Dual Minority Biracial (e.g., Black/Asian Biracial). Most parents were mothers (91%) and had a college education or higher (94%). Participating parents racially identified as White ($n = 81$), Black ($n = 65$), Biracial ($n = 24$), and Hispanic ($n = 7$), though racial identification was missing for 38 parents. Most (61%) participating parents of the Biracial children were racial minorities. For a within-subjects design focused on the primary outcome variable of face categorizations, we targeted a minimum of 50 per racial group a priori. Sensitivity power analyses indicated the study was 80% powered to detect minimum effects of $R^2 = 0.08$ in linear regressions, $\eta^2_p = 0.04$ in one-way ANOVAs, and $d = 0.19$ in one-sample t tests.

2.2 | Measures and procedure

Children and parents independently completed all measures using an iPad or laptop.

2.2.1 | Racial categorization

Children and parents first completed four training trials instructing them to categorize unambiguous monoracial Black and White faces from the Chicago Face Database (Ma et al., 2015). Children and parents saw one monoracial White or Black target face and two additional faces below the target, one White and one Black. They were asked, “Look at the top face, which face below does this face look more like?”.

In the 12 experimental trials, children and parents completed the same procedure, but instead saw 12 racially ambiguous Black/White Biracial target faces (six female, six male)\(^1\) with two additional unambiguous racial faces below the target—one White and one Black—and were again asked “which face does this face look more like?”. All Biracial stimuli were photos of actual Black/White Biracial individuals rather than computer-generated or morphed images because real images have higher ecological validity for real-world categorization. All images were pretested on White and Black racial prototypicality, attractiveness, and emotion neutrality to be equivalent on racial ambiguity (see Gaither, Chen, et al., 2019 for stimuli details; two sample faces are on OSF). This set of stimuli includes a range of features that could be seen as either Black or White (e.g., variations in skin tone, hair texture, and lip fullness). Though these stimuli reflect only a subset of the Black/White Biracial population, using a stimuli set of individuals who reflect difficulty in distinguishing between the Black/White binary is an important way to test for hypodescent and IOE. Participants received a score of 0 for faces categorized as White and 1 for Black, in line with common hypodescent measurement (score range 0–12).
2.2.2 | Children’s skin tone perception

As a more variable measurement of biased skin-tone perceptions compared to the forced-choice categorization task, children completed a skin-tone matching task. Across four trials—which included four additional racially-ambiguous Biracial faces not used in the previous task—(two female, two male; see Gaither, Chen et al., 2019 for stimuli details), children saw one face at a time and colored a blank face underneath to match the target face using one of eight crayons from the Crayola Multicultural Crayon set that varied in skin tone. Each crayon increased from White (scored as 1) to Black (scored as 8) across eight distinct skin-tone shades (see materials on OSF). Children’s crayon selections were averaged to create a continuous variable with scores ranging from 1 to 8.

2.2.3 | Children’s racial constancy

Child participants completed a racial constancy measure adapted from previously validated measures (Hirschfeld, 1995; Ruble et al., 2007; Semaj, 1980). Participants saw three faces matched to their gender—one face was a Black or White child target placed above the faces of a Black adult and a White adult (order was counterbalanced across all participants). Participants were asked, “When this child grows up, will they look like this adult [White] or that adult [Black]?” Next, participants saw a picture of a Black or White adult placed above a picture of a Black child and a White child (order counter-balanced) and were asked “When this adult was little, did they look more like this child [White] or that child [Black]?” Lastly, participants saw a picture of a White child and were asked, “If this child really wanted to be Black and change his/her skin color could he/she do that?” and were asked to explain their reasoning. Participants were coded as having racial constancy if they correctly answered the two face categorization questions and their open-ended responses displayed understanding that people’s race does not change (see Gaither, Schultz et al., 2014; Pauker et al., 2010; Ruble et al., 2007 for similar coding strategies). There was no order effect, \( \chi^2(1, N = 178) = 0.99, p = .320 \).

2.2.4 | Children’s essentialism

To examine how rigidly children perceive categories across four domains (e.g., animals, artifacts, gender, and race), participants completed a category comparison task adapted from Rhodes and Gelman (2009) and Kalish (1998). Children were introduced to a puppet named Feppy, saw two pictures belonging to the same domain, and were asked to determine if the pictures belonged to the same category. For example, in the race trial, participants saw pictures of a White and Black child and were told “Feppy and his friends say these are the same kinds of people. Are they maybe right?” This question was asked similarly for the three other domains (e.g., dog vs. cat, car vs. train, boy vs. girl). In instances where children essentialized the domain category and said the two pictures were not the same kind of animals/things/people (e.g., a White and Black child are not considered the same kind of person), they were scored a “0.” Alternatively, when participants were more flexible in their interpretation of categories (e.g., a White and Black child could potentially be considered the same kind of person), they were scored a “1.” Therefore, higher scores indicated fewer essentialist category judgments across 16 trials (4 per category; see Rhodes & Gelman, 2009a).

