Research Article

Nature and Nurture in Own-Race Face Processing

Yair Bar-Haim,[1] Talee Ziv,[1] Dominique Lamy,[1] and Richard M. Hodes[2]

[1]Department of Psychology, Tel-Aviv University, Tel-Aviv, Israel, and [2]American Jewish Joint Distribution Committee, Addis Ababa, Ethiopia

ABSTRACT—***A standard visual preference task was used to examine 3-month-olds' looking times at own-race versus other-race faces as a function of environmental exposure to faces from the two categories. Participants were Caucasian infants living in a Caucasian environment, African infants living in an African environment, and African infants living in a predominantly Caucasian environment. The results indicate that preference for own-race faces is present as early as 3 months of age, but that this preference results from exposure to the prototypical facial environment.***

Intergroup bias is the systematic tendency to evaluate members of one's own group (the in-group) more favorably than members of a group to which one does not belong (the out-group). This tendency can take the form of favoring in-group members, derogating out-group members, or both (Hewstone, Rubin, & Willis, 2002). Intergroup bias is thought to be an initial form of prejudice that is based on a fundamental strategy for survival and personal well-being in the context of group living (Brewer, 2001). A salient instance of intergroup bias is racial prejudice.

Several researchers have suggested that differential processing of the characteristic features of own-race versus other-race members may contribute to prejudice and stereotyping (e.g., Aboud, 1988; Bigler & Liben, 1993; Doyle & Aboud, 1995; Katz, 2003; MacLin & Malpass, 2001; Richeson & Shelton, 2003). For example, people are more accurate at recognizing faces from their own racial group than faces from other races (for reviews and discussion, see Bothwell, Brigham, & Malpass, 1989; Meissner & Brigham, 2001). A recent functional magnetic resonance imaging study by Golby, Gabrieli, Chiao, and Eberhardt (2001) provided evidence that this recognition bias is accompanied by a race-dependent neural activation pattern. Using a recognition paradigm, these authors found higher activation in response to own-race than to other-race faces in specific face-sensitive regions of the adult brain.

By the age of 4 to 6 years, children already display racial stereotyping and prejudice in a variety of contexts (e.g., Aboud, 2003; Doyle & Aboud, 1995; Katz, 2003; Killen, Lee-Kim, McGlothlin, & Stangor, 2002). At about the same age, children also display a recognition advantage for own-race faces. Feinman and Entwisle (1976) tested Caucasian and African American children in Grades 1, 2, 3, and 6 on their ability to recognize photographs of Caucasian and African American children. Performance improved significantly with age, but the same own-race bias was evident at each age for both African Americans and Caucasians (see also Pezdek, Blandon-Gitlin, & Moore, 2003, for similar findings in third graders, and Sangrigoli & de Schonen, 2004a, for a study of 3- to 5-year-old Caucasians tested for recognition of Caucasian and Oriental faces).

Evidence for an own-race processing bias in early infancy has also been reported. In a study on the development of racial prejudice in young infants, Katz and Downey (2002, cited in Katz, 2003) used a habituation-dishabituation paradigm to test 6-month-olds' ability to discriminate between own-race and other-race faces and showed what may be an early reflection of other-race homogenization. Caucasian infants' response to a Caucasian male face after being habituated to four Caucasian female faces was stronger than their response to an African American male face after being habituated to four African American female faces. For African American infants, the findings were reversed. The greater ease of responding to gender cues with own-race than other-race faces suggests that differential processing of own-race versus other-race faces occurs very early on. Recently, Sangrigoli and de Schonen (2004b) assessed the own-race recognition bias in 3-month-old Caucasians. Infants were first habituated to a single face. Then, at test, the same face was presented together with a novel face of the same race. Looking times at the novel face were longer for Caucasian than for Asiatic faces, suggesting that the infants were better at recognizing own-race than other-race faces.

Address correspondence to Yair Bar-Haim, Department of Psychology, Tel-Aviv University, Ramat Aviv, Tel-Aviv 69978, Israel, e-mail: yair1@post.tau.ac.il.

