

Developmental Origins of the Other-Race Effect

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Abstract

The other-race effect (ORE) in face recognition refers to better recognition memory for faces of one's own race than faces of another race—a common phenomenon among individuals living in primarily mono-racial societies. In this article, we review findings suggesting that early visual and sociocultural experiences shape one's processing of familiar and unfamiliar race classes and give rise to the ORE within the 1st year of life. However, despite its early development, the ORE can be prevented, attenuated, and even reversed given experience with a novel race class. Social implications of the ORE are discussed in relation to development of race-based preferences for social partners and racial prejudices.

Keywords

other-race effect, perceptual narrowing, face perception, face recognition, face processing

In primarily mono-racial societies, most people frequently encounter individuals from their own race, whereas encounters with individuals from other races are relatively infrequent. Such asymmetry in exposure to own- and other-race faces presents an ideal “natural experiment” for understanding how specific input from the environment shapes people's abilities to process familiar and unfamiliar categories of visual objects and their attitudes about them. Indeed, extensive evidence shows that adults are better at recognizing faces of their own race than those of another unfamiliar race (Meissner & Brigham, 2001). In this article, we review findings regarding the developmental origins of this so-called other-race effect (ORE) and the experience-dependent recalibration of one's visual representation of faces when exposed to a novel race class. We also discuss early visual preferences and recognition biases in relation to the development of racial preferences and prejudices.

Visual Experience and Expertise for Own-Race Faces

Newborns show no racial preferences (Kelly et al., 2005), but by 3 months of age, infants with experience primarily with own-race individuals prefer to look at faces of their

own race than faces of another race (Bar-Haim, Ziv, Lamy, & Hodes, 2006; Kelly, Liu, et al., 2007; Kelly et al., 2005). However, 3-month-olds with experience with individuals from their own race as well as those from another race show no visual preference for faces belonging to either group (Bar-Haim et al., 2006). Thus, an early visual preference for a race class is shaped by the familiar race class in one's environment.

Such early visual preferences may help in shaping the development of a differentiation and recognition advantage for the familiar race class that also begins to emerge at around 3 months of age. Face recognition in infants is most commonly studied by familiarizing infants with an image of a face and then measuring their visual preferences for a novel face when paired with the familiarized

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face. An own-race bias in differentiating between small differences in facial identity can be observed in 3-month-olds (Hayden, Bhatt, Joseph, & Tanaka, 2007). However, the ORE in 3-month-olds can be easily eliminated via brief exposure to photos of other-race faces (Sangrigoli & de Schonen, 2004). Indeed, 4-month-olds demonstrate holistic processing of both own- and other-race faces (Ferguson, Kulkofsky, Cashon, & Casasola, 2009). However, although 6-month-olds can still recognize faces from certain unfamiliar racial groups, they fail to do so with faces from other racial groups (Kelly et al., 2009; Kelly, Quinn, et al., 2007). By 8 months of age, infants process own-race, but not other-race, faces holistically (Ferguson et al., 2009); furthermore, at 9 months of age, infants show a robust ability to recognize own-race faces while showing poor recognition of all other-race faces (Kelly et al., 2009; Kelly, Quinn, et al., 2007). After infancy, although recognition of both own- and other-race faces improves with age, the ORE persists into childhood and adulthood with continued asymmetry in own- and other-race experience (Goodman et al., 2007; Pezdek, Blandon-Gitlin, & Moore, 2003; Walker & Hewstone, 2006).

Overall, it appears that at birth, one's visual representation of faces is broadly tuned with no preexisting race-based visual preference or recognition bias. However, continued experience with own-race individuals and lack of experience with other-race individuals during the 1st year of life leads to a perceptual narrowing process: One's visual representation of faces becomes fine-tuned to differentiate between and recognize own-race faces (Scott, Pascalis, & Nelson, 2007). Experience with own-race individuals likely develops a visual representation of faces based on many dimensions necessary to differentiate between own-race faces—dimensions that may not be ideal in differentiating between faces from another race (Valentine, 1991).

Considering infants' developing visual capabilities, it remains to be seen whether gradual improvements in visual acuity and contrast sensitivity influence the emergence and development of the ORE in face recognition. Improved visual capabilities would allow infants to develop increasingly refined visual representations of faces based on fine-detailed dimensions most crucial in differentiating between own-race individuals. Studies in which researchers examine how developmental changes in perception interact with experiential factors would provide a fuller account of the development of the ORE in face recognition.