2.2.5 | Parent racial-ethnic socialization

Parents reported the racial-ethnic socialization of their child (e.g., how often they read their child racially diverse books, use racially diverse toys, talk about racial issues) through seven items. Participants responded using a scale of 1 (never) to 5 (very often), with items averaged to create a reliable scale (\( \alpha = 0.73 \)).

2.2.6 | Parent color-evasive socialization

Parents reported how often they talk to their children using color-evasive socialization through four items (see Apfelbaum et al., 2008; Neville et al., 2000 for further details; e.g., “That people are equal regardless of their racial or ethnic background,” “That people from some racial or ethnic groups are sometimes discriminated against”). Participants responded using a scale of 1 (never) to 5 (very often), with items averaged to create a reliable scale (\( \alpha = 0.77 \)).

2.2.7 | Parent color-evasive endorsement

Parents reported their own endorsement of color-evasive attitudes through four items (e.g., “It is more important to be colorblind than it is to celebrate differences in race and ethnicity”; “When I interact with other people, I try to not even notice the color of their skin”) Participants responded using a scale of 1 (strongly disagree) to 7 (strongly agree), with items averaged to create a reliable scale (\( \alpha = 0.71 \)).

2.2.8 | Parent essentialism

Parents reported their essentialism through eight items (e.g., “To a large extent, a person’s race biologically determines his/her abilities and traits”; “Races are just arbitrary categories and can be changed if necessary”; No et al., 2008). Participants responded using a scale of 1 (strongly disagree) to 7 (strongly agree), with items averaged to create a reliable scale (\( \alpha = 0.71 \)).
2.2.9 | Intergroup contact

Parents reported the racial makeup of their family members, their friends, and their child’s school, neighborhood, and friends. Parents also reported their zip code, which was linked to the Census to calculate the percentage of White and Black people in their zip code.

2.2.10 | Parent demographic form

Parents reported the racial/ethnic background of their child’s two primary caregivers and caregiver education levels. Additionally, they reported what race their child refers to themselves as, and how often the parent speaks to their child about race (see Supplemental Materials).

2.3 | Results

Descriptive statistics and pairwise comparisons are reported in Table 1. Higher scores indicate greater categorization of faces as Black and the selection of darker crayons to match ambiguous targets. To answer the first research question, one-way ANOVAs tested for racial group differences in participants’ racial categorizations and skin tone perceptions. Follow up one-sample t-tests for each racial group tested participants’ tendency to categorize the faces as Black or White, or whether they did not differ from chance. The alpha level was adjusted using a Bonferroni correction to account for the multiple comparisons performed in testing the first research question, $\alpha = 0.004$. To answer the second research question, we separately regressed children’s categorizations on child racial cognition (main effects of racial constancy and essentialism), parent factors (main effects of parents’ categorization, racial socialization, color evasiveness socialization, essentialism, and color evasiveness), and intergroup contact (main effects of self-reported and census-based), and child race, controlling for age and gender. We repeat these regressions with children’s skin tone selection of darker crayons to match ambiguous targets. To answer the second research question, we separately regressed children’s categorizations on child racial cognition (main effects of racial constancy and essentialism), parent factors (main effects of parents’ categorization, racial socialization, color evasiveness socialization, essentialism, and color evasiveness), and intergroup contact (main effects of self-reported and census-based), and child race, controlling for age and gender. We repeat these regressions with children’s skin tone selection of darker crayons to match ambiguous targets. To answer the second research question, one-way ANOVAs tested for racial group differences in participants’ racial categorizations and skin tone perceptions, $\eta^2_p = 0.31$, 95% CI [0.21, 0.40]. One sample $t$-tests indicated parents’ racial categorization differed by child race, $F(2, 199) = 8.28$, $p < .001$, $\eta^2_p = 0.08$, 95% CI [0.02, 0.15]. One sample $t$-tests indicated parents of Black children categorized the faces as White significantly more often than chance, $t(60) = -2.97$, $p = .004$, $d = -0.38$, 95% CI $[-0.74, -0.13]$ (see Figure 2). Parents of White children categorized the faces as Black more often than chance, $t(66) = 2.72$, $p = .008$, $d = 0.33$, 95% CI [0.09, 0.63], though not significantly after the Bonferroni correction, while parents of Biracial children’s categorization did not differ from chance, $t(73) = -0.51$, $p = .610$, $d = -0.06$, 95% CI $[-0.30, 0.19]$.

