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Young children's difficulty in disregarding information from external features when matching unfamiliar faces

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ABSTRACT

Three experiments were conducted to examine developmental differences in reliance on internal (i.e., eyes, nose, mouth, and cheeks) or external (i.e., hairstyle) facial features between young children and adults when matching two unfamiliar faces. Participants viewed two facial images and were asked to decide whether the images showed the identical person or two different people. Four different types of stimuli were presented: two incongruent stimuli, in which the two images showed either the same internal face (i.e., same person) with different hairstyles or two different internal faces (i.e., different people) with the same hairstyle, and two congruent stimuli, in which the two images showed either the same face and hairstyle or two different faces and hairstyles.

We found that children were more likely to base their responses on external hairstyles for the incongruent stimuli, unlike adults (Experiment 1), even when they were instructed to attend to internal features (Experiment 2). Eye movement data showed that both children and adults spent the most time gazing on the internal features and gave little attention to the external hairstyle, and children attended to each part of the internal features as long as, or even longer than, adults (Experiment 3). Children's response based on external hairstyles was due to their inability to disregard external information and was not attributed to their tendency to attend more frequently to external parts rather than internal parts.

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Introduction

Despite long-term exposure to faces during infancy, young children do not reach an adult level of expertise for facial processing. In particular, they show low performance when processing unfamiliar faces or faces exhibited for a short time. From a practical point of view, young children compared with adults are far more likely to misidentify people when their appearance has been changed by hairstyle or eyeglasses. Why are young children inferior to adults at identifying people? What are the differences in facial processing between young children and adults? In this study, we focused on the process of attending to internal facial information and disregarding external information to address these questions.

Developmental differences in facial processing between adults and young children have been examined mainly from the aspects of featural and configural processing (Baenninge, 1994; Diamond & Carey, 1977; Flin, 1985; Mondloch, Dobson, Parsons, & Maurer, 2004; Mondloch, Le Grand, & Maurer, 2002). Earlier studies (e.g., Diamond & Carey, 1977) showed that facial identifications by young children were based more on isolated features of paraphernalia such as a hat or glasses. More recent studies (Mondloch et al., 2002, 2004) demonstrated that preschoolers were insensitive to configural (second-order) relations or spatial relations among facial features (e.g., space between eyes, space between nose and mouth) despite their sensitivity to individual facial features (e.g., shape of eyes, nose, mouth) and to contour. Overall, the literature suggests that children's poor performance on face recognition tasks, relative to that of adults, could be attributed to immature second-order relational processing.

Moreover, several studies (Campbell et al., 1999; Campbell, Walker, & Baron-Cohen, 1995; Ellis, Shepherd, & Davies, 1979; Young, Hay, McWeeny, Flude, & Ellis, 1985) found another difference in facial processing between young children and adults or older children—reliance on internal features (eyes, nose, mouth, and cheeks) or external features (hairstyle or hairstyle including contour). For example, Ellis and colleagues (1979) demonstrated that adults showed an internal processing advantage in recognizing familiar faces, whereas there was no difference between internal and external processing in recognition of unfamiliar faces. Young and colleagues (1985) showed similar results using matching tasks. In contrast, preschool-aged children showed an external advantage in recognizing both familiar and unfamiliar faces; that is, they tended to recognize even familiar faces based on the external feature of hairstyle (Campbell et al., 1995, 1999). For example, Campbell and colleagues (1999) used naming tests of famous (i.e., familiar) people, such as movie stars and politicians, when presenting internal features, external features, or the whole face. Children under 11 years of age showed an external advantage. An internal advantage was found only at 15 years of age. This research suggested that a developmental shift from external to internal advantage occurs during childhood.

Recent studies, in contrast, have insisted that previous observations of a shift in reliance from external to internal facial features can be attributed to the familiarity of the faces rather than to age-related changes in face processing (Ge et al., 2008; Megreya & Bindemann, 2009; Wilson, Blades, & Pascalis, 2007). These studies demonstrated that young children were likely to match or identify familiar faces based on internal features. They used facial stimuli of the children's classmates or teachers, which were more familiar to the children than faces of celebrities. For example, Wilson and colleagues (2007) showed that 5- and 6-year-olds recognized their teachers' faces better from internal features than from external features. In addition, even 4-year-olds showed internal advantage in a task of naming their own classmates (Ge et al., 2008). These researchers concluded that children generally process familiar faces based on internal features and process unfamiliar faces based on external features, which is the same manner as that of adults.

However, to conclude that there is no developmental difference in processing external and internal information would be premature for the following reason: The above-mentioned studies did not account for the contribution of the various elements of the total facial configuration, that is, the internal and external parts of the face. In these studies, internal parts were cut out from a whole face and presented in the absence of external parts and vice versa to control the effect of the other parts. However, in everyday life, people do not see internal face and external hairstyle separately. Thus, investigations using facial stimuli of either external or internal parts do not reflect facial processing in real life. Some