One explanation for the own-race processing advantage is that people tend to have more contact with multiple face exemplars from their own race than from other races and therefore develop expertise at recognizing own-race faces (Brigham & Barkowitz, 1978; Brigham & Malpass, 1985; Gauthier & Nelson, 2001; Malpass & Kravitz, 1969; Nelson, 2001). Evidence for this *contact*, or *differential-experience*, hypothesis comes from studies showing reduced deficits in other-race face recognition in members of minority groups. For example, in the United States, the same-race recognition advantage is greater for Caucasians than for African Americans (e.g., Anthony, Copper, & Mullen, 1992; Golby et al., 2001), who, by virtue of being a minority, tend to have more contact with people of other races than Caucasians do. This asymmetry has also been demonstrated in children. Feinman and Entwisle (1976) showed that African American children were better at recognizing Caucasian faces than Caucasian children were at recognizing African American faces. Furthermore, children who came from integrated schools and lived in mixed-race neighborhoods showed smaller biases than children from segregated schools. Other results showing that training and exposure reduce the other-race effect also support the differential-experience hypothesis (Elliott, Wills, & Goldstein, 1973; Goldstein & Chance, 1985; Lavrakas, Buri, & Mayzner, 1976; Li, Dunning, & Malpass, 1998). Remarkably, Sangrigoli and de Schonen (2004b, Study 2) showed that the own-race recognition bias was eliminated when infants underwent a familiarization phase in which they were exposed to only three exemplars of other-race faces.

In the context of the study of the development of racial prejudice, however, it is important to examine whether young infants show an actual preference, rather than a processing advantage, for members of their own race. Although differential processing of own-race versus other-race faces may indeed be associated with own-race favoritism, that is not necessarily the case.

The infant studies that demonstrated an own-race processing advantage (Sangrigoli & de Schonen, 2004b), or in one instance an own-species processing advantage (Pascalis, de Haan, & Nelson, 2002), used paradigms that rely on infants' response to novelty following habituation. In these paradigms, longer looking times at a novel face are taken to demonstrate infants' categorization and discrimination abilities. These abilities were found to be superior for own-race or own-species faces relative to other-race or other-species faces. Such habituation-dishabituation procedures, however, do not allow one to draw inferences about preference for own-race faces, because own-race and other-race faces do not compete for infants' attention and interest. Instead, there is competition between a novel face and a habituated face of the same race, and the magnitude of the resulting novelty effect is compared between own-race and other-race faces. In contrast, standard visual preference tasks can provide evidence for own-race preference. When exemplars of two racial categories are presented simultaneously, and thus compete for an infant's interest, preference can be inferred if the infant consistently looks longer at one category (e.g., African faces) than at the other (e.g., Caucasian faces). Differential looking has been used similarly in the attractiveness literature as a measure of discrimination and preference (e.g., Langlois, Ritter, Roggman, & Vaughn, 1991; Rubenstein, Kalakanis, & Langlois, 1999).

The purpose of the present research was to assess whether infants as young as 3 months of age show preference for own-race faces relative to other-race faces, and whether the development of such preference is modulated by infants' exposure to members of other races in the immediate social environment. To that end, we used a standard visual preference task to examine 3-month-olds' visual preferences for own-race versus other-race faces as a function of environmental exposure to faces from the two categories.

METHOD

Participants

Participants were 36 healthy full-term infants, selected from three distinct populations with different degrees of contact with members of other races. Six additional infants were tested, but did not complete the experiment because of fussiness. Each group consisted of 12 infants (6 male, 6 female). The Caucasian Israeli group (mean age = 14.08 weeks, SD = 1.44) was recruited from the general population of Israel and lived in a primarily Caucasian environment. The African Ethiopian group (mean age = 13.67 weeks, SD = 1.72) was recruited from families living in Addis Ababa and Gonder, Ethiopia, and awaiting immigration to Israel; these families lived in a primarily African environment. The African Israeli group (mean age = 13.75 weeks, SD = 1.54) consisted of Israeli-born infants of Ethiopian origin. The African Israeli group was recruited from Ethiopian families who were new immigrants to Israel living in absorption centers. Many new immigrants' first home in Israel is an absorption center, where they live for 6 to 18 months. Such centers provide intensive cross-race contact for new immigrants from Ethiopia. Because the centers provide a vast array of social support and acculturation services, the primarily Caucasian staff running them is in close, daily contact with the resident families and their children. For instance, infants living in the absorption centers undergo routine bimonthly examinations by Caucasian Well Child Service providers. Additional cross-race exposure results from the fact that new Caucasian immigrants (primarily from Argentina and countries of the former Soviet Union) also reside in the same absorption centers. Finally, only 1% of the general population in Israel is of Ethiopian origin. Thus, whenever the African Israeli infants were taken outside the absorption center, they were heavily exposed to members of another race.

