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# Similarity and difference in the processing of same- and other-race faces as revealed by eye tracking in 4- to 9-month-olds

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### ABSTRACT

Fixation duration for same-race (i.e., Asian) and other-race (i.e., Caucasian) female faces by Asian infant participants between 4 and 9 months of age was investigated with an eye-tracking procedure. The age range tested corresponded with prior reports of processing differences between same- and other-race faces observed in behavioral looking time studies, with preference for same-race faces apparent at 3 months of age and recognition memory differences in favor of same-race faces emerging between 3 and 9 months of age. The eye-tracking results revealed both similarity and difference in infants' processing of own- and other-race faces. There was no overall fixation time difference between same race and other race for the whole face stimuli. In addition, although fixation time was greater for the upper half of the face than for the lower half of the face and trended higher on the right side of the face than on the left side of the face, face race did not impact these effects. However, over the age range tested, there was a gradual decrement in fixation time on the internal features of other-race faces and a maintenance of fixation time on the internal features of same-race faces. Moreover, the decrement in fixation time for the internal features of other-race faces was most prominent on the nose. The findings suggest that (a) same-race preferences may be more readily evidenced in paired comparison testing

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formats, (b) the behavioral decline in recognition memory for other-race faces corresponds in timing with a decline in fixation on the internal features of other-race faces, and (c) the center of the face (i.e., the nose) is a differential region for processing same-versus other-race faces by Asian infants.

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## Introduction

Recent work examining the ontogenesis of face perception in infants has revealed that infants are sensitive to gender and race information based on differential experience with female versus male faces and same- versus other-race faces (Lee, Anzures, Quinn, Pascalis, & Slater, *in press*). For example, in the case of gender, 3- and 4-month-olds reared by female caregivers prefer female faces over male faces and also represent female faces at the level of individuals, with male faces being represented at the summary category level (Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002). That the female preference is experientially based is evidenced by the fact that 3- and 4-month-olds reared by male caregivers and newborn infants do not display the preference (Quinn et al., 2002, 2008).

In the case of race, infants as young as 3 months of age, but not newborns, prefer same-race faces over other-race faces (Bar-Haim, Ziv, Lamy, & Hodes, 2006; Kelly et al., 2005, 2007a) and also show an advantage in recognizing structural changes to same-race faces over other-race faces (Hayden, Bhatt, Joseph, & Tanaka, 2007). However, at 3 months of age, the recognition advantage appears to be fragile enough such that it can be overcome by laboratory training involving brief exposure to as few as three other-race faces (Sangrigoli & de Schonen, 2004). In two large-scale studies of recognition of same- and other-race faces, including African, Asian, and Caucasian faces, and Asian versus Caucasian participants, same-race recognition advantages were observed to emerge during the period between 3 and 9 months of age (Kelly et al., 2007b, 2009). The combined results suggest that the representation of faces by infants may initially be unspecified but becomes tuned to the gender of the primary caregiver and the predominant race of faces encountered during the initial months of life.

Further evidence for tuning into social category information in faces is evident in a study that investigated how infants between 6 and 9 months of age respond to race category information (Anzures, Quinn, Pascalis, Slater, & Lee, 2010). In particular, 9-month-old Caucasians differentiated categories of female Caucasian and Asian faces (i.e., they generalized to novel instances of the familiarized race category and responded differentially to novel instances of the novel race category), whereas 6-month-old Caucasians did not. The 6-month-olds showed differential responsiveness (i.e., a significant increase in looking) to Caucasian faces after familiarization with Asian faces, but they showed no such increase in looking at Asian faces after familiarization with Caucasian faces. This pattern of responsiveness is consistent with the idea that 6-month-old performance in the racial categorization task was influenced by the spontaneous preference for own-race faces. Infants' spontaneous preference for own-race faces could have driven the observed increase in looking at own-race faces after familiarization with other-race faces and would have interfered with increased looking at the less preferred other-race faces after familiarization with own-race faces.

The findings of Anzures and colleagues (2010) suggest that younger infants' racial categorization may be influenced by a spontaneous preference for the category of faces with which they have the most experience, whereas older infants are able to separate categories of own- versus other-race faces. However, there was also an important sense in which even the older infants' representations for same- and other-races were not symmetrical. Specifically, at 9 months of age, same-race faces were discriminated, suggesting that they were *categorized* (where a category refers to a grouping together of discriminably different entities that are responded to equivalently). By contrast, at the same age, other-race faces were not discriminated, suggesting that they were represented through *categorical perception* (where the perception is of similar exemplars that are difficult to discriminate). This pattern of results in turn implies that same- and other-race faces are, by 9 months of age, represented by different category structures.

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