Sociocultural Experience and Expertise for Own-Race Faces

In addition to the importance of visual experience, sociocultural conventions in interacting with social partners

appear to shape infants' visual scanning of faces. Consistent with the Western cultural convention in maintaining eye contact during social interactions (Argyle & Cook, 1976), Caucasian 6- to 10-month-olds show an age-related increase in their visual scanning of the eye region of Caucasian faces (Wheeler et al., 2011). However, they show no such change in their scanning of African American faces. In contrast, consistent with the Eastern cultural convention in limiting direct eye contact (Li, 2004), Asian 4- to 9-month-olds in China do not show an increase in the scanning of own-race eye regions (Liu et al., 2011). Instead, they focus on the central/nasal regions of own-race faces, but their focus on the central/nasal regions of other-race Caucasian faces declines with age.

Thus, infants learn to adopt cultural conventions in social gaze interactions, but they only do so for the familiar race class in their environment. In the case of Caucasian infants, only their face scanning of own-race faces becomes more similar to the face scanning pattern shown by Caucasian adults (Blais, Jack, Scheepers, Fiset, & Caldara, 2008). Likewise, in the case of Chinese infants, only their face scanning of own-race faces maintains a face scanning pattern similar to that shown by Asian adults (Blais et al., 2008; Fu, Hu, Wang, Quinn, & Lee, 2012).

The similar developmental timeline in infants' differential scanning of own- and other-race faces and the emerging ORE suggest that the two behaviors may be related. Indeed, among North American 3-month-olds raised by mono-racial parents, greater scanning frequency between the eye and mouth regions of own-race faces is associated with a greater likelihood of recognizing own-race faces (Gaither, Pauker, & Johnson, 2012). It is interesting to note that among biracial 3-month-olds with Asian mothers, reduced scanning between the eye and mouth regions of Asian faces is associated with a greater likelihood of recognizing Asian faces (Gaither et al., 2012).

In future studies, researchers should investigate how face scanning may be related to own- and other-race face recognition among older infants who show a more robust ORE. Perhaps the ORE in older infants is exacerbated by their initial categorization of faces as own- or other-race, which may subsequently instigate differential visual scanning and processing of faces—at the subordinate level of identity for own-race faces versus at the more global level of race for other-race faces (see Ge et al., 2009). Indeed, by 9 months of age, infants visually categorize faces by race, and they also show a robust ORE (Anzures, Quinn, Pascalis, Slater, & Lee, 2010). In contrast, 6-month-olds do not appear to consistently categorize faces by race (Anzures et al., 2010), and their ORE in recognition does not seem as robust relative to older infants (Kelly et al., 2009; Kelly, Quinn, et al., 2007). In older children,

categorization appears to reinforce differential processing of items from familiar/unfamiliar race classes. Top-down influences in cognitive processing are evident in 2- to 6-year-olds who show better recognition of 50% own-race and 50% other-race morphed faces when such faces are depicted as belonging to one's own-race rather than another race (Shutts & Kinzler, 2007). A similar, albeit more perceptually based, cognitive process may also be occurring in infants showing a robust ORE in the latter half of the 1st year of life.

Other-Race Experience and Attenuation of the ORE

Although expertise in recognizing the familiar race class begins to develop early, face processing expertise remains plastic and is continuously fine-tuned by experience. Researchers have shown that experience with other-race faces can prevent, attenuate, or even reverse the typical ORE in face recognition. Sangrigoli and de Schonen (2004) found that although the ORE was already present in Caucasian 3-month-olds, it was eliminated after only 2 minutes of visual experience with photographs of three different Asian faces. In contrast, Heron-Delaney et al. (2011) found comparable recognition of Caucasian and Asian faces among Caucasian 6-month-olds. However, proficiency in recognizing Asian faces was maintained at 9 months of age only if, starting at 6 months of age, infants were given approximately 70 minutes of visual experience with photographs of individually named Asian faces (Heron-Delaney et al., 2011).

Among older infants already showing the ORE, greater visual experience with other-race faces is needed to attenuate the decline in other-race face recognition. Caucasian 8- to 10-month-olds who show difficulty in recognizing other-race faces begin to show above-chance recognition of novel Asian faces after approximately 100 to 155 minutes of visual experience with dynamic videos of individually named Asian faces (Anzures et al., 2012).

It remains to be seen whether a faster attenuation of the decline in other-race face recognition during infancy would be observed if the other race became the ethnic majority rather than the minority. However, a few researchers have examined similar cases among child adoptees. In one study, Asian children from China or Vietnam adopted into Caucasian families in Europe between 2 and 26 months of age showed comparable recognition of Asian and Caucasian faces at 6 to 14 years of age (de Heering, de Liedekerke, Deboni, & Rossion, 2010). In contrast, Asian adults from Korea who were adopted into Caucasian families in Europe between 3 and 9 years of age showed better recognition of other-race Caucasian faces than own-race Asian faces (Sangrigoli, Pallier, Argenti, Ventureyra, & de Schonen,

2005). Thus, approximately 20 years of primary experience with another race is sufficient to reverse the typical own-race bias in face recognition.