Stimuli

Each stimulus display consisted of color photographs of two faces (8 cm × 9.6 cm) presented side by side against a gray background. The nearest edges of the two photographs were 6 cm apart. A set of eight different face pairs was generated. Each pair consisted of one Caucasian face and one African (Ethiopian) face that was of the same sex and matched for attractiveness (see Fig. 1a for examples of the face stimuli used). Within this set, the African face appeared on the right and the Caucasian face on the left for four pairs (two male, two female), and the left-right position was reversed for the remaining four pairs. The 16 photographs used in the experiment were selected from a larger collection of African and Caucasian faces rated for attractiveness on a 5-point scale by Caucasian Israeli, African Israeli, and African Ethiopian adults. The mean age of the models in the selected set was 22.06 years (SD = 4.10), and the mean attractiveness was 2.54 (SD = 0.63). All faces were frontally oriented and displayed a neutral expression. Clothing cues were masked. Each infant viewed the set of eight face pairs once. Order of the pairs was randomized separately for each infant.

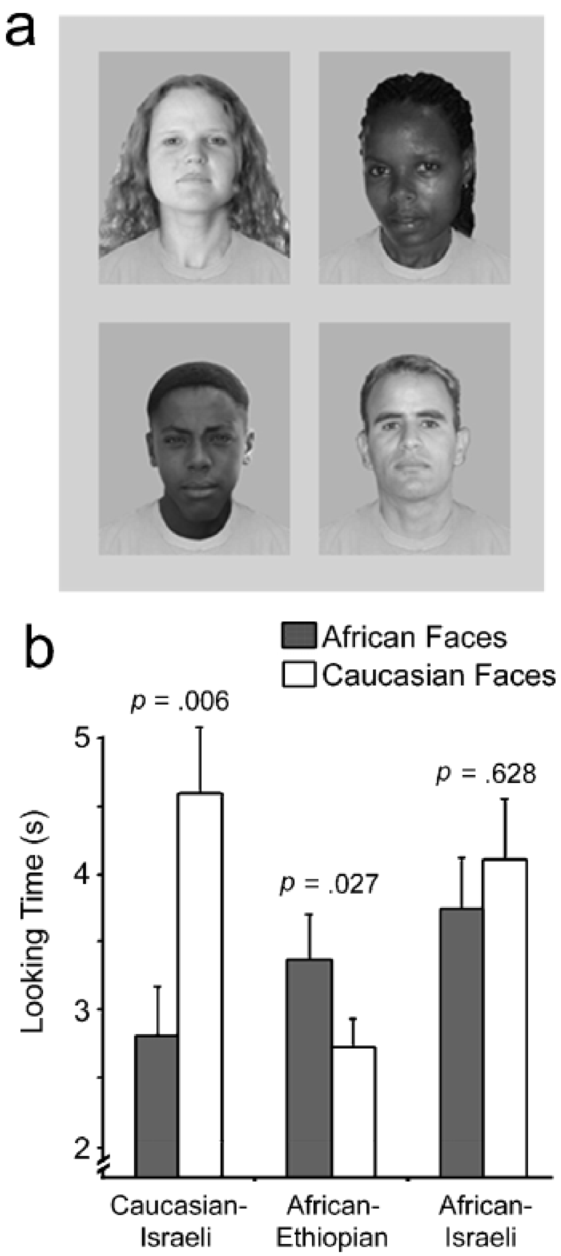

Fig. 1. Examples of the face stimuli (a) and looking times (in seconds) of the Caucasian Israeli, African Ethiopian, and African Israeli infants. Whiskers represent standard errors.

Procedure

The experiment was conducted in small, darkened rooms. The infants were seated on their mothers' laps with their heads positioned about 30 cm from a 14-in. laptop computer screen that was used for stimulus presentation. A portable one-way mirror served as a partition between the experimenter and the infant.

Mothers were instructed to fixate on a mark above their heads. Thus, they could not see the face stimuli, which ensured that their preferences could not be communicated to the infants. Before the beginning of each trial, a series of black-and-white visual patterns and click noises was presented to draw the infant's gaze to the center of the screen. As soon as this happened, the experimenter, who observed the infant's visual fixations from behind the one-way mirror, initiated the trial, and a face pair appeared for 10 s. The experimenter recorded on-line, on a second laptop computer, the direction of each gaze (right, left, not focused) and its duration (in seconds). The experimenter could not see the stimuli that the infant was viewing and was thus blind as to what type of face appeared on each side of the computer screen at any given time. Interrater reliability was assessed in a pilot study involving 29 Israeli infants. Mean percentage agreement was 97%.

