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Cross-Race Preferences for Same-Race Faces Extend Beyond the African Versus Caucasian Contrast in 3-Month-Old Infants

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Abstract

A visual preference procedure was used to examine preferences among faces of different ethnicities (African, Asian, Caucasian, and Middle Eastern) in Chinese 3-month-old infants exposed only to Chinese faces. The infants demonstrated a preference for faces from their own ethnic group. Alongside previous results showing that Caucasian infants exposed only to Caucasian faces prefer same-race faces (Kelly et al., 2005) and that Caucasian and African infants exposed only to native faces prefer the same over the other-race faces (Bar-Haim, Ziv, Lamy, & Hodes, 2006), the findings reported here (a) extend the same-race preference observed in young infants to a new race of infants (Chinese), and (b) show that cross-race preferences for same-race faces extend beyond the perceptually robust contrast between African and Caucasian faces.

It has been reported recently in two separate studies that 3-month-old infants demonstrate a visual preference for faces from their own ethnic group when paired with faces from other ethnic groups. Using a standard visual preference task, Kelly et al. (2005) found that English Caucasian infants preferred to look at Caucasian faces when paired with African, Chinese, or Middle Eastern faces. Using the same paradigm, Bar-Haim, Ziv, Lamy, and Hodes (2006) found a cross-race visual preference in Israeli and Ethiopian infants with Israeli infants showing a visual preference for Caucasian faces and Ethiopian infants preferring to look at the faces from their own racial group. Crucially, Bar-Haim et al. (2006) also tested a population of Israeli-born infants of Ethiopian parentage recruited from an absorption center

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in Israel where intensive exposure to both Caucasians and Africans was experienced. These 3-month-old infants demonstrated no preference for either the Caucasian or African faces. Kelly et al. (2005) also found that newborn Caucasian infants did not present the own-race preference, which was observed in the 3-month-old population. The lack of preference for either own- or other-race faces in newborns indicates that the infant's face representation may be "ethnically unspecified" at birth, but is subsequently shaped according to the ethnicity of faces viewed within the visual environment. This possibility of an unspecified face representation at birth is supported by the finding that 3-month-old infants also demonstrate a visual preference for faces that match the gender of their primary caregiver, whether this is male or female (Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002). Although newborns' spontaneous preference for male or female faces has yet to be tested, the fact that infants show a preference for the gender of their primary caregiver at 3 months of age suggests that the faces in the visual environment have an impact on the infants' face representation during early development.

Further evidence of the infant's face representation being shaped by the visual environment is that 6-month-old infants are able to discriminate between both human and monkey faces, but the ability to discriminate monkey faces has diminished by 9 months of age (Pascalis, de Haan, & Nelson, 2002). However, passive exposure to monkey faces during the 3-month period when the ability naturally declines is sufficient to maintain the infant's ability to discriminate between monkey faces (Pascalis et al., 2005). It is also important to note that although the face processing system appears to undergo a period of refinement during this time of life, it does not become fixed. This is attested to by the finding that Korean adults who were adopted by French families during their childhood (aged 3–9 years) demonstrated the same discrimination deficit for Korean faces shown by the native French population (Sangrigoli, Pallier, Argenti, Ventureyra, & de Schonen, 2005). This finding is highly indicative of a face representation that remains flexible throughout both infancy and childhood. Although the face representation emerges early in life based on differential experience, it appears to retain its plasticity until at least 9 years of age.

It is well established that adults typically find it easier to recognize faces from their own racial group, as opposed to faces from other racial groups. This is commonly known as the other-race effect (ORE; see Meissner & Brigham, 2001, for a review). Despite a relative paucity of developmental literature investigating the ORE, available data suggest that the effect emerges reasonably early in life. However, the precise age of onset remains ambiguous with reports ranging from 8 years (Chance, Turner, & Goldstein, 1982), to 6 years (Feinman & Entwhistle, 1976), to 5 years (Pedzek, Blandon-Gitlin, & Moore, 2003), and 3 years (Sangrigoli & de Schonen, 2004a). Also, one report (Goldstein & Chance, 1980) failed to find any evidence of the ORE in children 6 to 12 years old, but a very large effect with adults tested using the same stimuli. A larger effect has also been reported in Caucasian children living in segregated as opposed to integrated communities (Cross, Cross, & Daly, 1971; Feinman & Entwhistle, 1976). In addition, Sangrigoli and de Schonen (2004b) provided evidence of the ORE in 3-month-old Caucasian infants using a visual paired-comparison (VPC) task. However, they also found the effect could be removed if the infants were habituated for just 2 min to three other-race face exemplars, as opposed to one. Although the other-race effect may be present early in life, it appears to remain flexible.