2.3.1 | Racial categorization bias

**Child participants**

Children’s racial categorization differed by race, $F(2, 212) = 47.00$, $p < .001$, $\eta^2_p = 0.31$, 95% CI [0.21, 0.40]. One sample $t$-tests compared each racial group’s categorization to the midpoint of the scale (see Figure 1). Black, $t(60) = -10.82$, $p < .001$, $d = -1.39$, 95% CI $[-1.85, -1.06]$, and Biracial, $t(82) = -4.20$, $p < .001$, $d = -0.46$, 95% CI $[-0.67, -0.25]$, children categorized the faces as White significantly more often than chance. In contrast, White children categorized the faces as Black significantly more often than chance, $t(70) = 3.34$, $p = .001$, $d = 0.40$, 95% CI [0.14, 0.68].

**Parents**

Parents’ racial categorization differed by child race, $F(2, 199) = 8.28$, $p < .001$, $\eta^2_p = 0.08$, 95% CI [0.02, 0.15]. One sample $t$-tests indicated parents of Black children categorized the faces as White significantly more often than chance, $t(60) = -2.97$, $p = .004$, $d = -0.38$, 95% CI $[-0.74, -0.13]$ (see Figure 2). Parents of White children categorized the faces as Black more often than chance, $t(66) = 2.72$, $p = .008$, $d = 0.33$, 95% CI [0.09, 0.63], though not significantly after the Bonferroni correction, while parents of Biracial children’s categorization did not differ from chance, $t(73) = -0.51$, $p = .610$, $d = -0.06$, 95% CI $[-0.30, 0.19]$.

2.3.2 | Children’s skin tone perception

Based on the average of four face coloring trials, there was no difference between racial groups on children’s crayon selection, $F(2,
### TABLE 1  Correlations between child and parent variables.

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<td>5. Racial socialization</td>
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</tr>
<tr>
<td>11. Black contact</td>
<td>–0.38***</td>
<td>–0.14</td>
<td>–0.12</td>
<td>–0.04</td>
<td>0.14</td>
<td>0.04</td>
<td>–0.06</td>
<td>0.19**</td>
<td>0.13</td>
<td>–0.74***</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Biracial contact</td>
<td>–0.14</td>
<td>–0.10</td>
<td>–0.15*</td>
<td>0.11</td>
<td>0.03</td>
<td>–0.15*</td>
<td>–0.05</td>
<td>0.05</td>
<td>–0.03</td>
<td>–0.21**</td>
<td>0.04</td>
<td>–</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>13. Percent White in zip code</td>
<td>0.34***</td>
<td>0.10</td>
<td>0.06</td>
<td>0.01</td>
<td>–0.08</td>
<td>0.06</td>
<td>–0.03</td>
<td>–0.19*</td>
<td>–0.11</td>
<td>0.62***</td>
<td>–0.60***</td>
<td>–0.15</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Percent Black in zip code</td>
<td>–0.30***</td>
<td>–0.06</td>
<td>–0.05</td>
<td>–0.02</td>
<td>0.03</td>
<td>–0.04</td>
<td>0.03</td>
<td>0.15</td>
<td>0.14</td>
<td>–0.60***</td>
<td>0.60***</td>
<td>0.13</td>
<td>–0.96***</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>15. Child age</td>
<td>0.03</td>
<td>0.17*</td>
<td>–0.16*</td>
<td>0.33***</td>
<td>0.14</td>
<td>0.23***</td>
<td>0.33***</td>
<td>–0.03</td>
<td>–0.05</td>
<td>0.01</td>
<td>–0.06</td>
<td>–0.01</td>
<td>0.01</td>
<td>0.003</td>
<td>–</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>5.0 (2.8)</td>
<td>5.8 (2.6)</td>
<td>4.3 (1.4)</td>
<td>11.3 (4.7)</td>
<td>3.1 (0.8)</td>
<td>0.5 (0.5)</td>
<td>2.7 (1.0)</td>
<td>3.0 (1.1)</td>
<td>3.8 (1.6)</td>
<td>39.7 (27.8)</td>
<td>32.9 (31.4)</td>
<td>7.3 (7.5)</td>
<td>27.2 (27.6)</td>
<td>61.5 (34.3)</td>
<td>5.0 (1.1)</td>
</tr>
</tbody>
</table>