RESULTS

The results are summarized in Figure 1b. A repeated measures analysis of variance (ANOVA) on average looking times (in seconds) with group (Caucasian Israeli, African Ethiopian, or African Israeli) as a between-subjects variable and face type (Caucasian or African) and face gender (male or female) as within-subjects variables revealed a significant Group × Face Type interaction, $F(2, 33) = 5.34$, $p < .01$. A trend toward a main effect of group was also found, $F(2, 33) = 2.79$, $p = .076$; average total looking times were 7.47, 6.07, and 7.86 s (SDs = 1.43, 1.78, and 2.41), for the Caucasian Israeli, African Ethiopian, and African Israeli groups, respectively. The main effect of face type was nonsignificant ($p = .13$), and so were all the effects involving gender of the face (all ps $> .40$).

To explicate the Group × Face Type interaction, we conducted three separate ANOVAs, one for each pair of groups. Because no main effect of face gender and no interactions involving this factor were found, it was omitted from further analyses. A significant Group × Face Type interaction was found in the analysis of the Caucasian Israeli and African Ethiopian infants, $F(1, 22) = 17.36$, $p < .001$, Cohen's $d = 1.78$.

The Group × Face Type interactions only approached significance for the comparisons between the Caucasian Israeli and African Israeli infants and between the African Israeli and African Ethiopian infants, $Fs(1, 22) = 2.72$ and 1.69, $ps = .06$ and $.10$, Cohen's $ds = 0.70$ and 0.56, respectively.

In addition, we assessed the effect of face type separately for each group. These analyses showed that the Caucasian Israeli infants looked longer at Caucasian than at African faces, paired two-tailed t test, $t(11) = 3.40$, $p < .01$, Cohen's $d = 1.03$. In contrast, African Ethiopian infants looked longer at African than at Caucasian faces, paired two-tailed t test, $t(11) = 2.56$, $p < .05$, Cohen's $d = 0.77$. Remarkably, Israeli-born infants of Ethiopian origin showed no particular preference for African or Caucasian faces, paired two-tailed t test, $t(11) = 0.50$, $p = .63$, Cohen's $d = 0.15$. A power analysis, calculating for 50% power, revealed that at least 301 additional participants would have been required in order to obtain a significant preference for Caucasian faces in this group. We therefore conclude that the null result obtained for the African Israeli group is reliable.

To ensure that these results indeed reflected a preference for own-race faces rather than culturally mediated color preferences, we carried out a control study among 3-month-old Caucasian Israeli (5 girls, 7 boys) and African Ethiopian (6 girls, 6 boys) infants living in Israel and in Ethiopia, respectively. The procedure was similar to that of the main experiment, except that all the faces of each race were replaced by a colored patch matching their average color composition. Thus, each Caucasian face was replaced by a uniform pink oval patch (RGB coordinates = 220, 190, 180), whereas each Ethiopian face was replaced by a brown oval patch (RGB coordinates = 90, 65, 70). We reasoned that if color rather than race-related preferences were at play in the main experiment, the same results would be observed.

Overall, infants showed much less interest in the colored ovals (mean total looking duration at both the pink and brown ovals = 2.63 s, $SD = 1.53$) than in the human faces (mean total looking duration at both the African and Caucasian faces = 7.11 s, $SD = 2.02$). More important, however, the results showed no specific color preference in either of the two groups, paired two-tailed t tests, $ts(11) = 0.73$ and 1.03, $ps = .48$ and $.33$, for Caucasian Israeli and African Ethiopian infants, respectively. These findings allow us to conclude that the results of the main experiment indeed reflected a bias in favor of own-race faces, rather than simple color preferences.

DISCUSSION

In the present study, the looking-time patterns of the Caucasian Israeli and African Ethiopian groups were race dependent. This finding indicates that by 3 months of age, infants have the ability to discriminate between own-race and other-race adult faces and is consistent with previous habituation-dishabituation studies, in which such abilities have been observed in 3- and 6-month-olds (Katz & Downey, 2002; Sangrigoli & de Schonen, 2004b). However, although the ability to categorize faces on the basis of characteristic racial features may be a prerequisite for the development of own-race favoritism, it is clearly not a sufficient condition for such favoritism. In this respect, the present study is novel in showing that actual preference for own-race faces may be present as early as 3 months of age.