Although the own-race face preference demonstrated by Kelly et al. (2005) and Bar-Haim et al. (2006) is obviously not a demonstration of the ORE, the possibility that the two phenomena (own-race face preference and superior own-race face recognition) are interrelated cannot be dismissed. Quinn et al. (2002) reported that the same population of infants who showed a visual preference for female faces also demonstrated a recognition deficit for male faces, but not female faces, as measured by the VPC task. Therefore, it is

conceivable that own-race preference and the ORE may be related to each other in an as yet unidentified way. We return to this point in the discussion.

A limitation of the findings reported by Kelly et al. (2005) is that infants from only a single ethnic group were tested. Although Bar-Haim et al. (2006) subsequently showed that an own-race preference at 3 months of age is not restricted to Caucasian infants, their findings are limited by the use of faces from only two ethnic groups: the own-race group and a contrast group. Moreover, the contrast tested—that between African and Caucasian faces—is arguably the most perceptually salient difference between ethnic categories of faces. One can ask whether cross-race differences in the preference for same-race faces at 3 months of age will be observed for race contrasts that are perceptually not as salient. The aims of this study were to investigate whether an own-race preference could be observed in infants from yet another ethnic group and if that preference would be found when own-race faces were paired with faces from a range of ethnic groups.

To assess spontaneous preference for own- versus other-race faces, a visual preference (VP) task identical to the design of Experiment 2 from Kelly et al. (2005) was used. To further assess the generality of the own-race preference found in Caucasian and Ethiopian infants, a Chinese 3-month-old population was tested. Given the findings already reported (Bar-Haim et al., 2006; Kelly et al., 2005), it was predicted that the Chinese infants would demonstrate a preference for faces from their own ethnic group. The use of stimuli from multiple ethnic groups should provide additional information regarding the extent of the preference for own-race faces, in particular, whether it can be observed for face contrasts that are perceptually subtler than the Caucasian versus African contrast.

METHOD

Participants

Participants were 3-month-old, healthy Chinese infants who were recruited at Zheijang Children's Hospital in Hangzhou, China. The children were all Han Chinese, the majority race in Zhejiang (99%). In total, 64 full-term 3-month-old infants (40 boys) of normal birth weight were included in the final sample. A further 17 infants were excluded due to side bias (> 95% of time spent looking at one face from the pairing; n = 11) or fussiness (n = 6). The foreign population in Hangzhou is extremely low and all mothers reported that their infant had received no contact with people from outside of China.

Stimuli

The stimuli were 32 color images of male and female adult faces (age range = 25–29) from four distinct ethnic groups (Chinese, Caucasian, Middle Eastern, and African) that were paired as follows: Chinese–Caucasian, Chinese–Middle Eastern, Chinese–African, and Chinese–Chinese. Examples of stimuli from all ethnic categories are presented in Figure 1. All pictures were taken with a Canon S50 digital camera. Using Photoshop (Adobe Systems, San Jose, CA), all faces were cropped to remove the neck and background detail from the original image. They were then mounted on a uniform dark gray background. All stimuli were resized identically to ensure uniformity. Faces from all ethnic groups were rated on a scale of 1 to 10 for attractiveness and distinctiveness by 8 Chinese (4 male, 4 female) independent observers and 8 Caucasian (4 male, 4 female) observers and subsequently paired to equate for gender, attractiveness, and distinctiveness.

