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No own-age bias in 3-year-old children: More evidence for the role of early experience in building face-processing biases

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ABSTRACT

This study aimed to investigate the presence of an own-age bias in young children who accumulated different amounts of early experience with child faces. Discrimination abilities for upright and inverted adult and child faces were tested using a delayed two-alternative, forced-choice matching-to-sample task in two groups of 3-year-old children, one composed of first-born children and the other composed of children who, from the time of their birth, had daily exposure to a child face through the presence of an older sibling in their home. Children without an older sibling were better at differentiating among adult faces than among child faces and showed an inversion effect that was selective for adult faces. Children with an older sibling were equally skilled at differentiating upright adult and child faces and showed inversion effects of comparable magnitude for both face types. Results support the notion that face representational space of younger children is tuned to adult faces and suggest that age biases during early childhood are dependent on the effects of early experience.

Introduction

A wealth of data indicates that adults' face perception abilities exhibit strong biases, such that discrimination and recognition are superior for specific categories of faces than for others, with relevant categories including species (see review in Dufour, Pascalis, & Petit, 2006), race (see review by Meissner & Brigham, 2001), gender (e.g., Lewin & Herlitz, 2002), and age (see review by Rhodes & Anastasi,

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2012). In particular, species, race, and age all seem to act as own-group factors, whereby adults are better at processing human faces (own-species bias, OSB; Pascalis & Bachevalier, 1998), same-race faces (own-race bias, ORB; Hancock & Rhodes, 2008), and adult faces (own-age bias, OAB; Perfect & Moon, 2005).

The nature of these biases has been interpreted within several theoretical frameworks, all of which emphasize the role of *differential experience* with various types of faces as an important factor for the shaping of these biases (e.g., Chiroro & Valentine, 1995; Hugenberg, Young, Bernstein, & Sacco, 2010; Sporer, 2001). Developmental studies have contributed to these interpretations by showing that the developmental trajectory of some of these biases is directly related to early environmental exposure to different face types (Kelly et al., 2007; Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002; Scott & Monesson, 2009, 2010). For example, between 3 and 9 months of age, infants gradually lose the ability to visually discriminate other-species and other-race faces while maintaining the ability to discriminate own-species and own-race faces, a phenomenon known as perceptual narrowing (for a review, see Scott, Pascalis, & Nelson, 2007), unless over this period, or immediately after, they are experimentally exposed to other-species faces (Scott & Monesson, 2009, 2010) or other-race faces (Anzures et al., 2012; Heron-Delaney et al., 2011) or they live in a mixed-race environment (Bar-Haim, Ziv, Lamy, & Hodes, 2006).

Accordingly, studies with children have also found evidence of race biases in face perception abilities whose magnitude and direction are dependent on the "face diet" to which children are exposed. Unlike studies with infants that primarily rely on looking time measures, studies with children have used the same type of tasks and manipulations used to examine adult participants, showing that the ORB is present in its adult-like form by 3 years of age (Sangrigoli & de Schonen, 2004). Nonetheless, like during infancy, the magnitude of the ORB is linked to the racial diversity of faces in children's environment. For example, cross-cultural adoption occurring between 3 and 9 years of age can modulate the bias (de Heering, de Liedekerke, Deboni, & Rossion, 2010; see also Sangrigoli, Pallier, Argenti, Ventureyra, & de Schonen, 2005).

Overall, evidence on the development of race biases suggests that early in development the face representational space becomes tuned to represent the race of the faces that are most frequently encountered in the everyday environment, which typically, although not necessarily, corresponds to an infant's own race. In contrast to the abundance of research examining the developmental trajectory of race biases, work on age-related biases has focused mainly on adulthood, with less research dedicated to the investigation of these biases during infancy, childhood, and adolescence. It is important to note that unlike species and race, which are face traits that typically remain stable across an individual's lifespan, age is a more changeable dimension inherent to faces, which implies that our exposure to various age groups is also changeable across the lifespan. Moreover, unlike race, for which there is typically overwhelming exposure to a commonly experienced category (i.e., own-race faces) and minimal exposure to alternate face categories (i.e., other-race faces), the differences between an individual's experiences with faces of various ages are more subtle. Possibly resulting from these differences in timing, amount, and/or quality of experience, the ORB and the OAB in adults seem to reflect at least partially different processes (Wiese, 2012). Within this framework, the investigation of age biases across development appears as a promising tool to understand how face representation adapts to reflect the individual's social experience in everyday natural contexts.

In adults, age is one of several sources of information that is rapidly extracted from faces (Rhodes, 2009) and is one important dimension that influences how faces are attended (e.g., Slessor, Phillips, & Bull, 2010), encoded (e.g., He, Ebner, & Johnson, 2011), discriminated (e.g., Kuefner, Macchi Cassia, Picozzi, & Bricolo, 2008; Kuefner, Macchi Cassia, Vescovo, & Picozzi, 2010; Macchi Cassia, Picozzi, Kuefner, & Casati, 2009b) and retrieved from memory (e.g., Fulton & Bartlett, 1991; Wright & Stroud, 2002). A number of studies have shown that in adults this influence takes the form of a processing advantage for faces of the observer's own-age group compared with other-age faces, giving rise to an OAB (also called other-age effect; Perfect & Moon, 2005; Wright & Stroud, 2002). In several different kinds of face-processing tasks, ranging from eyewitness identification to perceptual discrimination, adults exhibit better performance for faces within their own age group compared with both older adult faces (Anastasi & Rhodes, 2006; Bartlett & Leslie, 1986; Bäckman, 1991; Fulton & Bartlett, 1991; Havard & Memon, 2009; Wiese, Schweinberger, & Hansen, 2008; but see Firestone, Turk-Browne, & Ryan,