The results also underscore the prominent role of infants' racial environment in the development of this preference for own-race faces. Indeed, preference for own-race faces was observed only in infants living in predominantly homogeneous own-race environments, and not in infants who experienced intensive cross-race exposure. Unlike Caucasian Israeli and African Ethiopian infants who live within an own-race majority and develop a clear preference for own-race faces, African Israeli infants (who by virtue of being a very small ethnic minority experience considerable cross-race exposure) do not develop a preference for own-race faces. Note that whereas earlier studies showed a smaller but nonetheless significant other-race effect in the African American minority relative to the Caucasian American majority (e.g., Golby et al., 2001), our African Israeli sample showed no preference. Although there are numerous differences between the American studies and ours (e.g., children and adults vs. infants, recognition vs. preference task), this discrepancy is likely the result of more intensive cross-race exposure in our sample (e.g., African Americans make up approximately 15% of the American population, whereas African Israelis make up only 1% of the Israeli population). An explanation based on cross-race contact is also consistent with findings that studying in integrated schools and living in mixed-race environments further reduce the own-race recognition bias in African American children (Feinman & Entwisle, 1976), and with Sangrigoli and de Schonen's (2004b, Study 2) finding that the own-race recognition bias in 3-month-olds disappears with very little exposure to other-race faces.

A recent study by Sangrigoli, Pallier, Argenti, Ventureyra, and de Schonen (2005) further underscores the role of the environment in shaping the own-race bias by showing that early intensive contact with other-race faces can overturn the bias. Sangrigoli et al. found that adults of Korean origin who were adopted by European Caucasian families between the ages of 3 and 9 years identified Caucasian faces better than Asian faces.

It is noteworthy, however, that in earlier studies on the own-race bias in children (e.g., Feinman & Entwisle, 1976; Sangrigoli & de Schonen, 2004b; Sangrigoli et al., 2005), the predominant racial environment was always Caucasian, and was therefore not counterbalanced between races. By investigating the role of exposure to a dominant own-race environment versus a dominant other-race environment in different racial contexts (Caucasian and African), the present study provides an important validation for the idea that the development of the own-race bias is modulated by exposure to a homogeneous own-race facial environment.

Early preferences for own-race faces may contribute to race-related biases later in life, perhaps by facilitating cognitive and emotional processing of own-race faces. Longitudinal data would be necessary to examine this hypothesis, that is, to investigate potential links between infants' preferences for own-race faces and own-race favoritism or prejudice later in childhood. Although the present findings indicate that preference for own-race faces emerges out of very early exposure to prototypical perceptual environments, they also demonstrate that significant exposure to other-race faces can block the development of own-race preference. Sangrigoli and de Schonen (2004b) showed that the recognition bias present in 3-month-old infants can be eliminated with very brief exposure to other-race faces. We speculate that the same might hold true for preference for own-race faces. An important goal for further research would be to delineate the critical period during which early-formed preferences for own-race faces may be altered by exposure to other-race faces.

Acknowledgments—This study was partially supported by The Israeli Science Foundation (Grant No. 989/03).

REFERENCES

Aboud, F.E. (1988). *Children and prejudice*. New York: Blackwell.

Aboud, F.E. (2003). The formation of in-group favoritism and out-group prejudice in young children: Are they distinct attitudes? *Developmental Psychology*, *39*, 48–60.

Anthony, T., Copper, C., & Mullen, B. (1992). Cross-racial facial identification: A social cognitive integration. *Personality and Social Psychology Bulletin*, *18*, 296–301.

Bigler, R.S., & Liben, L.S. (1993). A cognitive–developmental approach to racial stereotyping and reconstructive memory in Euro-American children. *Child Development*, *64*, 1507–1508.

Bothwell, R.K., Brigham, J.C., & Malpass, R.S. (1989). Cross-racial identification. *Personality and Social Psychology Bulletin*, *15*, 19–25.

Brewer, M.B. (2001). Ingroup identification and intergroup conflict: When does ingroup love become outgroup hate? In R.D. Ashmore, L. Jussim, & D. Wilder (Eds.), *Social identity, intergroup conflict, and conflict reduction* (pp. 17–41). London: Oxford University Press.

Brigham, J.C., & Barkowitz, P. (1978). Do "They all look alike"? The effect of race, sex, experience, and attitudes on the ability to recognize faces. *Journal of Applied Social Psychology*, *8*, 306–318.

Brigham, J.C., & Malpass, R.S. (1985). The role of experience and contact in the recognition of faces of own- and other-race persons. *Journal of Social Issues*, *41*, 139–155.