Procedure

All infants were tested in a quiet room at the Zheijang Children's Hospital in Hangzhou, China. Infants were seated on their mother's lap approximately 60 cm away from a 42-in.

Toshiba plasma television on which the images were displayed. All mothers were instructed to fixate centrally above the screen and to remain quiet during testing. Each infant was randomly assigned to one of the four ethnic pairing conditions, with 16 infants in each condition. Because infants participated in only one condition, they were exposed to the same number of own-and other-race faces. This feature of the experimental design prevented a potential within-experiment familiarity preference from developing across trials. Each infant was shown two face pairings, one male and one female. The presentation of slides was counterbalanced for gender and left or right positioning of images across trials.

When displayed on the television all images measured 18 cm × 18 cm (14° visual angle) and were positioned side by side separated with a 9-cm gap. Each pair of images was displayed until 10 sec of fixation time had elapsed. Therefore, the total presentation time varied between both infants and face pairings, with the shortest time being 10 sec and the longest being 18 sec. The average length of each trial was 12.7 sec. If the infant spent 10 sec looking away from the projected images, the trial was terminated. Between each image pairing, a blank screen was presented for 5 sec or until the infant moved his or her eyes from the final point of fixation from the previous trial. A color camera (specialized for low light conditions) was used to film the infant's eye fixations. This was displayed to the experimenters during recording on a computer monitor. Eye fixations were recorded and later analyzed frame by frame by two independent observers on a computer using specialized software. The average level of interobserver agreement was high (Pearson r = .91).

RESULTS

Preliminary examination of the data revealed no significant gender differences for stimuli or participants, so the data were combined for further analysis. A paired-samples two-tailed *t* test conducted on the total time spent looking at Chinese faces versus chance (50%) yielded a highly significant result: Overall, the infants attended more to Chinese than other-race faces (62.64% and 37.36%, respectively), $t(47) = 6.543$, $p < .0001$. To investigate whether the Chinese preference was represented within each of the three contrasting ethnicity conditions, further *t* tests comparing individual novelty preferences versus chance (50%) were conducted. Paired samples two-tailed *t* tests yielded significant preferences in all conditions: Chinese–Caucasian (61.31% and 38.69%), $t(15) = 3.084$, $p < .008$; Chinese–Middle Eastern (64.05% and 35.95%), $t(15) = 4.527$, $p < .0004$; and Chinese–African (62.56% and 37.44%), $t(15) = 3.657$, $p < .002$. In addition, a one-way between-groups analysis of variance (ANOVA) revealed that the preference for Chinese faces did not differ significantly among any of the three conditions, $F(2, 45) = .247$, $p = .782$. Finally, a paired samples two-tailed *t* test revealed that the infants displayed a null preference in the Chinese–Chinese condition (looking times of 50.63% and 49.37%, respectively), $t(15) = .193$, $p = .85$.

DISCUSSION

The results clearly demonstrate that like 3-month-old English, Israeli, and Ethiopian infants, 3-month-old Chinese infants show a spontaneous preference to look at faces from their own ethnic group when paired with other-race faces. Furthermore, the preference for own-race faces is both significant and consistent across a range of distinct ethnic face pairings. The importance of a preference for own-race faces regardless of the ethnicity of the face with which they are paired should not be understated. Finding a preference for Chinese faces when paired with African faces is not altogether unexpected, as the contrast difference between faces from the two categories is apparent (see Kelly et al., 2005, for full analysis of physical contrast differences). However, the fact that this preference persists regardless of

the extent to which the own- and other-race faces differ in terms of skin tone or physiognomy highlights the robust nature of the preference. The preference for the Chinese faces over the Middle Eastern and Caucasian faces is particularly noteworthy inasmuch as the physical contrast differences between these categories of faces were minimal.