**Note:** Higher child essentialism scores indicate more flexible cognition.

**Abbreviation:** SD, Standard Deviation.

* *p < .05. ** *p < .01. *** *p < .001.
2.3.3 Child racial cognition

We regressed children's racial categorization on children's racial constancy (coded as 0 = constancy not endorsed, 1 = constancy endorsed), children's essentialism (collapsed across the domains of animals, artifacts, gender, and race, though see Supplemental Materials for analyses with disaggregated subscales), and child race (two dummy variables with Black or Biracial = 1, White = 0), controlling for age and gender (coded as 0 = girl, 1 = boy). All continuous variables were standardized. The alpha level was adjusted using a Bonferroni correction to account for the multiple comparisons, \( \alpha = 0.006 \). The model was significant, \( F(9, 151) = 11.37, p < 0.001, R^2 = 0.40 \), and there were significant main effects of parent categorization \( (\hat{\beta}_{\text{Black vs White}} = 0.19, p = 0.003) \), and child race \( (\hat{\beta}_{\text{Black vs White}} = 0.30, p < 0.001) \). Greater categorization of faces as Black by parents was associated with greater categorization of faces as Black by children, and Black and Biracial participants categorized fewer faces as Black than White participants. There were no other significant effects \( \hat{\beta}_{\text{Race Socialization}} = -0.08, p = .256; \hat{\beta}_{\text{Color Evasiveness Socialization}} = 0.02, p = .822; \hat{\beta}_{\text{Color Evasiveness}} = -0.01, p = .919; \hat{\beta}_{\text{Age}} = -0.10, p = .108; \hat{\beta}_{\text{Gender}} = 0.003, p = .957 \).

Using the same parameters, we also regressed children's skin tone selection on parents' categorization, racial socialization, color evasiveness socialization, essentialism, color evasiveness, and child race (two dummy variables with Black or Biracial = 1, White = 0), controlling for age and gender. The model was not significant, \( F(9, 146) = 1.30, p = .243, R^2 = 0.07 \).

2.3.4 Parent factors

We regressed children's racial categorization on parents' categorization, racial socialization, color evasiveness socialization, essentialism, color evasiveness, and child race (two dummy variables with Black or Biracial = 1, White = 0), controlling for child age and gender (coded as 0 = girl, 1 = boy). All continuous variables were standardized. The alpha level was adjusted using a Bonferroni correction to account for the multiple comparisons, \( \alpha = 0.030 \). The model was significant, \( F(9, 1467) = 12.03, p < 0.001, R^2 = 0.44 \). There were significant main effects of child race \( \hat{\beta}_{\text{Black vs White}} = -0.76, p < 0.001; \hat{\beta}_{\text{Biracial vs White}} = -0.33, p = 0.001 \). Black and Biracial participants categorized fewer faces as Black than White participants. There were no other significant effects \( \hat{\beta}_{\text{White Contact}} = -0.04, p = .800; \hat{\beta}_{\text{Black Contact}} = 0.05, p = .718; \hat{\beta}_{\text{Biracial Contact}} = -0.05, p = .498; \hat{\beta}_{\text{Percent White}} = 0.39, p = .086; \hat{\beta}_{\text{Percent Black}} = 0.31, p = .157, \hat{\beta}_{\text{Age}} = 0.02, p = .797, \hat{\beta}_{\text{Gender}} = 0.03, p = .664 \).

Using the same parameters, we also regressed children's skin tone selection on self-reported contact with Black, White, and Biracial people, percentage of Black and White people in participants' zip code, and child race (two dummy variables with Black or Biracial = 1, White = 0), controlling for age and gender (coded as 0 = girl, 1 = boy). All continuous variables were standardized. The alpha level was adjusted using a Bonferroni correction to account for the multiple comparisons, \( \alpha = 0.057 \). There were significant main effects of race \( \hat{\beta}_{\text{Black vs White}} = -0.33, p < 0.001 \). Black participants selected darker crayons and Black participants selected lighter crayons than White participants. The effects of children's essentialism \( (\hat{\beta} = 0.09, p = .208) \), racial constancy \( (\hat{\beta} = 0.11, p = .143) \), gender \( (\hat{\beta} = -0.03, p = .627) \), and race \( (\hat{\beta}_{\text{Biracial vs White}} = -0.12, p = .167) \) were not significant.
Discussion

White children and their parents categorized ambiguous Black/White Biracial faces more often as Black, which could be accounted for by either the IOE or hypodescent. However, Black children and their parents categorized the faces more often as White, consistent with an IOE account. Additionally, Biracial children categorized the faces more often as White, though less so than Black children. Parents of Biracial children, however, did not differ from chance in their categorization. Parents’ exposure to their child’s Biracial identity, and variation in the racial background of the parent tested likely contributed to this outcome, as 61% were racial minorities and 25% were White (14% of parents of Biracial children did not list their racial identity), but we were statistically underpowered to test this possibility directly.

