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Children (but not adults) judge similarity in own- and other-race faces by the color of their skin

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ABSTRACT

Both face shape and pigmentation are diagnostic cues for face identification and categorization. In particular, both shape and pigmentation contribute to observers' categorization of faces by race. Although many theoretical accounts of the behavioral other-race effect either explicitly or implicitly depend on differential use of visual information as a function of category expertise, there is little evidence that observers do in fact differentially rely on distinct visual cues for own- and other-race faces. In the current study, we examined how Asian and Caucasian children (4–6 years of age) and adults use three-dimensional shape and two-dimensional pigmentation to make similarity judgments of White, Black, and Asian faces. Children in this age range are capable of making category judgments about race but also are sufficiently plastic with regard to the behavioral other-race effect that it seems as though their representations of facial appearance across different categories are still emerging. Using a simple match-to-sample similarity task, we found that children tend to use pigmentation to judge facial similarity more than adults and also that own-group versus other-group category membership appears to influence how quickly children learn to use shape information more readily. Therefore, we suggest that children continue to adjust how

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different visual information is weighted during early and middle childhood and that experience with faces affects the speed at which adult-like weightings are established.

Introduction

Faces are highly multidimensional stimuli. A wide variety of visual features may carry diagnostic information for individuation and categorization, and a key goal of face recognition research for many years has been to characterize observers' use of distinct cues in face processing tasks. For example, the various distinctions between "featural" and "configural" processing have been elaborated in many studies (Maurer, Le Grand, & Mondloch, 2002). Briefly, featural processing is usually understood in terms of analysis of discrete parts of the face (e.g., eyes, nose, mouth), whereas configural processing is often understood in terms of metric descriptors of how those features are arranged relative to one another within the face (e.g., eye-to-eye spacing). Similarly, the distinction between "holistic" face processing (usually as revealed via the composite face effect [Young, Hellawell, & Hay, 1987]) and fragmented localized processing has also been described at length. Holistic processing of the face is thought to rely on some description of facial appearance that encodes the entire face pattern as a whole rather than via a fragmented representation of multiple constituent parts. These dichotomies between featural/configural analysis and local/holistic analysis are sufficiently high level that it is not trivial to relate the candidate mechanisms to a specific set of visual features. However, face recognition also appears to rely on a specific vocabulary of low-level features; intermediate spatial frequencies (~8–16 cycles/face) are the most useful for a range of recognition tasks (Costen, Parker, & Craw, 1996; Nasanen, 1999; Ruiz-Soler & Beltran, 2006), and horizontal orientation energy (e.g., edges) similarly appears to be more useful for recognition than vertical orientations (Dakin & Watt, 2009; Goffaux & Dakin, 2010). Thus, in terms of both candidate high-level features and well-specified low-level features, face recognition appears to depend on distinct visual information to varying degrees. Some visual features are more useful than others, and skilled observers preferentially use these. Ultimately, understanding how face recognition works will depend on understanding which sources of information contribute the most to various tasks and how observers recruit distinct visual cues for face individuation and categorization judgments.

Experience with faces appears to influence the extent to which specific visual features or specific processing strategies are used to support face recognition. Developmentally, it appears that infants and young children might not use the same representations as adults to recognize faces. For example, holistic processing of face patterns appears not to be fully mature until nearly 7 years of age (Mondloch, Pathman, Le Grand, Maurer, & de Schonen, 2007), although the composite face effect (De Heering, Houthuys, & Rossion, 2007) is evident in children as young as 4 years. The classic face inversion effect (Yin, 1969) also appears to change over development (Carey & Diamond, 1977; Schwarzer, 2000), although the extent to which this reflects face-specific development has been disputed (Crookes & McKone, 2009). In terms of the use of specific information to individuate and categorize faces, children also appear to be less sensitive to some aspects of facial appearance than adults, suggesting that the vocabulary they use to represent and recognize faces is changing developmentally. For example, children's sensitivity to differences in the spacing between discrete facial features appears to change substantially during childhood (Mondloch, Le Grand, & Maurer, 2002), remaining below adult levels up to 10 years of age. Children also do not appear to use spatial frequency information in the same way as adults until middle childhood; the typical adult-like bias for intermediate spatial frequencies (8–16 cycles/face) does not appear to be robust during early childhood (Leonard, Karmiloff-Smith, & Johnson, 2010). In addition to developmental changes in how information is used for face recognition, there are similar results that arise from examining the impact of face experience vis-à-vis differential exposure to own-race versus other-race faces in adult observers. Specifically, other-race faces appear to be recognized via different visual cues or strategies than own-race faces,