Doyle, A.B., & Aboud, F.E. (1995). A longitudinal study of White children's racial prejudice as a social cognitive development. *Merrill Palmer Quarterly*, *41*, 209–228.

Elliott, E.S., Wills, E.J., & Goldstein, A.G. (1973). The effects of discrimination training on the recognition of White and Oriental faces. *Bulletin of the Psychonomic Society*, *2*, 71–73.

Feinman, S., & Entwisle, D.R. (1976). Children's ability to recognize other children's faces. *Child Development*, *47*, 506–510.

Gauthier, I., & Nelson, C.A. (2001). The development of face expertise. *Current Opinion in Neurobiology*, *11*, 219–224.

Golby, A.J., Gabrieli, J.D.E., Chiao, J.Y., & Eberhardt, J.L. (2001). Differential responses in the fusiform region to same-race and other-race faces. *Nature Neuroscience*, *4*, 845–850.

Goldstein, A.G., & Chance, J.E. (1985). Effects of training on Japanese face recognition: Reduction of the other-race effect. *Bulletin of the Psychonomic Society*, *23*, 211–214.

Hewstone, M., Rubin, M., & Willis, H. (2002). Intergroup bias. *Annual Review of Psychology*, *53*, 575–604.

Katz, P.A. (2003). Racist or tolerant multiculturalists? How do they begin? *American Psychologist*, *58*, 897–909.

Katz, P.A., & Downey, E.P. (2002). *Infant categorization of race and gender cues*. Unpublished manuscript, Institute for Research on Social Problems, Boulder, CO.

Killen, M., Lee-Kim, J., McGlothlin, H., & Stangor, C. (2002). How children and adolescents evaluate gender and racial exclusion. *Monographs of the Society for Research in Child Development*, *67*(4, Serial No. 271).

Langlois, J.H., Ritter, J.M., Roggman, L.A., & Vaughn, L.S. (1991). Facial diversity and infant preferences for attractive faces. *Developmental Psychology*, *27*, 79–84.

Lavrakas, P.J., Buri, J.R., & Mayzner, M.S. (1976). A perspective on the recognition of other-race faces. *Perception & Psychophysics*, *20*, 475–481.

Li, J.C., Dunning, D., & Malpass, R.S. (1998). *Cross-racial identification among European-Americans: Basketball fandom and the contact hypothesis*. Unpublished manuscript, Cornell University, Ithaca, NY.

MacLin, O.H., & Malpass, R.S. (2001). Racial categorization of faces: The ambiguous race face effect. *Psychology, Public Policy, and Law*, *7*, 98–118.

Malpass, R.S., & Kravitz, J. (1969). Recognition for faces of own and other race. *Journal of Personality and Social Psychology*, *13*, 330–334.

Meissner, C.A., & Brigham, J.C. (2001). Thirty years of investigating the own-race bias in memory for faces: A meta-analytic review. *Psychology, Public Policy, and Law*, *7*, 3–35.

Nelson, C.A. (2001). The development and neural bases of face recognition. *Infant and Child Development*, *10*, 3–18.

Pascalis, O., de Haan, M., & Nelson, C.A. (2002). Is face processing species-specific during the first year of life? *Science*, *296*, 1321–1323.

Pezdek, K., Blandon-Gitlin, I., & Moore, C. (2003). Children's face recognition memory: More evidence for the cross-race effect. *Journal of Applied Psychology*, *88*, 760–763.

Richeson, J.A., & Shelton, J.N. (2003). When prejudice does not pay: Effects of interracial contact on executive function. *Psychological Science*, *14*, 287–290.

Rubenstein, A.J., Kalakanis, L., & Langlois, J.H. (1999). Infant preferences for attractive faces: A cognitive explanation. *Developmental Psychology*, *35*, 848–855.

Sangrigoli, S., & de Schonen, S. (2004a). Effect of visual experience on face processing: A developmental study of inversion and non-native effects. *Developmental Science*, *7*, 74–87.

Sangrigoli, S., & de Schonen, S. (2004b). Recognition of own-race and other-race faces by three-month-old infants. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *45*, 1219–1227.

Sangrigoli, S., Pallier, C., Argenti, A.-M., Ventureyra, V.A.G., & de Schonen, S. (2005). Reversibility of the other-race effect in face recognition during childhood. *Psychological Science*, *16*, 440–444.

(Received 12/6/04; Revision accepted 2/18/05; Final materials received 3/10/05)