To date, research confirms that proficiency in other-race face recognition can develop following relatively brief visual exposure to photographs or videos of other-race faces during infancy (Anzures et al., 2012; Sangrigoli & de Schonen, 2004) and adulthood (Goldstein & Chance, 1985; Hills & Lewis, 2006; Rhodes, Locke, Ewing, & Evangelista, 2009; Tanaka & Pierce, 2009). However, live social interactions provide a rich representation of faces through varied viewpoints and varied emotional expressions embedded in meaningful social contexts. It has yet to be investigated whether live social interactions with other-race individuals lead to a faster attenuation of the ORE with longer lasting effects on other-race face recognition in both infants and adults.

In addition to visual experience, emphasis on individuating between other-race faces appears to be an important factor in developing proficiency in other-race face recognition among adults (Goldstein & Chance, 1985; Hills & Lewis, 2006; Rhodes et al., 2009; Tanaka & Pierce, 2009). In contrast, emphasis on racial categories leads to a smaller attenuation of the ORE in adults (Tanaka & Pierce, 2009). Similarly, 6-month-olds maintain the ability to individuate between monkey faces at 9 months of age only if they are given visual experience with images of monkeys with different names rather than the category label of "monkey" or no label (Scott & Monesson, 2009). Thus, visual experience alone may not be sufficient to attenuate a bias in face recognition. Attention to visual and naming cues that highlight that other-race faces differ from one another appears to be crucial in learning to process other-race faces at the individual level of identity rather than at the categorical level of race.

The ORE and Racial Preferences and Prejudices

One might wonder whether early visual preferences and recognition biases for own-race individuals would influence interactions with social partners. Evidence to date suggests that infants do not discriminate among social partners on the basis of race. Ten-month-olds accept toys equally from own- and other-race individuals (Kinzler & Spelke, 2011). Similarly, 2-year-olds give toys equally to own- and other-race individuals (Kinzler & Spelke, 2011), and 3- to 4-year-olds show no bias for own- or other-race peers when choosing a playmate or friend (Abel & Sahinkaya, 1962). However, by 5 years of age, children tend to choose own-race over other-race individuals as playmates or friends (Abel & Sahinkaya, 1962; Kinzler, Shutts, DeJesus, & Spelke, 2009; Kinzler & Spelke, 2011).

Although 5-year-olds prefer own-race social partners when they are provided only with visual cues (i.e., images of faces), they tend to choose other-race children portrayed as speaking their native language in their native accent over own-race children speaking their native language with a foreign accent (Kinzler et al., 2009). Thus, children's social interactions are influenced by their evaluations of in-group/out-group membership, with race being only one of several factors used in their evaluation.

Children between 5 and 7 years of age show more positive evaluations (e.g., clean, good, friendly) of own-race children and show more negative evaluations (e.g., dirty, naughty, unfriendly) of other-race children, whereas younger children show no such biases (Aboud, 2003). However, more contact with other-race individuals is related to less prejudiced attitudes in adults (see also Meissner & Brigham, 2001, for a review) and children (Binder et al., 2009). In addition, mere visual exposure to photographs of other-race faces increases adults' ratings of likeability for novel faces from the same other-race group (Zebrowitz, White, & Wieneke, 2008). Although there is no direct association between the ORE and self-reports of racial attitudes (see Meissner & Brigham, 2001 for a review), a reduction in the ORE via training in individuating between other-race faces is associated with a reduction in implicit racial biases (Lebrecht, Pierce, Tarr, & Tanaka, 2009).

Conclusions and Future Directions

The early development of the ORE is shaped and maintained by asymmetries in experience with own- and other-race individuals. This asymmetry in experience likely influences later race-based social preferences and attitudes that emerge at around 5 years of age. The developmental gap between the ORE in face recognition and race-based social preferences and attitudes is likely due to the cognitive demands involved in forming in-group/out-group categories that are more conceptually based than earlier perceptually based race categories.

Nevertheless, experience with other-race individuals can broaden one's face recognition expertise and improve attitudes about other-race individuals. However, if other-race experience ceases, the long-lasting effects of such experience on face recognition expertise and social attitudes remain unclear. Timing of exposure may play a crucial role, with earlier exposure leading to longer lasting effects in face recognition. Indeed, primary experience with own-race individuals for only 2 to 26 months after birth followed by a lack of experience with own-race individuals is sufficient to nonetheless maintain proficiency in recognizing own-race faces at 6 to 14 years of age (de Heering et al., 2010). Furthermore, temporary

experience with other-race individuals may require minimal subsequent reexposure to regain advantages in other-race face recognition. In the case of social attitudes, early childhood experience with other-race social partners combined with positive views of other racial groups in the social environment may help to prevent the development of prejudiced attitudes (Bigler & Liben, 2007).

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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