Parents’ categorization and endorsing racial constancy emerged as significantly associated with race categorizations. The regression models testing intergroup contact demonstrated multicollinearity (see Supplemental Materials), suggesting some associations may not have been significant because of strong relations between participant race and the two measures of intergroup contact. However, the most consistent finding across analyses was that Black and Biracial participants categorized faces as White more than White participants. Because the literature has seldom systematically tested whether racial group membership shifts racially ambiguous Black/White Biracial categorizations (Young et al., 2020), Study 2 aimed to replicate and extend the parent findings from Study 1 with a larger adult sample. Additionally, as a more conservative test of hypodescent and IOE tendencies, Asian participants were also recruited as neither White nor Black is considered an ingroup for that population (Gaither et al., 2022). Among Asian participants, categorizing the faces as Black would suggest hypodescent, while categorizing the faces as White would suggest IOE because White is a more salient outgroup in the U.S.

STUDY 2

3.1 Participants

Black (N = 75; 42 female, 33 male; M_age = 35.9 years, SD_age = 13.9), White (N = 75; 18 female, 57 male; M_age = 47.1 years, SD_age = 18.8), Asian (N = 75; 45 female, 30 male; M_age = 35.7 years, SD_age = 11.6), and Black/White Biracial (N = 75; 45 female, 30 male; M_age = 33.7 years, SD_age = 11.8) adults were recruited through Amazon Mechanical Turk. Participants lived across the U.S. (37% South, 21% West, 20% Midwest, 22% Northeast). Sensitivity power analyses indicate the study was 80% powered to detect minimum effects of $R^2 = 0.04$ in linear regressions, $\eta_p^2 = 0.03$ in one-way ANOVAs, and $d = 0.16$ in one-sample $t$ tests.

3.2 Measures and procedures

Participants completed the same four training trials and 12 ambiguous race categorization trials from Study 1. Additionally, participants completed the same skin tone perception task as children in Study 1 except they completed the task online using images of each of the eight Multicultural Crayola crayons. Lastly, participants completed the same measures of adult essentialism ($\alpha = 0.63$), and color evasiveness ($\alpha = 0.70$) from Study 1. Intergroup contact was again derived from participants’ self-reported zip code. Descriptive statistics and pairwise comparisons are reported in Table 2. The alpha level was adjusted using a Bonferroni correction to account for the multiple comparisons, $\alpha = 0.0025$.

3.3 Results

3.3.1 Racial categorization bias

Participants’ racial categorization differed by race, $F(3, 296) = 5.89$, $p < .001, \eta_p^2 = 0.06, 95\% CI [0.01, 0.11]$. One sample $t$-tests compared each racial group’s categorization to the midpoint of the scale (see Figure 4). Black, $t(74) = -1.45, p = .151, d = -0.17, 95\% CI [-0.38, 0.06]$, and Black/White Biracial, $t(74) = 0.75, p = .453, d = 0.09, 95\% CI [-0.16, 0.30]$, adults’ categorization did not differ from chance. In contrast, White adults categorized the faces as Black significantly more often than chance, $t(74) = 2.52, p = .014, d = 0.29, 95\% CI [0.08, 0.52]$, and Asian adults categorized the faces as White significantly more often than chance, $t(74) = -2.80, p = .006, d = -0.32, 95\% CI [-0.53, -0.10]$, though these were not significant after the Bonferroni correction.

3.3.2 Skin tone perception

Based on the average of four face coloring trials, there was no difference between racial groups on crayon selection, $F(3, 296) = 0.86$,
TABLE 2 Correlations of study 2 key variables.

<table>
<thead>
<tr>
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<th>7.</th>
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</thead>
<tbody>
<tr>
<td>1. Face categorization</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Skin tone perception</td>
<td>0.12*</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Essentialism</td>
<td>–0.09</td>
<td>–0.09</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Color evasiveness</td>
<td>–0.14*</td>
<td>0.13*</td>
<td>–0.17**</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Percent White in zip code</td>
<td>0.02</td>
<td>0.07</td>
<td>–0.10</td>
<td>–0.09</td>
<td>–</td>
<td></td>
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<tr>
<td>6. Percent Black in zip code</td>
<td>–0.04</td>
<td>–0.12*</td>
<td>0.13*</td>
<td>–0.01</td>
<td>–0.76***</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>7. Percent Asian in zip code</td>
<td>0.01</td>
<td>0.05</td>
<td>–0.004</td>
<td>0.13*</td>
<td>–0.30***</td>
<td>–0.27***</td>
<td>–</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>5.9 (2.4)</td>
<td>2.8 (0.7)</td>
<td>3.7 (0.9)</td>
<td>3.7 (1.6)</td>
<td>60.3 (25.9)</td>
<td>22.0 (24.8)</td>
<td>7.4 (12.4)</td>
</tr>
</tbody>
</table>

*p < .05. *p < .01.