Taken together with the findings from Kelly et al. (2005) and Bar-Haim et al. (2006), a clearer understanding of the early developmental origins of racial categorization is beginning to emerge. Kelly et al. (2005) reported that the own-race face preference is not present at birth, but has developed by 3 months of age. This finding led the authors to speculate that human perceptions of ethnic, physiognomic differences are learned and likely to be a consequence of the faces encountered in the visual environment during development. The results of Bar-Haim et al. (2006) provide additional support for this hypothesis in three ways: first, by finding the same result as Kelly et al. (2005) with a Caucasian population in a different geographical location; second, by finding an own-race preference in Ethiopian infants primarily exposed to own-race faces; and third, by showing that infants who receive exposure to two different ethnic groups fail to elicit a preference for faces from either of those groups. The data reported in this study further validate the hypothesis by extending the own-race preference to another distinct ethnic group and by confirming that a preference for an own-race face is observed regardless of the ethnicity of the face with which it is paired.

The evidence from this study along with that reported in Kelly et al. (2005) and Bar-Haim et al. (2006) suggests that visual preferences for faces of different races appear to be modifiable depending on the races of the faces encountered in the natural rearing environment of the infant. As observed in the introduction, it is possible that own-race preference and the superior recognition for own-race faces are related and perhaps governed by common mechanisms. On this basis, we can speculate that the early own-race preference may not be as rigid as certain other experience-dependent developmental phenomena that have critical periods, and it may be reduced when an individual encounters faces of another race. For example, the data reported in Sangrigoli and de Schonen (2004b) indicate that superior performance for same-race faces in a recognition memory task context (i.e., the ORE) can be modified on the basis of laboratory training experience. Moreover, the apparent flexibility of the ORE effect in 3-month-olds is consistent with findings reported in adults. That is, although the ORE has been consistently demonstrated in adults, it has also been shown to be reducible with minimal training (Elliott, Wills, & Goldstein, 1973; Lavrakas, Buri, & Mayzner, 1976) and that the benefits of such training can last for at least 5 months (Goldstein & Chance, 1985). It is important to note that the ORE has not been wholly negated when training has been administered, but the fact that it can be reduced with brief exposure to other-race faces lends support to both the flexibility of the face representation in adulthood and the notion of an experience-dependent face processing system during development.

Although there are several ways to account for how preference and recognition may be related when perceiving the race of faces, we tentatively suggest that a plausible scenario for the emergence of the ORE is as follows: Predominant exposure to faces from a single racial group leads to greater visual attention toward those faces that in turn produces superior face recognition abilities with faces from that group and poorer recognition abilities with faces from racial groups that are not frequently viewed in the visual environment. The visual preference for same-race faces based on differential exposure might thus be viewed as a mediating variable in the superior recognition of same-race faces (i.e., the ORE). Moreover, if visual attention is considered to be a finite capacity (e.g., Norman & Bobrow, 1975), it is even possible that a requisite of a face processing system operating at optimal proficiency is that it must be limited to only a single face category (e.g., Caucasian). Alternatively, it could be argued that if an individual (e.g., a child with parents of different ethnicity) is heavily

exposed to more than one face category during development, he or she will attain expertise with faces from both categories. However, in most individuals, the ability to efficiently process faces from unfamiliar groups fails to develop due to a lack of exposure to faces from these groups, allowing face processing capabilities to be fully exploited for the category most commonly encountered. Nevertheless, training or simple exposure to faces from an unfamiliar category would appear sufficient to allow for the acquisition of at least some sensitivity to such faces.

In summary, this study has provided further evidence in support of an unspecified face representation at birth, which is shaped by the faces observed within the visual environment during the initial months of development. Future research is needed to help elucidate more precisely what dimensions of experienced facial information are contained in the infants' mentally represented face structures and are responsible for inducing both a visual preference for and superior recognition of own-race faces.

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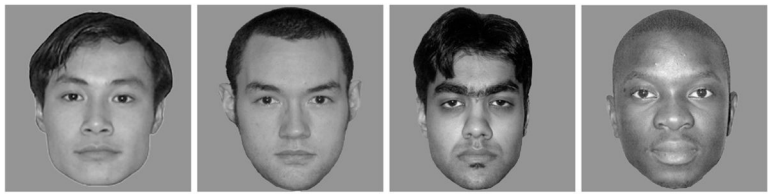

Chinese Caucasian Middle Eastern African

FIGURE 1.
Sample stimuli.