FIGURE 5 Adults’ skin tone perception by participant race in Study 2. Note. Higher scores indicate selection of darker crayons, and the horizontal line indicates the midpoint of the scale.

\[ p = .46, R^2 = 0.01, 95\% CI [0.00, 0.03]. \]

One sample t-tests indicated that White, t(74) = −28.98, p < .001, d = −3.35, 95\% CI [−4.20, −2.76], Black, t(74) = −17.04, p < .001, d = −1.97, 95\% CI [−3.81, −1.21], Asian, t(74) = −21.39, p < .001, d = −2.47, 95\% CI [−3.98, −1.78], and Black/White Biracial, t(74) = −27.81, p < .001, d = −3.21, 95\% CI [−4.69, −2.31] participants selected a skin tone significantly lighter than the midpoint of the scale (see Figure 5).

3.3.3 Adult factors

We regressed adults’ racial categorization on essentialism, color evasiveness, and participant race (three dummy variables with White as the referent group), controlling for age and gender (coded as 0 = women, 1 = men). All continuous variables were standardized. The alpha level was adjusted using a Bonferroni correction to account for the multiple comparisons, \( \alpha = 0.01. \) The model was significant, \( F(7, 292) = 3.38, p = .002, R^2 = 0.08. \) There were significant effects of color evasiveness (\( \beta = −0.13, p = .026. \)), and participant race (\( \hat{\beta}_{\text{Asian vs White}} = 0.26, p = .003; \hat{\beta}_{\text{Black vs White}} = 0.19, p = .026, \)) though not significant after the correction. Categorizing more faces as Black was associated with lower color evasiveness, and Black and Asian participants categorized fewer faces as Black than White participants. There were no other main effects (\( \hat{\beta}_{\text{Essentialism}} = −0.08, p = .192; \hat{\beta}_{\text{Asian vs White}} = 0.09, p = .320; \hat{\beta}_{\text{Age}} = −0.01, p = .923; \hat{\beta}_{\text{Gender}} = 0.03, p = .564). \)

We also regressed adults’ skin tone perceptions on essentialism, color evasiveness, and participant race (three dummy variables with White as the referent group), controlling for age and gender (coded as 0 = women, 1 = men). The model was not significant, \( F(7, 292) = 1.52, p = .159, R^2 = 0.04. \)

3.3.4 Intergroup contact

We regressed adults’ racial categorization on the percentage of White, Asian, and Black people in their zip code, and participant race (three dummy variables with White as the referent group), controlling for age and gender (coded as 0 = women, 1 = men). The continuous variables were standardized. The model was significant, \( F(8, 290) = 2.67, p = .008, R^2 = 0.07. \) There were significant main effects of participant race, such that Black and Asian participants categorized more faces as White than White participants (\( \hat{\beta}_{\text{Asian vs White}} = 0.36, p < .001; \hat{\beta}_{\text{Black vs White}} = 0.20, p = .029, \)) though not significant after the Bonferroni correction. There were no other main effects (\( \hat{\beta}_{\text{Percentage White}} = −0.15, p = .383; \hat{\beta}_{\text{Percentage Black}} = −0.15, p = .386; \hat{\beta}_{\text{Percentage Asian}} = 0.02, p = .843; \hat{\beta}_{\text{Biracial vs White}} = 0.09, p = .293; \hat{\beta}_{\text{Age}} = 0.02, p = .785; \hat{\beta}_{\text{Gender}} = 0.02, p = .800). \)

We also regressed adults’ skin tone perceptions on the percentage of White, Asian, and Black people in their zip code, and participant race (three dummy variables with White as the referent group), controlling for age and gender (coded as 0 = women, 1 = men). The model was not significant, \( F(8, 290) = 0.70, p = .687, R^2 = 0.02. \)

3.4 Discussion

Black and Black/White Biracial adults’ categorization did not differ from chance, thereby not supporting either the hypodescent or IOE account. However, White adults categorized the ambiguous faces more
often as Black, consistent with either the hypodescent or IOE account. Asian adults categorized the ambiguous faces more often as White, consistent with IOE since White is considered a salient outgroup (Gaither et al., 2022).

4 | GENERAL DISCUSSION

The present studies examined children and adults’ categorization of racially ambiguous Black/White Biracial faces to test whether hypodescent or IOE accounts of categorization generalize across racial groups and contexts. The present work tested Black, White, and Biracial children and Black, White, Biracial, and Asian adults who live in predominately racial ingroup contexts and measured how child racial cognition (racial constancy and essentialism), parent factors (racial categorization, racial socialization, color evasiveness socialization, essentialism, color evasiveness), and intergroup contact (self-reported and census-based) were associated with categorization.

4.1 | Hypodescent or ingroup overexclusion?

The findings indicate IOE is a better account than hypodescent for the categorization of racially ambiguous Black/White Biracial faces. This is an important advancement, as it demonstrates how categorization outcomes differ when racial group membership and context are considered. Indeed, both White and Black children and their parents in Study 1, and White and Asian adults in Study 2 categorized the faces more often as salient racial outgroup members (i.e., White participants categorized the faces more as Black, while Black and Asian participants categorized the faces more as White). White participants’ categorizations are consistent with both IOE and hypodescent. Because hypodescent among White perceivers is theorized to be motivated by antiegalitarianism (Ho et al., 2017, 2020), while IOE is theorized to be driven by intergroup distinctiveness motivations, it is necessary to understand White participants’ motives for their racial categorizations to better understand whether these are best described as hypodescent or IOE. Though both White and Black groups represent racial outgroups to Asian Americans, White people may be conceptualized as the more salient outgroup because they are a numerical majority in the U.S., and the U.S. racial hierarchy privileges White people (Gaither et al., 2022; Roberts & Rizzo, 2020). Thus, Asian American’s categorizations were also consistent with the IOE account. Lastly, Biracial children also categorized the faces more often as White, though less than Black children. For Biracial children with White parents, categorization as White does not necessarily represent exclusion from the ingroup. Indeed, for Black/White Biracial participants, both categorizations could represent their ingroup. Yet, because Biracial children with White parents are more often identified as mixed race than as mono-racial White, White may still be a salient racial outgroup rather than an ingroup, suggesting Biracial children’s categorization is also consistent with the IOE (Lichter & Qian, 2018). Though the Biracial sample was underpowered to test for differences based on children’s specific racial backgrounds, the White racial category still likely reflects the most salient racial outgroup for this sample. Study 2 addresses this limitation with a sample of Black/White Biracial participants.

Black and Black/White Biracial adults in Study 2 showed no bias in their racial categorizations. For Black/White Biracial participants, this suggests they are not systematically categorizing faces when the stimuli and the categorization options represent ingroups. Differences between the parents in Study 1 and participants in Study 2 (e.g., amount of racial-ingroup members in their zip code, geographic variation, rural vs. urban locations, or taking the study in-person vs. online) could have contributed to this difference (see Supplemental Materials). Moreover, Biracial adults may be less essentialist than Biracial children and thus more flexible with their own racial identities and perceptions of race. Further, the Biracial adults self-identified as Biracial, while Biracial children were identified by their parents, limiting our knowledge on how flexibly Biracial children thought about their racial ingroups and outgroups. Although the results are mixed, these findings largely support the notion that hypodescent is not likely a universal process for ambiguous Black/White Biracial categorization and other factors shift these perceptions. This is consistent with existing developmental research, which has found limited evidence of hypodescent (Gaither et al., 2022; Roberts et al., 2020; Roberts & Gelman, 2015).

Additionally, racial categorization was also associated with participants’ selection of crayon colors to match the skin tone of racially ambiguous targets. This provides converging evidence of these racial categorization patterns across both dichotomous and continues measures (Young et al., 2020), further demonstrating that racially ambiguous faces are seen more variably than a hypodescent explanation suggests. Overall, these findings suggest racial categorization followed the ingroup overexclusion hypothesis better than hypodescent and varied significantly by racial group. Additionally, several other factors were related to categorization, which we review next.

4.2 | Racial constancy and essentialism

Children’s endorsement of racial constancy beliefs predicted categorization of more faces as Black. This is consistent with previous work demonstrating racial constancy beliefs are associated with poor memory for ambiguous Black/White Biracial faces among White children, suggesting White children who view racial group membership as immutable see racially ambiguous faces as their outgroup (Gaither et al., 2014). Conceptualizing race as immutable may be linked to firmer boundaries between racial groups, leading to ambiguous faces being forgotten or categorized as outgroup members.

Interestingly, although racial constancy (which is a specific component of overall essentialist thinking) was associated with categorization outcomes, children’s overall essentialism as measured through a category comparison task was not related to their categorizations. While racial constancy measures children’s understanding of the relevance of skin tone to racial categorization and the stability of skin tone over time, essentialism better captures the social importance of racial
categories as a group (Rhodes & Gelman, 2009). Moreover, previous research has found that although young children associate physical features with racial groups, they do not readily view these groups as natural kinds or use beliefs about natural kinds to guide racial categorization (Rhodes, 2013; Shutts et al., 2013; Waxman, 2010). Thus, these two measures may capture distinct aspects of children’s understanding of race, a point underscored by the null relationship between children’s racial constancy and essentialism.

4.3 | Parental and intergroup contact influence

Parents’ racial categorization was related to children’s categorization, but there was no relation between explicit measures of parents’ socialization and children’s categorization. This suggests children may learn about racial group boundaries through observational learning of parent’s categorization rather than through direct socialization. Similarly, past research did not find an association between parents’ racial socialization and Black and White children’s categorization of racially ambiguous faces (Roberts & Gelman, 2015). Although this previous study was characterized by low parent response rates, the present study replicates this null finding with a higher-powered sample. Moreover, the association between parent and children’s categorization could also be driven by their intergroup contact, which is often influenced by parents’ neighborhood, friend network, or school choices.

In Study 1, children’s contact with racial ingroup and outgroup members was related to categorization, but not above and beyond participant race. There were strong effects of race on the amount of contact, such that White children’s parents reported more contact with White people than other groups, and Black children’s parents reported more contact with Black people than other groups (see Supplemental Materials). Few people had high amounts of contact with racial outgroup members. This finding is consistent with previous research, which shows high racial homophily in childhood, often reflecting the demographics of caregivers’ social networks and neighborhood and school settings (Thomas, 2019). Therefore, in the present analysis, participant race and intergroup contact did not predict unique variance in categorization.

4.4 | Implications

The present studies contribute to the racial categorization and developmental intergroup theory literatures by demonstrating that racial categorization is better explained by ingroup overexclusion than hypodescent, and elucidating how both child racial cognition and parent factors influence children’s racial categorization of racially ambiguous Black/White Biracial faces. Importantly, we are among the first to test how categorization varies by race, including a diverse sample of Biracial children and adults. Thus, the present studies provide a theoretical advancement by directly testing two competing accounts of racial categorization. As the U.S. becomes increasingly diverse, with an especially fast growth of Multiracial people who are often racially ambiguous, understanding how racially ambiguous people are categorized is imperative to understanding race relations.

4.5 | Limitations and future directions

The present studies are limited by aspects of the study design. For example, the stimuli included only Black/White Biracial faces, did not include ancestry information, and did not require children to understand racial vocabulary, such as “White”, “Black” or “Mixed/Biracial”. These categorization processes should be tested with more diverse stimuli, a broader range of response options, and consider other social information about a target. For example, including an open-ended response option could provide a more rigorous test of IOE by testing whether participants spontaneously categorize racially ambiguous others as members of a salient outgroup. Relatedly, the stimuli used was limited in only reflecting Biracial individuals rated as racially ambiguous, and not all Biracial people are ambiguous in appearance. Moreover, future research should prioritize larger sample sizes of Biracial participants to examine differences by participants’ background. Further, the developmental trajectories of categorization measures using racial terminology could be influenced by children’s acquisition of racial language.

Moreover, participants in Study 1 were recruited from a large metropolitan city characterized by high segregation. Participants in Study 2 were recruited from more geographic areas but demonstrated similar patterns of greater contact with racial ingroups in their zip code. Thus, the findings related to intergroup contact should not be generalized to more integrated settings. Moreover, the present study measured participants’ amount of intergroup contact, but did not differentiate between positive and negative contact. Negative intergroup contact also makes racial group membership salient (Paolini et al., 2010) but could increase racial identity-related threats which can shift categorization motivations. Thus, differences in the type and quantity of contact may also differentially influence racial categorization.

Future research would also benefit from testing the behavioral consequences of racial categorization. Do children and adults’ behavior towards a racially ambiguous person differ based on their initial racial categorization? While categorization is seen as a step preceding prejudice and discrimination, less is known about how the categorization of racially ambiguous faces precedes differential behavior (Bigler & Liben, 2006; Tajfel & Turner, 1986). Lastly, we report the p values for each hypothesis test, as well as the Bonferroni correction to account for the family wise error rate. We urge readers to consider these in interpreting the findings.

5 | CONCLUSION

The present work is among the first to systematically test whether hypodescent or ingroup overexclusion better account for the categorization of racially ambiguous Black/White Biracial faces among a
racially and age diverse sample of participants. Across dichotomous and continuous variables, racial categorization varied by racial group, supporting the in-group overexclusion hypothesis among both children and adults. Further, the findings demonstrated children’s categorization is related to parents’ categorization and their racial cognition. Together, this work shows variability in categorization and suggests understanding changing demographics in the U.S. requires a more nuanced consideration of people’s racial group membership, family, and environmental context.

ACKNOWLEDGMENTS

This research was approved by the Institutional Review Board at the University of Chicago. This work was supported by the National Science Foundation SBE Postdoctoral Research Fellowship under Grant No. 2004269 awarded to A. Albuja, and NSF CAREER Grant BCS-2042433 awarded to S. Gaither.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

REFERENCES


SUPPORTING INFORMATION
Additional supporting information can be found online in the Supporting Information section at the end of this article.